THE INDIAN JOURNAL OF SURGERY

APRIL, 1957

BIMONTHLY

Annual Subscription Rs. **24**

Achromycin*

HYDROCHLORIDE TETRACYCLINE HCl CRYSTALLINE

Ointment

Lederle

PACKAGE:

½ oz. tube (containing 30 mg. per Gm. (3%) of Tetracycline Hydrochloride in a petroleum-wool fat base).

...a new and superior broad-spectrum antibiotic

now in Ointment form for

topical application

...is effective against both Gram-positive and Gram-negative organisms, including streptococci, staphylococci, and the coli-aerogenes group.

ACHROMYCIN

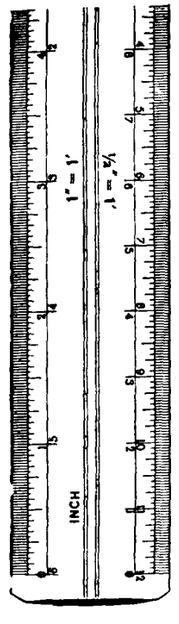
...is applied directly to the involved area, preferably on sterile gauze, for:

- Treatment of superficial pyogenic infections of the skin
- Prevention of infections in wounds
- After surgery

Specify Lederle

LEDERLE LABORATORIES (INDIA) PRIVATE LTD.
P. O. B. 1994, BOMBAY 1

*Trade Mark



by any measure it's

BARD-PARKER RIB-BACK SURGICAL BLADES

and by any measure it is just as true today as when our Company was founded . . . in the purchase of B-P RIB-BACK SURGICAL BLADES you are provided with the most dependable cutting edges that modern scientific methods and *the art of accuracy* can produce . . . their performance in use is the answer to the question of economy!

Sole Distributors:

BOMBAY SURGICAL CO.

NEW CHARNI ROAD :: BOMBAY-4.

It's Sharp

RIB-BACKS packaged in the *new* RACK-PACK eliminates unwrapping, handling or racking of individual blades. A real *time* and *labor* saver for the O.R. personnel. *In a matter of seconds from* RACK-PACK to sterilizer.

QUALITY AND DEPENDABILITY • UNIFORMLY SHARP • ENDURING CUTTING EDGES

The Indian Journal of Surgery

Vol. XIX No. 2

CONTENTS APRIL 1957

NOTICE TO CONTRIBUTORS

The Indian Journal of Surgery publishes original articles in all branches of surgery and allied subjects. Papers for publication and all editorial communications should be addressed to the Editorial Secretary, Indian Journal of Surgery, 164, Poonamallee High Road, Madras 10. Papers sent to the journal are sent to a panel of referees and are accepted for publication on their recommendation. The accepted papers are published on the understanding that they have not been, and will not be published in whole or in part in any other journal.

Orthopaedic Section : Articles intended for publication in the Orthopaedic Section of the Journal may kindly be sent to the Sectional Editor, Dr. N. S. Narasimhan, F.R.C.S., 221, Thambu Chetty St., Madras-1.

Style : Manuscripts must be typewritten on one side on quarto or foolscap sheets, double space and with a margin of not less than two inches. They should bear the name and full address of the author to whom the proofs are to be sent. The paper should conclude with a brief summary stating the conclusions described in the paper.

Tables and Illustrations : Tables should be numbered in Roman numerals and set out on sheets separate from the text. The illustrations should be kept separate from the text and should be numbered consecutively in Arabic numerals. Each figure should be referred to in the text and the descriptive legends should be typewritten on a separate sheet of paper. Nothing should be written or typed on the back of the illustrations. Photographs and photo-micrographs should be printed on glossy paper and generally should not be larger than 6.5 x 6.5 cms. If transmitted through the post they should not be folded and should be protected by corrugated cardboard paper.

Illustrations will not be accepted unless they reach a certain standard of excellence technically, present an attractive appearance and add significantly to the value of the presentation.

References : These should be arranged alphabetically by authors. For citation of a book, give in order author's name, initials, complete title, place of publication, name of publishers, year and page. For an article author's name, initials, full title of paper exactly as it appears, name of journal (abbreviated as in the Quarterly Cumulative Index Medicus), volume number (in heavy type Arabic numerals), inclusive page numbers and year. The following example illustrates the desired punctuation and arrangement.

> Christopher, F.: Minor Surgery. 5th Edition. Philadelphia and London: W. B. Saunders Company, 1945, p. 348.

Citations in the text should give the author's name followed by the number listed in the reference.

Proofs : Contributors will receive one proof in galley by air mail, if necessary, which should be immediately corrected and returned by air mail to the Editorial Secretary. Only minor alterations will be accepted in the original manuscript at the time of the correction of proofs.

Reprints : 25 reprints of an article will be sent to the author or divided among the authors. Additional reprints can be supplied at cost price if application is made when the proofs are returned.

All communications regarding membership of the Association, subscription to the Journal, and advertisements may be addressed to the Hony. Secretary, Association of Surgeons of India, 164, Poonamallee High Road, Madras 10.

THE
INDIAN JOURNAL OF SURGERY

Vol. XIX APRIL 1957 No. 2

CARCINOMA OF THE MALE BREAST

(A study of 30 cases)

*by M. V. SIRSAT, Bombay.**

Notable publications on carcinoma of the male breast are those of Gilbert [2], Neal [4], Sachs [5] and Wainwright [7]. The purpose of this paper is to present a clinical and pathological study of 30 cases of carcinoma of the male breast recorded in the Laboratories of the Tata Memorial Hospital, Bombay, during the period 1941 to 1955.

Clinical Findings

Frequency: During the fourteen-year period (1941-1955) whereas 30 cases of carcinoma of the male breast were recorded, there were 1.596 carcinomas of the female breast. Thus carcinomas of the male breast formed 1.8 per cent of the total breast carcinomas. The incidence of male breast carcinoma in Europe and U.S.A., is reported to be about 1 per cent. In Malaya, Marsden [3] has recorded an incidence of 3 per cent for mammary carcinoma in the males. Cooray [1] from Ceylon reported 5 cases in males to 170 in females, an incidence of 2.9 per cent. Marsden (loc cit) has stated that the incidence of breast carcinoma in males is highest in certain parts of Africa, its incidence among Negroes being as high as 10 per cent.

Age Incidence: The youngest patient in the series was 35 years old and the oldest 80 years. Fig. 1. shows that the peak age incidence of carcinoma of the breast in men is a decade later than the peak age incidence of carcinoma in women.

Race and Religion: All the 30 patients were Indians. The distribution according to communities is shown in the following table (Table I) and is compared with the distribution of 42 cases of gynaecomastia seen during the same period.

Table I

CORRELATION BETWEEN THE INCIDENCE OF GYNAECOMASTIA AND CARCINOMA IN MALE BREAST IN DIFFERENT COMMUNITIES

	Hindu Deccani	Hindu Gujarati	Muslim	Christian	Parsee	Others	Total
Gynaecomastia	13	5	6	1	16	1	42
Carcinoma	9	7	5	2	4	3	30

It will be seen that gynaecomastia occurred more frequently amongst Parsees; 16 cases (38.1 per cent) as against 4 (12.5 per cent) cases of carcinoma of the breast, were seen in that community. The significance of gynaecomastia as a precursor to carcinoma of the breast is discussed later.

Clinical Features

1. Duration of tumour before coming under observation: This was recorded in 28 cases. About 35 per cent of men with cancer of the breast applied for treatment within 6 months of their noticing a lump in the breast (Table II).

Table II

DURATION OF TUMOUR AT THE TIME OF OBSERVATION

	Number of cases	Percentage
0 — 6 months	10	35.7
7 — 12 months	7	25.0
13 — 23 months	5	17.9
2 yrs. — 3 yrs.	4	14.3
Over 3 yrs.	2	7.1
Total	28	100.0

Duration of tumour not recorded in 2 cases.

* Dept. of Pathology, Tata Memorial Hospital, Bombay.

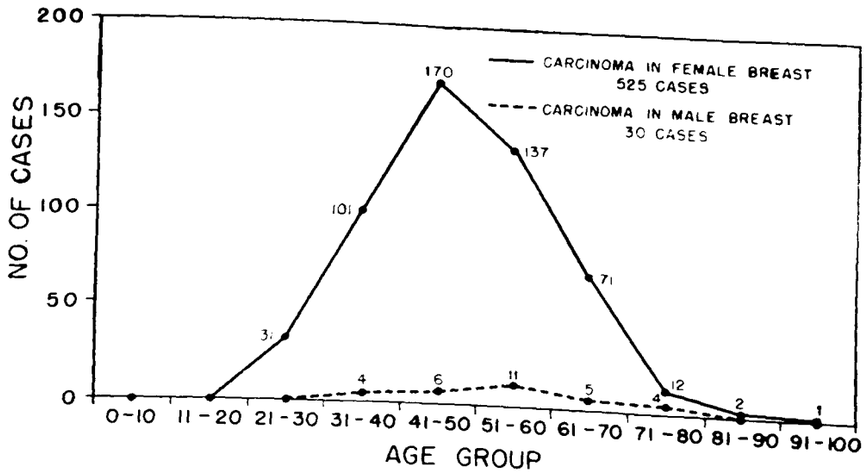


FIG. 1

2. Presenting symptoms and signs: Table No. III shows the distribution of these in series of 30 cases studied.

TABLE III

INITIAL SYMPTOMS AND SIGNS

Symptom	No. of cases
Breast mass only	6
Breast mass plus	
Retracted nipple, pain and ulceration	2
Retracted nipple	3
Discharging nipple	1
Encrusted nipple and ulceration	12
Ulceration only	1
Mass, Pain, Ulceration, and skin nodules	5
Total	30

(a) Ulceration of the nipple: In more than 50 per cent of the cases this was the principal symptom. This was often accompanied by either a mass in the breast or retraction of the nipple.

(b) Involvement of the nipple: The nipple was involved in 12 cases out of 30. Wainwright (loc cit) stated that in carcinoma, the nipple of the male breast is more commonly involved than in the female breast and that is because the male mammary gland is so small that any growth must necessarily be near enough to the nipple to affect it sooner or later

Fig. 2.

(No. 1841). A Hindu male aged 60, with papillary cyst-adenocarcinoma. A simple mastectomy was done. Patient alive for 7 years.

(c) Involvement of the axillary lymph nodes: Clinically these were involved in 20 cases. However, in 13 specimens histological examination of lymph nodes showed metastases in 8 instances.

(d) Breast involved: The right breast was involved 15 times, and the left one in 14 cases. Bilateral involvement was present in 1 case. Literature on this subject reveal that carcinoma occurs almost with equal frequency in two breasts.

Co-existent Gynaecomastia and Cancer: Many authors consider gynaecomastia as one of the etiological factors in cancer of the male breast. In the present series however in only 1 case had gynaecomastia preceded carcinoma. At this Hospital a preponderance of gynaecomastia amongst Parsees is observed, in them however only 4 cases of carcinoma of the breast were seen. It may be remarked that, in India, Parsees are economically, a better class of people than the other communities and yet gynaecomastia is common amongst them. Marsden (loc cit) suggested that there was a direct correlation between a high incidence of gynaecomastia and prevalence of liver diseases in the natives of Malaya and certain parts of Africa. According to him, malnutrition was responsible for the liver diseases, diseased livers did not inactivate estrogens and the resultant hormonal inbalance led to gynaecomastia. Such correlation certainly did not exist in the cases described here. Of 42 cases of gynaecomastia recorded in this laboratory 16 (38.1 per cent) are among the Parsee community which has nutritional standards far above any other community in Bombay. A scrutiny of the case records of these 42 patients did not reveal history or presence of liver dysfunction or disease.

Fig. 3.

The specimen from patient (Fig. 2). Note the papillomatous nature of the tumour. The cysts seen in the photograph were filled with yellowish fluid.

PATHOLOGY

There is little difference in the pathology of carcinoma of the male and female breast. The distribution of 4 histological types of carcinoma seen in this series is shown in Table IV.

TABLE IV

PATHOLOGIC VARIETIES

1. Infiltrating Duct Carcinoma	...	16
2. Scirrhous	...	7
3. Papillary cyst-adenocarcinoma	...	6
4. Colloid	...	1
Total	...	30

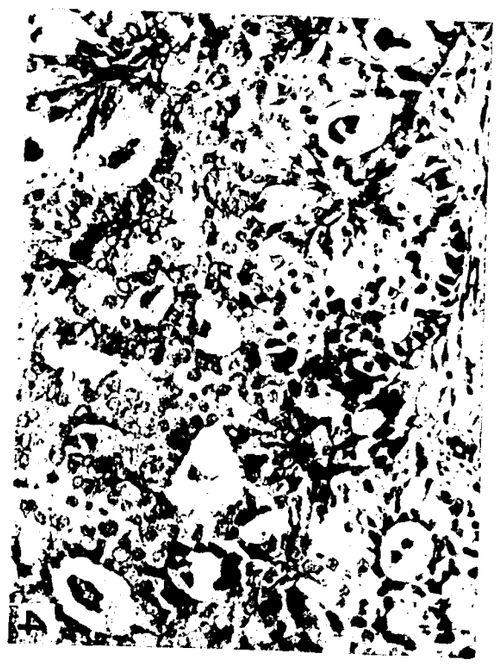


Fig. 4.

Photomicrograph of papillary cyst-adenocarcinoma. The picture does not show the papillary portion but the acinar areas are well brought out. Twenty per cent of the carcinoma in the series reported herein belonged to this variety.

(H. & E stain x 240)

Fig. 5.

(No. 2267). A Muslim male aged 55, with a carcinoma of the left breast. Note ulcerated growth destroying the nipple. Small outlaying nodules around the ulcer are seen. The supraclavicular and axillary lymph nodes were involved. The patient died within a year after admission to the hospital.

The lobular type of carcinoma is not known to occur in men, because the male breasts do not possess lobules. Stewart [6] has pointed out that certain pathological types seen in the female breast do not occur in males. Table IV shows that the majority of cases fall into the histological variety of infiltrating duct carcinoma as would be expected. Six cases belong to an interesting variety of infiltrating papillary cyst-adenocarcinoma. Papillary cyst-adenocarcinoma comprises 1 per cent of the tumours that affect the male breast. In the present series, however 6 cases out of 30 (20 per cent) were papillary cyst-adenocarcinomas: an unusually high incidence of this variety. The tumour is characterised histologically by branching finger-like processes around a core of fibrovascular connective tissue. Infiltration by the tumour through the fibrous capsule is often seen. However all the 6 tumours encountered in this series were slow growing, well circumscribed and not attached to the skin or pectoral fascia.

Summary

1. Carcinoma of the male breast is a rare disease. Only 30 cases were encountered in the Laboratories of the Tata Memorial Hospital, during 1941 through 1955. During the same period there were 1,596 cases of carcinoma in the female breast.

2. The role of gynaecomastia as a precursor to carcinoma is discussed. Gynaecomastia was most frequently found amongst the Parsees. Amongst them, however only 4 cases of carcinomas were seen.

3. There is little difference in pathology between carcinoma of the male and female breast. In the present series, papillary cyst-adenocarcinoma occurred in 20 per cent of the cases.

REFERENCES

1. Cooray, G. H.: Observations on Malignant Disease in Ceylon based on a study of two thousand two hundred and ninety five Biopsies of Malignant Tumours. Indian J. Med. Res. 32: 71-91. 1944.

2. Gilbert, J. B.: Carcinoma of the Male Breast with Special Reference to Etiology. Surg. Gynec. & Obst. 57: 451-466. 1933.

3. Marsden, A. T. H.: The Etiology of Carcinoma of the Male Breast. Alleg. Path & Bact. 18: 728-730. 1955.

4. Neal, M. P.: Malignant Tumours of the Male Breast. Arch. Surg. 27: 427-465. 1933.

5. Sachs, M. D.: Carcinoma of the Male Breast. Radiology. 37: 458-467. 1941.

6. Stewart, F. W.: Tumours of the Breast. Fascicle 34. Published by the Armed Institute of Pathology. Washington, D.C. 1950.

7. Wainwright, J. M.: Carcinoma of the Male Breast: Clinical and Pathologic Study. Arch. Surg. 14: 836-859. 1927.

Received for publication on 10-10-56.

BOECK'S SARCOID OF STOMACH

*by P. N. WAHI and PASHPATI N. WAHI, Agra.**

The incidence of gastric involvement in cases of sarcoidosis is low. The gastrointestinal tract as a whole is rarely involved. In some of the reported series of cases the percentage involvement of gastrointestinal tract is as follows: Friedman [4] 17.2 percent, Rubbin & Pumer [12] 11.5 percent, and Ricker & Clark [10] 4.5 percent. Most of these are instances of involvement of small intestine. This has led to the suggestion of an etiologic relation between regional ileitis and sarcoidosis. Weightage of opinion is however in favour of rejection of such a relationship. Important reviews by Fisher [3], Riley [11], Reisner [9] and Nickerson [8] do not include a single case of gastrointestinal tract involvement. Review of 4 cases by Barrie and Bogcoch [1] includes two cases of appendicular involvement and none of the stomach.

Cases of isolated sarcoidosis of the stomach presenting only gastric symptomatology are very rare. Gore and McCarthy [5] reported a case of sarcoid of the stomach in a 26 year old man. Gastrectomy was performed and the histologic examination of the regional lymph node confirmed the diagnosis. They also in this report have mentioned a similar case presented by Dr. Fred Stewart at a surgico-pathological conference in New York in 1942. Giubert [6] has described a case of a 61 year old woman who presented symptoms of a gastric ulcer which was revealed by X-ray examination as located on the lesser curvature. Histological examination of the resected stomach showed the presence of granulomata in the base of the ulcer and the mucosa. McKusick [7] described two cases of Boeck's sarcoid of the stomach. Both the cases showed evidence of gastritis and had enlarged regional lymph nodes. His first case was a woman of 49 years who was admitted with the complaints of heaviness in the upper abdomen following meals, and gaseous eructation. Operative diagnosis was carcinoma of the stomach with metastasis in the regional lymph nodes. Microscopic examination of the resected stomach showed sarcoidosis. The second case was of a woman of 41 years who was admitted for gastro-intestinal bleeding. Specimen of resected stomach showed three or four superficial ulcers. Microscopic examination showed granulomas characteristic of sarcoidosis. Most of the giant cells contained Schauman bodies. The rarity of gastric involvement warrants the report of the following case.

* From the Dept. of Pathology, S. N. Medical College, Agra.

CASE REPORT

Hindu female, aged 24 years was admitted to the S. N. Hospital, Agra with the complaints of distension and pain in abdomen and vomiting of one year's duration. She has been married for eight years and the last child was born two years back. Before her present complaints she was in perfect health. About 1 year back she started getting mild attacks of pain in the epigastric region three to four times a day. This pain became more and more continuous till it persisted all the 24 hours. Sometimes she would get attacks of sharp acute pain in the epigastric area especially 3—4 hours after a heavy meal. She could only get relief after vomiting. She also complained of eructations. She could also feel a lump in the epigastric region.

The barium meal showed no filling defect or ulceration. However, the emptying of the stomach was delayed. The diagnosis of pyloric stenosis was made. Pathological investigations revealed a normocytic normochromic anaemia. Nothing else was abnormal. Laparotomy and gastrojejunostomy was performed. Pyloric antrum and the adjacent portion of stomach was markedly hypertrophied and adhesions to the surrounding mesentry were seen. No other abnormality in the stomach was detected. Regional lymph nodes were enlarged. One of the lymph nodes was removed and sent for histological examination.

Microscopical examination of the resected lymph node revealed the presence of numerous granulomas dispersed throughout the node. There were focal collections of histiocytic cells with a tendency to form epitheloid cells. Lymphocytes and a few plasma cells and eosinophils were also seen. Numerous multinucleated giant cells were

Fig. 1.

Microphotograph showing a granuloma of Sarcoid. Patchy fibronoid necrosis and fibrosis is seen. Numerous giant cells are seen. Tubercle bacilli were not detected by special stain. (H.E. x 100)

present. These were of foreign body type. Some of them contained doubly refractile bodies. No caseation was seen. Areas of patchy fibrinoid necrosis and fibrosis were seen. Appropriate stains did not reveal acid fast bacilli (Fig. 1).

COMMENTS

This woman had signs and symptoms of pyloric stenosis. She was considered as a case of sarcoidosis of the stomach from the characteristic histologic lesions seen in the regional lymph nodes. This case fulfilled the histologic criteria laid down by Nickerson[8], e.g. (1) absence of caseation, (2) absence of tubercle bacilli, (3) absence of any other evidence of tuberculosis in the body and (4) the giant cells are larger than in tuberculosis and contain more nuclei.

Lymph node involvement is quite frequent in sarcoidosis. Bernstein[2] found the involvement of lymph nodes as the most frequent manifestation of the disease. However it has to be remembered that there may be no actual enlargement and only, biopsy of the node may disclose histologic evidence of sarcoidosis. In this case the diagnosis was made after the examination of the regional lymph node which was enlarged and was considered to be malignant.

REFERENCES

1. Barrie, H. J. and Bogoch, A.: Am. J. Path. **29**: 3, 1953.
2. Bernstein, S. S.: J. Mt. Sinai Hosp. **12**: 1045, 1946.
3. Fisher, A. M.: Tr. Am. Clin. and Climatol. A. **59**: 58, 1947.
4. Friedman, M.: Am. J. Path. **20**: 621, 1944.
5. Gore, I. and McCarthy, A. M.: Surgery. **16**: 865, 1944.
6. Guibert, H. L.: Am. Anat. Path. **17**: 295, 1947.
7. McKusick, V. A.: Gastroenterology. **23**: 103-113, 1953.
8. Nickerson, D. A.: Am. Rev. Tuberc. **24**: 19, 1937.
9. Reisner, D.: Am. Rev. Tuberc. **49**: 289, 1944.
10. Ricker, W. and Clark, M.: Am. J. Clin. Path. **19**: 725, 1949.
11. Riley, E. A.: Am. Rev. Tuberc. **62**: 231, 1950.
12. Rubin, E. H. and Pumer, M.: Am. Rev. Tuberc. **49**: 146, 1944.

Received for publication on 28-10-'56.

EXTRA SUPRA RENAL PHAEOCHROMOCYTOMA

by A. K. BASU, S. R. KONAR and G. S. KARAI, Calcutta.

INTRODUCTION

Phaeochromocytoma is a tumour arising from chromaffin tissue, which developmentally, is derived from the neural ectoderm. In the process of development and transition from the primitive neural crest, the major element of this type of tissue is lodged in the suprarenal medulla but remnants may also be found in outlying areas such as the main and secondary sympathetic nerve ganglia, the peri and pre-aortic nerve plexuses in the abdomen and in the thorax and also in the area in front of the bifurcation of the aorta and pelvic brim. The tissue situated in this last position has been given the special name of "Organ of Zuckerkandl" and about 13 examples of Phaeochromocytomas involving this organ as well as the para-aortic deposits and exercising vasospastic influence have so far been described in the literature (Weber 1949). Similar type of chromaffin tissue also is found in the so-called "Carcinoid" tumours of the appendix, Meckel's diverticulum and small intestine, but until now, the tumours involving these organs, though morphologically similar, have not yet been reported as producing any influence on the blood pressure mechanism. 4 examples of intrathoracic phaeochromocytomas have so far been reported. Of these, accurate pre-operative diagnosis was possible in only 2 (Roth & Kvale, 1956). Other reported instances of extrasuprarenal phaeochromocytomas have involved the kidney (2 cases), neck (1 case) and lesser omentum (1 case).

CASE REPORT

A frail looking lady aged 44 years was admitted into hospital on 7-4-1956 complaining of periodic attacks of giddiness, faintness and palpitation of 10 to 12 years' duration. These attacks were usually brought on by changes of posture particularly when she stooped down. At the initial examination, one of us was able to outline an intra-abdominal lump below and to the left side of the umbilicus. Attempts to delineate the lump by carefully palpating its margin precipitated a fainting attack and blood pressure reading at this time was 190/90 mm. of Hg. This episode immediately brought on the suspicion of a tumour having vasopressor properties and the patient was investigated from this point of view.

On Examination:

A firm, elastic intra-abdominal lump was palpable below and to the left side of the umbilicus. It was relatively mobile from side to side, but fixed in vertical movement, and pulsation of the aorta could be felt transmitted through the lump. There was no expansile pulsation. On pressure over the lump, the patient complained of giddiness and faintness.

Among others, the following investigations were done in the hospital:

(1) Resting blood pressure — 95/50 mm. of Hg.
(2) Blood pressure on standing — same.
(3) Blood pressure after massaging the swelling for 2 mins. — 180/90 mm. Hg.
(4) Urinary Catecholamine — 169.8 microgram per 100 c.c.
(5) Plasma Catecholamine — 55 microgram per 100 c.c.
(6) I.V. Pyelography — showed normal appearances.
(7) Perirenal pneumography — showed normal outlines of both suprarenal glands.
(8) B.M.R. — +31%.

In view of other confirmatory evidences, it was not decided to produce any hypertensive crisis by injection of adrenergic drugs.

Exploration was decided upon. The anaesthetist (Dr. S. K. Chatterjee) decided to use "Arfonad" as the hypotensive agent in case of acute hypertensive crisis and "Levophed" (Noradrenaline) in case of a hypotensive episode.

1st Operation:

The first exploration was performed on 4-7-'56. The abdomen was opened by left paramedian incision and the lump was found to be solid and firm and of the size of about 8 cm. x 6 cm. It was situated retroperitoneally over the bifurcation of the aorta, the left common iliac artery and the left common iliac vein (Fig. 1). The tumour was densely adherent to the surrounding structures such as the left leaf of the mesentery and these adhesions contained many vessels. Progress was therefore very slow. When the relation of the tumour to the aorta was clearly visible, it was apparent that its separation might entail resection of whole or part of the aortic wall and

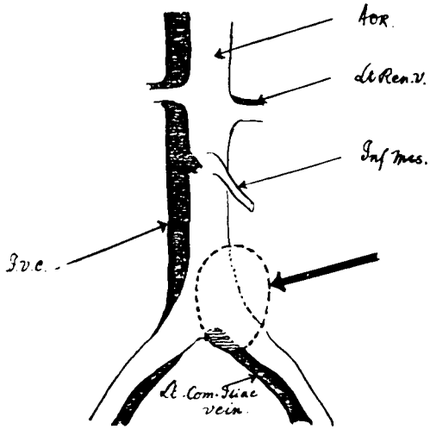


Fig. 1.
Shows the position of the tumour and its relations to surrounding structures.

as we were not prepared for such an eventuality, the operation was terminated with the hope that re-exploration would be performed again with everything ready for aortic resection and repair. On aspiration of the tumour mass, a small quantity of haemorrhagic fluid was aspirated. On examination, this fluid was later found to contain 4 microgram of catecholamine per 100 c.c.

2nd Operation :

This was done on 18-7-1956. The trunk of the aorta below the renal arteries and both common iliac arteries were controlled by double loops of umbilical tapes. Fortunately, it was possible this time by slow and painstaking dissection to separate the tumour from the aorta without major damage to its wall. At places, the adventitia was slightly shaved off, but the wall remained intact. A number of small feeding vessels from the aorta were ligated and divided. The tumour was also particularly adherent to the left common iliac vein in the interval between the common iliac tributaries. The venous drainage of the tumour was by a small tributary joining this portion of the vein and in the process of separation, a rent

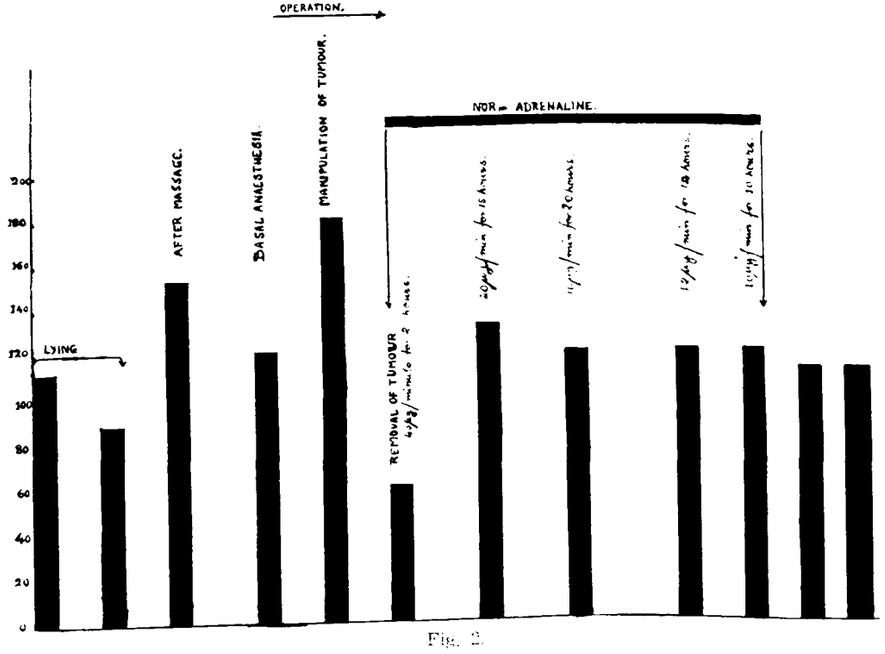


Fig. 2.
Shows the blood pressure changes, in the pre-operative, operative and post-operative period, together with the strength of noradrenaline solution used in the post-operative period.

of about ½" diameter was made in this vein. This was at first controlled by pressure and after removal of the tumour was repaired by 5·0 Deknatel silk with atraumatic needle.

The patient had maintained a fairly even blood pressure level during and up to the time of removal of the tumour with occasional spikes rising up to 190 mm. Hg. But as soon as the tumour was removed, the pressure fell precipitately to 60 mm. Hg. Rapid infusion of Noradrenaline solution restored the pressure to 160 mm. Hg. and the operation was completed without further trouble.

Post Operative :

It was necessary to use noradrenaline solution for about 96 hours in this case to maintain the blood pressure on an even keel ranging between 100 to 110 mm. Hg. systolic (Fig. 2). Gradually the concentration of the noradrenaline solution was reduced and from the 4th day onwards the pressure was stable. The patient tolerated the prolonged administration of noradrenaline solution fairly well and except for slight thrombophlebitis in one of the veins did not have any other trouble. 2 months after the operation, the patient is free from symptoms. Her blood pressure is

Fig. 3.
Shows the histological appearance of the tumour. (H & E x 300)

Fig. 4.
Same in high power. (H & E x 600)

steady at about 110 mm. Hg. Estimation of urinary catecholamine gave the figure of 4 microgram per 100 c.c. Serum catecholamine was so low as could not be measured.

Description of the tumour :

The tumour was globular in shape, the diameter being about 3". Cut section revealed a solid fleshy surface, brownish in colour. The formol saline solution in which it was preserved very soon became brownish. On immersing the tumour in bichromate solution, it took the chromic acid stain rapidly.

Histology of the tumour :

(Figs. 3 & 4) revealed strands of characteristic eosinophilic granular cells separated by numerous vascular channels. There were numerous alveolar spaces around the cell masses.

Discussion

The diagnosis of a Phaeochromocytoma wherever situated is based mainly on clinical symptoms or signs and to a lesser extent on certain pharmacological and bio-

chemical tests and in some cases on concomitant radiological demonstration of a space occupying lesion in the likely areas. Clinically, attacks of paroxysmal hypertension associated with faintness, giddiness, pallor, sweating, vomiting and a sense of suffocation are characteristic and these attacks may either come spontaneously or may be brought on by exercise, emotion or by changes of posture and manipulation of an intra-abdominal swelling as exemplified in the present case. Although in between the attacks, the blood pressure usually returns to normal level. it is being increasingly recognized that in late stages, phaeochromocytomas may lead to sustained severe hypertension and therefore can easily be mistaken as being of the malignant hypertension type. Recently we have had another case of phaeochromocytoma with sustained malignant type of hypertension. The differentiation is made more difficult by the fact that phaeochromocytomas may also be associated with advanced eye-ground and renal function changes and in such cases diagnosis will mainly depend on biochemical findings in the urine and response to certain adrenolytic drugs.

The blood pressure response to adrenergic and adrenolytic drugs in paeochromocytoma patients is characteristic. Sudden acute hypertensive response to Histamine, Tetraethyl ammonium chloride (T.E.A.C.) and to Methacholine in a patient complaining of paroxysmal attacks is confirmatory (Roth & Kvale 1956). Similarly acute hypotensive response to phentolamine (Regitine), and piperoxane in patients with sustained hypertension is also helpful, for similar sudden and profound fall of pressure does not occur in real malignant hypertensives (Emlet et al 1951).

Recently it has been possible to approximately measure the amounts of adrenaline and noradrenaline in the urine and thereby attain an idea of the circulating vasopressor drugs in the system. Moulton and Willoughby (1955) have described a simple bio-assay technique which can be used as a screening test. In their hands, this test was very satisfactory in that neither false positive nor false negative results were obtained. In phaeochromocytomas, the urinary catecholamines viz. adrenaline and noradrenaline are invariably raised—sometimes to alarming proportions and after removal of the tumour, there is corresponding fall of these amines. Both these expectations were fully corroborated in our present case. The pre-operative raised catechol amines both in the urine as well as in the blood were significantly reduced after operation. Also significant amounts of catecholamine was present in the aspirated fluid content of the tumour indicating its vasopressor activity.

Another important diagnostic aid is the demonstration of the retroperitoneal tumour by perirenal insufflation of air (Blackword 1951). Interpretation of these air studies is always difficult but in large tumours may be helpful. In the present case this method of investigation led to inconclusive results, but helped to demonstrate the presence of suprarenal glands, above the kidneys and normal in size.

The special problems associated with phaeochromocytomas situated at the aortic bifurcation are particularly with regard to their operative excision. These were very well illustrated in the case reported here. These tumours are usually densely adherent to the aorta or the iliac arteries or with the left common iliac vein and removal of the tumour may necessitate, as in this case, partial or total excision of the adherent vessels and their subsequent repair.

The most significant post-operative feature of the present case was the need for prolonged administration of noradrenaline solution to maintain the blood pressure about the level of 110 mm. Hg. Noradrenaline had to be used for about 96 hours (Fig. 2). It would be seen that initially and for about 2 hours after operation the strength of the noradrenaline solution was

40 microgram per minute. This is a very high dose but in another case, we have used even 80 microgram per minute for some hours without any untoward effect and with eventual recovery of the patient. Concentrated noradrenaline solution is said to be injurious to vessel walls but used with discretion and care and particularly with a fine plastic tubing in the vein, the patients tolerate the solution well.

Summary

(1) A case of extrasuprarenal phaeochromocytoma situated at the bifurcation of the aorta is presented. It was possible to accurately diagnose this case prior to the operation.

(2) Significant points in the diagnosis of phaeochromocytoma in general are mentioned. Stress is laid on special laboratory and pharmacological tests which may be of more importance than the clinical syndrome of paroxysmal hypertension and associated symptoms.

(3) Special difficulties in the operative procedure of this type of tumour such as intimate adherence to important blood vessels are well illustrated in this case.

(4) In the post operative stage, the need of prolonged administration of noradreline solution and its initial high concentration is stressed.

ACKNOWLEDGEMENT

We are grateful to Lt. Col. N. C. Chatterjee, Surgeon Superintendent, S.S.K.M. Hospital, for allowing us to publish this case. Dr. S. K. Chatterjee, Specialist Anaesthetist, besides administering the anaesthesia skillfully took great interest in the post-operative management of the patient and our grateful thanks are due to him. We are grateful to Dr. B. K. Aikat for the histological report and the microphotographs.

REFERENCES

1. Blackword, J.: "Perirenal pneumography." Brit. Jour. Surg. **39**: 111, 1951.
2. Emlet, J. R., Grimson, K. S., Bell, D. M. and Orgain, E. S.: "Use of piperoxane and regitine as routine tests in patients with hypertension." J.A.M.A. **146**: 1383, 1951.
3. Moulton, R. and Willoughby, D. A.: "A short laboratory screening test for phaeochromocytoma." Lancet ii: 16, 1955.
4. Roth, G. N. and Kvale, W. F.: "Phaeochromocytoma — Factors in accurate Pharmacologic diagnosis." Dis. of Chest. **29**: 366, 1956.
5. Weber, H. W.: "Contribution to the knowledge of tumours of the chromaffin system and of the sympathetic system." Frankfurt Z. Path. **60/1-2**: 228, 262, 1949.

Received for publication on 13-10-'56.

TRAUMATIC CHYLOTHORAX

(A Brief Review and Report of a Case)

by TIMOTHY TAKARO and JAMES R. DONALDSON, Miraj.†*

Introduction

Traumatic Chylothorax is a relatively rare and important sequel to operative and non-operative injury to the neck, chest, or abdomen, and should therefore be of interest to both the general and the thoracic surgeon. Ninety cases of traumatic chylothorax have been recorded in the medical literature available to us, up to Goorwitch's review in 1955 [8]. Of these 90, 17 were due to surgical trauma, and the remainder to various types of injuries, such as gunshot wounds, automobile accidents, stab wounds, blunt injuries, acute hyperextension of the spine, and even apparently, to severe coughing. Of the cases due to operative injury, eight developed chylothorax following thoracolumbar sympathectomy operations, while three followed the Blalock operation, and one case each resulted from rib resection for tumour, lysis of adhesions, thoracoplasty, left radical neck dissection, esophagectomy, and ligation of an anomalous subclavian artery. We are adding a single case of traumatic chylothorax with associated fractures of the first three ribs on the left, dislocation of the left clavicle at the sterno-clavicular joint, and hernial defect of the anterior thoracic wall, which was successfully treated surgically.

Surgical Anatomy

The thoracic duct is a thin, fibro-muscular vein-like tube 2 to 4 mm. in diameter in the average adult, which conducts chyle from the cisterna chyli at the level of the second lumbar vertebra in the abdomen, to the venous system, by emptying into the left subclavian vein, at or near its juncture with the left internal jugular vein, in the neck. Thus it traverses the thorax from bottom to top. It passes into the thorax from below, alongside the aorta, through the aortic hiatus in the diaphragm, and ascends on the anterior aspect of the vertebral bodies, between the azygos vein and the aorta, slightly to the right of the midline. At approximately the 5th or 6th thoracic vertebral level, it crosses to the left, and ascends into the neck behind the arch of the aorta, and the left sub-clavian artery, between the left side of the esophagus and the left parietal pleura. Injuries to the portion of the thoracic duct above the 5th or 6th thoracic vertebra usually result in a left-sided chylothorax, while injuries below this level usually result in a right-sided chylothorax. Occasionally, bilateral chylothorax is seen (Frazell [7]).

The duct system is well supplied by collaterals through minute direct communications with the intercostal, lumbar, and azygos veins. Hence the thoracic duct can be ligated with impunity. Although reduplication and branching occurs frequently above the eighth thoracic vertebral level, between the eighth thoracic vertebra and the cisterna chyli, the thoracic duct is almost always a single structure, and therefore, can almost always be completely interrupted surgically in this area (Van Pernis [18]).

Surgical Physiology

Approximately one to three liters of chyle are thought to pass along the thoracic duct in every 24 hour period in an average sized adult. This material is the colour of dilute milk, more or less white depending upon its fat content. In dogs, it has been shown that 25—50% of chyle volume comes from hepatic lymph (Cain et al [5]). Because of the high fat and protein content of chyle, and the fact that more than half of the fats absorbed by the intestinal villi pass along the thoracic duct, rupture of the duct is a very serious matter from the nutritional standpoint. In addition, the large quantities of chyle which collect hourly in either or both pleural cavities may cause serious mediastinal displacement and cardio-respiratory embarrassment.

Chyle is mildly alkaline in reaction, with a specific gravity which varies from 1012 to 1026 depending upon its fat and protein content. These, in turn, depend upon the nutritional state of the patient, the type and quantity of food recently taken, and the time of the last meal. The fat content may vary from 0.5% to 5.0%. Chylous fluid is also high in lymphocytes and eosinophilic leukocytes. When the thoracic duct is ruptured, with loss of chyle into the pleural cavity, there is a steady decline in serum proteins and total blood fats (Baldridge et al [2], Ehrenhaft et al [6]) as well as a pronounced lymphopenia, the relative decline of all three possibly depending upon how much chyle the collaterals conduct into the blood stream. Body weight falls, and eventually inanition may supervene, with death, if the leakage does not stop. The fall in blood fats and lymphocytes is much more acute if the previously intact duct is suddenly ligated, but within two or three weeks time, both of these return to normal levels (Ehrenhalf [6]). Ligating the previously traumatized leaking duct also results in a brief drop in lymphocytes, but usually serum proteins (and presumably also blood fats) begin to climb almost immediately, as the previous loss of proteins and fats is suddenly checked by obstructing the leaking duct and forcing the collateral channels to open up [2]. Chyle is bacteriostatic, and therefore infection developing in chylous fluid is rarely if ever reported.

Clinical Picture

Following trauma, there may be a delay of from two to ten days or more before any symptoms referable to chylothorax appear. The earliest symptoms, which are usually due to massive pleural effusion, are dyspnea, especially on exertion, and orthopnea, and even a shock-like state may be found in the presence of massive effusions. These symptoms are relieved by thoracentesis, only to return again as fluid reaccumulates. The material aspirated in usually milky, in uncomplicated cases of trauma, but if mixed with blood, it may be pink, or if the chylothorax is associated with malignancies, grey, green, brown, or coffee-coloured milky or turbid fluids may be seen (Klepser [11]). The appearance of milky fluid often suggests the diagnosis, because fluid of this nature is rarely aspirated in pleural effusions or empyemas. The diagnosis should, of course, be confirmed by any or all the various tests for chyle, (see below), or by the recovery in the chylous fluid of a lipophilic dye previously orally ingested (Klepser et al [11]). As leakage of chyle continues, the patient becomes dehydrated, and more and more debilitated, in spite of adequate food intake, and, in weeks, or months following injury, death from inanition may occur.

CASE REPORT

S.P., a 13 year old Hindu boy, was admitted to the Wanless Hospital, Miraj, on 19-7-1956 with a diagnosis of traumatic chplothorax made by the referring physician.* He gave a history of having been pushed off the back of a tractor about one month before admission, and run over by the machinery which the tractor was pulling. As a result, he had an extensive scalp laceration and an obvious dislocation of the left clavicle at the sterno-clavicular junction. The laceration was sutured, and the boy was said to have had no further untoward symptoms until eight days later, when he began to complain of dyspnea on effort, and orthopnea. He was found to have a massive left pleural effusion, and aspiration yielded large quantities of milky fluid. Repeated aspirations every day or two were necessary to relieve the patient's dyspnea. He soon lost weight and strength and developed a decubitus ulcer. After about four weeks of treatment he was referred to our hospital.

On admission, he was found to be thin, weak, dyspneic, and orthopneic. There was a large soft fluctuant mass about 6 x 10 cm. just beneath the clavicle, which ballooned alarmingly with each cough (Fig. 1). The medial end of the left clavicle bulged abnormally beneath the skin.

* Director of Surgery, Wanless Tuberculosis Sanatorium, Wanlesswadi, and Consultant in Thoracic Surgery, Wanless Hospital, Miraj.

† Consultant in Orthopaedic Surgery, Wanless Hospital, Miraj.

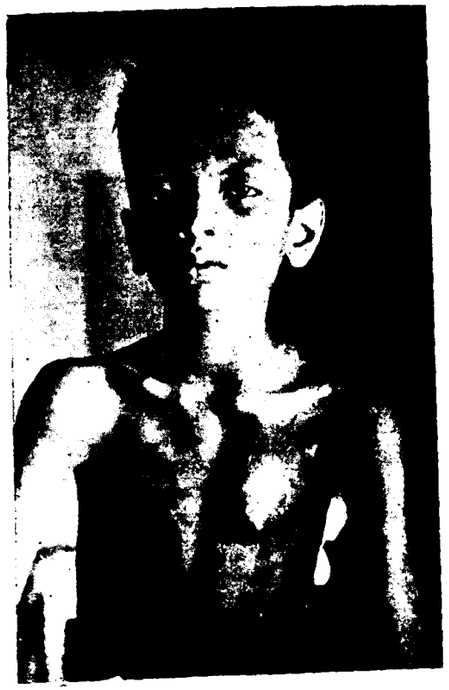


Fig. 1.

The appearance of the patient on admission, and one month after the injury which resulted in fractures of the first three ribs, left, dislocation of the medial end of the clavicle, hernial defect of the left anterior chest wall, through which chyle has leaked into the sub-pectoral space, and rupture of the thoracic duct, with left chylothorax. There is also a healed laceration of the scalp. Note the poor nutritional state of the patient due to chronic loss of chylous fluid.

There was a decubitus ulcer 1 cm. in diameter of the skin overlying the left scapula. Haemoglobin was 72% of normal; WBC 7,600, with 67% polymorphonuclear leukocytes, and 31% lymphocytes and 2% basophils. Urinanalysis was positive one plus for albumin and sugar as well as for "pus cells". The roentgenogram of the chest showed fractures of the postero-lateral portions of the second and third left ribs; massive left pleural effusion with 75% collapse of the left lung and shift of the mediastinum markedly to the right (Fig. 2).

Soon after admission, 1200 c.c. of milky fluid were aspirated from the left chest with relief of dyspnea, but a scout film following this showed

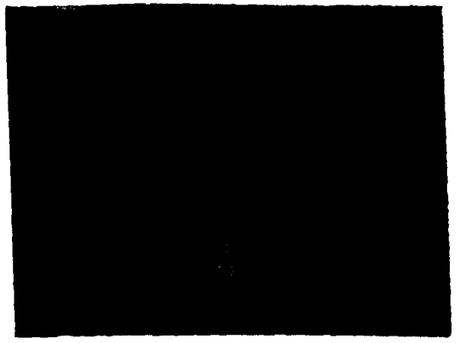


Fig. 2.

Reproduction of the roentgenogram of the chest on admission, showing left chylothorax, with shift of the mediastinum to the right. The fractured ribs did not reproduce well on these photographs.

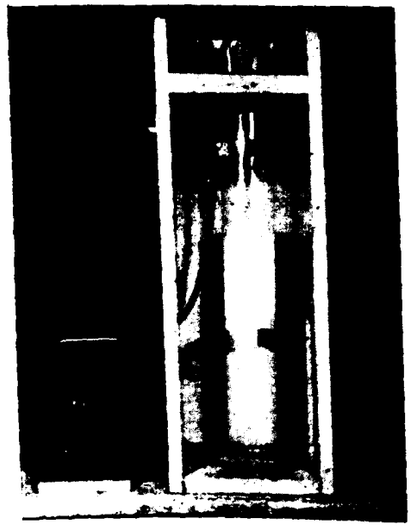


Fig. 3.

Appearance of typical milky chylous fluid in the thoracic suction pump.

the left lung still only 50% expanded, with a residual large effusion and a fluid-air level. Consequently a closed thoracotomy was done on the following day, posterolaterally, near the base of the lung, establishing tube drainage with negative pressure by means of a simple thoracic suction pump. Approximately 1200 c.c. of fluid

Fig. 4.

Aeproduction of the roentgenogram of the chest following one week of closed tube drainage. The left chest is filled with partially clotted chyle, and the thoracotomy tubes are blocked by the same material.

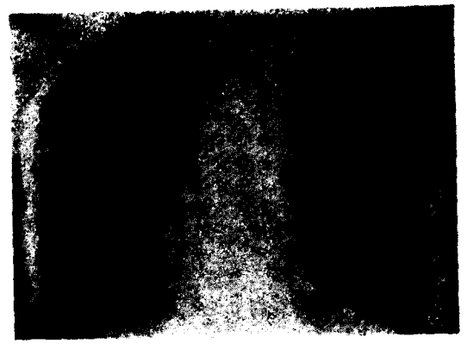


Fig. 5.

Reproduction of the roentgenogram of the chest two weeks after operation, at which clotted chyle was evacuated, the left lung decorticated, and a gelfoam (spongostan) tampon sutured over the mediastinal defect in the vicinity of the ruptured thoracic duct.

of milky colour was removed by the tube and by aspiration of the anterior fluctuant mass, which appeared to communicate with a defect between the first and second ribs, near the costo-chondral junctions. It was noted that the material removed separated in a few moments into a heavier creamy clot and a thinner milky fluid. The laboratory analysis of this material was as follows: Milky, turbid, odorless fluid, with coagulum; specific gravity 1013%; alkaline; total proteins 0.9%; total fats 0.8%; the fluid became transparent after alkalinization and treatment with ether; no fat globules could be detected on treatment with alcoholic Sudan III (apparently because the fat was present as chylomicrons on dark field illumination, due to reduced dietary fat); preponderance of lymphocytes in fluid; examination for echinococcus hooklets, and microfilaria negative; smear and culture for organisms negative; Conclusion: Chyle * (Fig. 3).

On the following day the chest tube was found to be completely obstructed, and, on screening, the left chest was opaque with a shift of the mediastinum to the right. Closed drainage was instituted through the anterior chest wall defect, the lower tube being removed. Meanwhile, parenteral supportive therapy, including blood, plasma, and glucose and saline solutions, was administered daily, and a high protein diet was given. After four days of tube drainage, it appeared that the chyle was clotting in the pleural cavity just as it was in vitro (Fig. 4), and open thoracotomy seemed urgently indicated. Accordingly, the patient was transferred to the Wanless Sanatorium, and the left pleural cavity was explored through a left lateral approach eight days after his admission to Wanless Hospital. Two hours after feeding the patient 200 c.c. of milk and cream, to aid in identifying the thoracic duct, and the leaking area, the sixth intercostal space on the left was widely opened and a mass of white liquid and clotted fibrinous material was evacuated from the left pleural cavity. The left lung was compressed to about 1/3rd normal size and held down by a friable gelatinous and thin fibrous envelope, which peeled off rather easily, allowing the lung to re-expand completely. A 3 x 3 cm. defect in the anterior parietal pleura between the first and second ribs was found. There was a fracture of the first rib at the costal cartilage, with inward and upward displacement of this rib, as well as the previously recognized fractures of the second and third ribs. Chyle was found oozing out from a 5 mm. rent in the posterior mediastinum, from behind the aortic arch at the level of the second interspace. Several attempts to place transfixion sutures at this area failed to control the leakage because the mediastinal defect abutted on the second rib, and sutures could not be properly placed. Therefore the inferior pulmonary ligament was divided, and the esophagus mobilized and retracted anteriorly and the aorta pulled gently to the left. A white tenous vein-like structure about 1—2 mm. in diameter which was thought to be the thoracic duct, was isolated and ligated in two places with cotton ties, a 3 mm. portion being excised for biopsy. No other structure resembling the thoracic duct was found after thorough exploration, but the aorta was not mobilized as recommended by Meade et al[13]. It was noted that chyle leakage

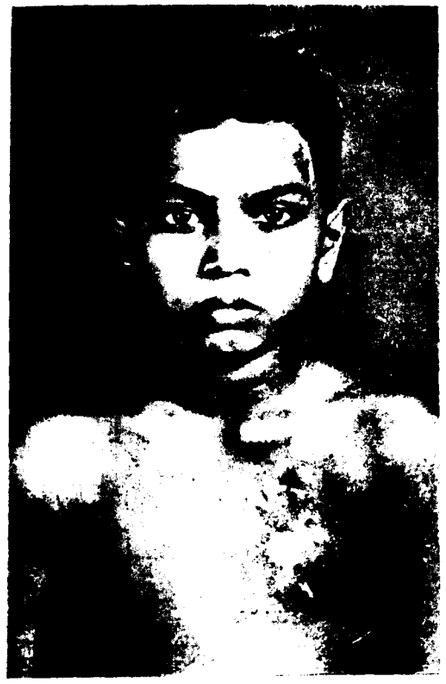


Fig. 6.

Appearance of the patient five weeks after surgery, showing the rapid improvement in the nutritional status of the patient following cessation of chyle leakage. The dislocated clavicle was not treated.

still continued, through the rent in the posterior mediastinum in the upper part of the chest. Therefore, a pledget of Gelfoam (Absorbable Gelatine Sponge) (Spongostan—DUMEX) was held firmly against the leaking area for 5 minutes and then anchored with sutures over the area. This controlled the leakage completely. Heavy pericostal cotton sutures were placed above and below the first and second ribs drawing them together in the region of the parietal pleural defect. The lung was inflated and the chest closed in layers, with a single tube draining the left pleural cavity with negative pressure. After draining 100 c.c. of bloody fluid in 48 hours, this was removed. The patient made an uneventful recovery. Serial films showed complete expansion of the left lung, and no further accumulation of chyle (Fig. 5). The patient was discharged from the Sanatorium on the 12th day after surgery, apparently well, and gaining weight. Five weeks later, another protograph of the patient was taken to compare with his admission film (Fig. 6).

Treatment

Traumatic chylothorax is a life-threatening condition with a mortality rate of 40—50% in cases which are either untreated, or treated by chest aspirations and supportive therapy alone (Lampson [12], Goorwitch [8]). However, since recoveries have been reported following chest aspirations or closed thoracotomy, it seems worthwhile to try these conservative measures, at least for a brief preliminary period, before resorting to open thoracotomy. A reasonable plan would seem to be to try chest aspirations for a week. If no diminution of chyle formation is noted, closed thoracotomy and tube drainage should be instituted, for a second week. If this also does not succeed in completely re-expanding the lung and reducing or stopping the flow of chyle, it is imperative to open the chest promptly to stop the fatal flow of chyle, by ligating the thoracic duct before the patient becomes too debilitated to be a reasonable surgical risk. Because of the easier accessibility of the thoracic duct on the right side, one should operate on this side regardless of the side on which the chylothorax occurs, unless the lung on the left is not completely expandable. In that event, it is necessary to explore the left side, in order to decorticate the lung and empty the pleural cavity of masses of clotted chyle. The exposure on the left side, either by mobilizing the esophagus or the aorta, is not as readily achieved and in more than one instance, the duct has apparently been missed, probably as it was in ours (Meade et al [13]). Klepser [11] advocates the use of a lipophilic dye administered before or during operation, to help in identification of the duct, but in the one case in which it was used, it was of little value, possibly because a pink or red colour was used. A more contrasting colour should be more useful. Merrill in 1955 [14] suggested the use of Evan's Blue to outline the thoracic duct, but the subcutaneous blue stain in the legs where the dye

is administered took two months to fade away. Increasing the flow of chyle by feeding a quantity of milk and cream prior to operation serves the dual purpose of distending the duct and making its identification easier, as well as identification of the point of leakage. If ligation of the duct cannot be accomplished or does not seem to stop the leakage of chyle, a direct attack on the ruptured mediastinum can be made. One can apply multiple transfixion sutures and Gelfoam (Spongostan) (or oxycel of Fibrin Foam) as Smithwick, Shumacker, and at least 6 other authors have either mentioned doing, or advocated in the past, with success [2, 3, 6, 12, 13, 16, 27]. As a matter of fact, Lampson [12] in the first reported case of successful ligation of the thoracic duct for traumatic chylathorax, also used Fibrin Foam to be more certain of success. He did not biopsy the duct. The technique of ligating the mediastinal defect, suggested by Seaman in 1954 [16] can also be used if it seems applicable. Anastomosis of the thoracic duct to the azygos vein, first suggested and carried out by Hodge and Bridges [9] in 1948 has not gained acceptance because there seems to be no need for it, since ligation of the duct, or a direct attack on the leaking area with transfixion sutures and/or Gelfoam (Spongostan) both have yielded such good results, and are considerably simpler to accomplish. Decortication of the lung is usually readily done, but in one of Meade's cases [13] of nine weeks duration, it was said to be extremely difficult to decorticate the lung. Another method of therapy, previously advocated, with an occasional success, but of doubtful rationale, is phrenic crush (Novak and Barton [15]). At least two deaths have been reported following the intravenous administration of the patient's own chyle: the cases of Whitcomb and Scoville, 1942. and of the Peet and Campbell, 1943 (Lampson [12]) and so, although others have reported no untoward symptoms following the intravenous use of chyle, this is considered to be a risky procedure by most observers. One patient died three months after successful treatment of chylothorax, of fulminating hepatitis thought to have been due to serum homologous jaundice acquired from large quantities of plasma previously given to replace her depleted proteins [13]. Parenteral therapy is probably best limited to blood, protein hydrolysates, and perhaps some of the newer fat solutions (Jordon et al [10]) and glucose and saline. An effort should be made to build up these patients as much as possible in one to two weeks' time and oral diet should probably not be curtailed except to limit fats by mouth.

Discussion

Traumatic chylothorax has been apparently safely and satisfactorily treated in every case in the last decade in which the above principles were observed [1, 2, 3, 4, 6, 7, 8, 11, 12, 13, 17]. It is likely to be more commonly seen in the future, as automobile accidents become more common, and intrathoracic procedures involving the area of the thoracic duct are more frequently done, including esophageal and great vessel surgery. Prompt recognition and proper treatment may convert this otherwise catastrophic complication into one which can be safely and reasonably handled, if the physiologic implications of the ruptured duct are realized, and necessary surgical intervention is not delayed too long.

Summary

A case report of traumatic chylothorax, successfully treated by surgery, is presented, together with a brief review of current ideas on this subject. The surgical anatomy, physiology and clinical features are outlined, and the treatment discussed. One should try conservative measures such as aspirations of the chest, closed thoracotomy, etc. for no longer than two or three weeks, before resorting to open thoracotomy, and ligation of the duct or control of leakage, if the formerly apalling mortality rate is to be avoided.

REFERENCES

1. Baffles, T. G. and Potts, W. J.: Post-operative Chylothorax. Ann. Surg. 139: 501-505, April 1954.

2. Baldridge, R. R. and Lewis, R. V.: Traumatic Chylothorax. Review of the literature and report of cases treated by ligation of the thoracic duct and cisterna chyli. Ann. Surg. 128: 1056-1078, Dec. 1948.

3. Baron, C. and Reardon, M.: Chylothorax following a blow to the abdomen. J. Thoracic Surg. 28: 11-14, July 1954.

4. Bressler, S., Wiener, D. and Thompson, S. A.: Traumatic Chylothorax following Esophageal Resection. J. Thoracic Surg. 26: 321-324, Sept. 1953.

5. Cain, J. C., Grindlay, J. H., Bollman, J. L., Flock, E. V. and Mann, F. C.: Lymph from Liver and Thoracic Duct. An Experimental Study. Surg., Gynec. & Obst. 85: 559-562, 1947.

6. Ehrenhaft, J. L. and Meyers, R.: Blood Fat levels following Supra — diaphragmatic ligation of the Thoracic Duct. Ann. Surg. 128: 38-45, July 1948.

7. Frazell, E. L., Harrold, C. C. Fr. and Rasmussen, L.: Bilateral Chylothorax. An Unusual complication of Radical Neck Dissection, with Recovery. Ann. Surg. Page 134-137, July 1951.

8. Goorwitch, J.: Traumatic Chylothorax and Thoracic Duct ligation. Case report and Review of the literature. J. Thoracic Surg. 29: 467-479, 1955.

9. Hodge, G. B. and Bridges, H.: Surgical Management of Thoracic duct injuries. An experimental study with clinical application Surgery. 24: 805-810, 1948.

10. Jordan, P. H., Wilson, P. and Stuart, J.: Observations on Patient Tolerance with Intravenous Administration of Fat Emulsion. S. G. & O. 102: 737-747, June 1956.

11. Klepser, R. G. and Berry, J. F.: Diagnosis and Surgical Management of Chylothorax with the Aid of Lipophilic dyes. Diseases of the Chest. 25: 409, 1954.

12. Lampson, R. S.: Traumatic Chylothorax. A Review of the literature and Report of a Case treated by Mediastinal Ligation of of the Thoracic Duct. J. Thoracic Surg. 17: 778-791, 1948.

13. Meade, R. H., Head, J. R. and Moen, C. W.: Management of Chylothorax. J. Thoracic Surg. 19: 709-720, 1950.

14. Merrill, K.: Use of Evans Blue to Outline the course of the Thoracic Duct. J. Thoracic Surg. 29: 555-557, 1955.

15 Novak, S. J. G. and Barton, P. N.: Chylothorax. Report of case arrested by Phrenicotomy. J. Thoracic Surg. 10: 629-634, 1941.

16. Seaman, J. B.: Rationale and a New Surgical Technique in Traumatic Chylothorax. J. Thoracic Surg. 27: 529-539, May 1954.

17. Shumacker, H. B. and Moore, T. C.: Surgical Management of Traumatic Chylothorax. S.G.O. 93: 46-50, July 1951.

18. Van Pernis, P. S.: Variations of the Thoracic Duct. Surgery. 26: 806-809, Nov. 1949.

Received for publication on 10-10-'56.

MELANOMATOSIS OF THE BRAIN AND MENINGES

*by B. N. BALAKRISHNA RAO and B. K. AIKAT, Calcutta.**

Melanomas are probably the commonest of all tumours, though on account of its frequency and wide distribution in both sexes in all races, and the infrequency of its malignant transformation, it has not received the attention it deserves from clinicians and pathologists. None the less, the lay people have ascribed considerable importance to these moles either as an auspicious sign or as a sign of beauty, both in the East and in the West. Some even have artificial moles as an attempt at beautifying. Thus melanomas have been known from ancient times and recognised as an entity.

While melanomas are most frequent on the skin, they are also present in various other organs like the eye, mucosa of the rectum, mouth and genitalia. A few cases have also been reported in the central nervous system. Occasionally other primary sites have been reported and few parts of the body have escaped such tumours. It is difficult to establish if a tumour in an uncommon site is a primary one, or a deposit from an overlooked primary source.

Melanomas of the central nervous system are rare. Forbes and Maloney (1950) report "primary diffuse or focal melanotic neoplasms of the central nervous system are rare and the case now reported is the only example to be found in the records of the neuropathology laboratory which has been in existence for the past 52 years." Akelaitis (1935) reviewing the literature considered it to be rare and collected reports of 29 cases. In a review of reported cases Weimann found that only 4 could be considered definitely to be primary melanosarcoma of the brain. Omodei-Zorini (quoted by Akelaitis) in a critical study of 20 cases could find only 12 certain cases. Though melanin bearing cells are present in the meninges, as in the skin and in the uveal tract, melanotic tumours of the meninges, as evidenced by the paucity of published literature on the subject, are very rare.

The following is a case of extensive melanotic tumours of the skin, meninges and brain in a young male :—

CASE REPORT

P., male, aged 15 years was admitted on 14-8-1952 for frequent periodic attacks of headache for the last 10 years which in the last month had become continuous associated with pain in the abdomen, dimunition of vision and marked general asthenia.

The history of the illness over a period of 10 years when his headaches started is one of recurring attacks of generalised headache at varying intervals of a fortnight to a month, but sufficiently severe to disable him from daily routine work. The intervals gradually became shorter till, for the last one month the headache was

Fig. 1.
Showing the pigmentation and naevi all over body and face.

* Dept. of Pathology, Seth Karnani Memorial Hospital, Calcutta.

Fig. 2.
Section of the meninges showing pigment deposits.

continuous. The headache at any stage was unassociated with vomiting or convulsions.

The pain in the abdomen for the last month is a dull continuous ache, generalised, with a feeling of soreness and unrelated to food and not relieved by any measure. He is very emaciated and asthenic and is bed ridden with marked muscular weakness of the limbs, so that he is unable to grasp anything in his hands.

Except for a fall from a height of five feet when he was five years old leaving a scar on his forehead, and generalised naevi all over the body from birth, there is no history of other illness.

On general examination, he is moderately well built, emaciated. The striking feature was the extensive pigmentation in large sheets and small discrete areas from the size of a pea to sheets of a couple of square feet in area. Many of them are slightly raised above the surface of the skin, and others are flush. There is a greater density of hair over the pigmented area than over the non-pigmented.

All the other systems except the Central Nervous System were essentially normal.

Central Nervous System :

Slow cerebration, and inability to sit or walk. Slow sluggish reaction of pupils, but equal. There is general hypotonia of the muscles and wasting. All the reflexes, both organic and peripheral are normal.

Fundus examination showed no evidence of pigment deposits, but engorgement and varicosity of the veins. The disc is swollen to 1D, and edges blurred. The picture was typical of papilloedema.

Cerebrospinal fluid tension was over 300 mm. of fluid as measured by the Greenfeld manometer, the limit of the capacity of the instrument to measure. The Chemistry and Cytology were normal.

Blood, Urine and Stools were normal except for moderate microcytic anaemia.

Operation :

He was operated on on 10-9-1952 under general chloroform nacrosis, and a subtemporal approach was used with the idea of decompressing the brain to relieve the intracranial tension and headache.

On opening the skull, the dura was tense and pigmented in patches from the size of a millet seed to a pea. It was incised, and discrete melanotic masses were found in the subarachnoid space and on the surface of the brain. Large thin walled veins were coursing over the melanotic masses.

The lateral ventricle was tapped and the cerebrospinal fluid was under great tension and about 30 c.c. was removed when there was a sudden fall of blood pressure, which recovered with cariac stimulants.

A small piece of the dura and a portion of the melanotic mass with neighbouring brain matter was removed. There was a great deal of bleeding which was controlled by the ligation of some veins and the use of gelfoam.

The appearance of the dura at operation was bluish purple partly due to the pigments in the dura and partly to the melanotic masses deep to it shining through. The deposits on the surface of the dura were small, miliary, but discrete. On the surface of the brain, these masses were larger, one of them in the field of operation measuring 1 cm. x 1 cm. and appeared slightly raised above the level of the gyri of the brain, which were flattened due to raised intracranial pressure. This probably was only an artefact, as when the skull flap was turned down and the dura opened, the brain had a tendency to protrude. As the consistency of the tumour masses was more solid than that of the brain itself, the more compact and discrete melanotic particles which were deep brownish black in colour, probably became more prominent.

Fig. 3.
The same as in 2 in high power.

Fig. 4.
Section of the brain showing pigment deposits.

An incision into the cortex of the brain showed that the melanotic masses were not only on the surface of the brain, but were well embedded in the substance of the brain.

The wound was closed and the patient returned to the wards. His condition deteriorated slightly in the subsequent 48 hours, and the relatives against all persuation took the patient home. It is presumed that he was past the stage of recovery.

Histological Report :

The section through pia arachnoid — shows pia is thickened and in the deeper parts, there are collections of cells containing dark pigment (Melanin).

Section of Brain :—The dark macroscopic area consists of gliosis with melanin pigment laden cells. The brain tissue itself is unusually vascular.

Pathologic Diagnosis :—Melanomatosis of the leptomeninges.

Discussion

Chromatophores in the meninges first described by Valentin and later confirmed by Obersteiner, Charpy, Kolliker etc. occurs in the meninges of normal adult brains. Obersteiner described these cells in the adventitia of the blood vessels and pia of the medulla oblongata and also in the blood vessels of the brain substance. This has been questioned by others (Kolliker, Golman) who are of the opinion that the chromatophores, asd consequently the pigmentation is confined to the pia.

Broniatowski studying a series of patients between the ages of 3 and 71 years of the pia in the neighbourhood of the medulla oblongata concluded that melanin containing cells appear at the age of 9 years. On the other hand, Farnell and Globus have seen chromatophores in infants.

In man, Rokitansky, Grahl, Berblinger and others have described cases of marked

pigmentation of the brain allied with numerous pigmented nevi of the skin. In cases of primary melanoma of the meninges mentioned by Esser, Schopper etc., numerous nevi in the skin were present as in the case described in the present article. Developmental disturbances in cases of melanosis and melanoma of the meninges have been reported by Hamill and Rothestein, Bosch and others.

Bloom's theory of the chromatophore in the skin can be reconciled with the epithelial school of adherents who believe that the melanin is produced in the basal cells of the epidermis and is discharged and taken up by mesodermal cells in the dermis to form the chromatophore. Ribbert believes that the rigid distinction between chromatophore and melanoblast does not exist because under certain conditions the chromatophore can become active in the formation of melanin. In all probability the melanin in the chromatophore of the meninges is an autochthonous product and in the formative stages these chromatophores are true melanoblasts. The consensus of opinion is that chromatophores and melanoblasts are similar and one agrees with the view of Ribbert that no rigid distinction between melanoblast and chromatophore is possible. The chromatophores in the pia, under certain pathological conditions, can take on malignant characteristics and give rise to a melanosarcoma (Akelaitis).

It is of interest to note that while visceral metastases are common in malignant melanomas where the primary is in the skin or uveal tract, indubitable primary melanotic tumours of the central nervous system have never produced visceral metastases. In this respect the behaviour meningeal melanomas are so distinct from those arising from skin and eye, that it is likely that the two are histologically and histogenetically different.

Summary

1. A case of a primary melanomatosis of the meninges and central nervous system is described.

2. The histo-pathology and possible origin has been discussed.

3. The operative findings of the meninges and brain has been described

ACKNOWLEDGEMENT

It is with pleasure we acknowledge the help of Dr. R. S. Dharkar, M.S., and Mrs. S. Kaul, our colleagues in the Department of Surgery who took unremitting care of the patient and obtained the necessary records.

REFERENCES

1. Akelaitis, A. J. E.: Amer. J. Path. **11**: 591, 1935.
2. Ewing, J.: Neoplastic Diseases. P. 964, 1940.
3. Farnell, I. J. and Globus, J. H.: Arch. Neurol. & Psychiat. **25**: 803, 1931.
4. Forbes, W. and Maloney, A. F. J.: J. Path. Bact. **52**: 403, 1950.
5. Lewis, C. W. D.: Ann. Roy. Coll. Surg. **19**: September 3, 156-184, 1956.
6. Willis, R. A.: Pathology of Tumours. **15**: 913, 1948.

Received for publication on 10-12-'56.

TRACHEOSTOMY AND ITS UTILITY IN CANCER SURGERY

*by D. M. ANKLESARIA, Bombay.**

Tracheostomy, one of the oldest operations in the history of medicine, was first described by Asclepiades in 124 B.C. but, the first authentic operation was probably performed by Brassavola in 1546 [5]. Until the middle of the 19th century it was considered a hazardous procedure. Traditionally, a tracheostomy has been looked upon as a dramatic emergency procedure to be adopted only in emergencies which might arise in diphtheria, neoplasms of the upper respiratory tract and occasionally in injuries of the pharynx, larynx and trachea. In the last decade, this operation has been performed more frequently but still as an emergency procedure. The newer concept of an elective tracheostomy has been gradually gaining favour in many quarters, because it not only assures an adequate airway but it also provides an easy route for aspiration of the respiratory tract when required.

Patients suffering from malignant growths in the region of the oropharynx, hypopharynx and larynx frequently consult a surgeon when the associated difficulty in breathing has progressed for quite some time. They then require an urgent tracheostomy before planning out the treatment for their disease. At times a patient receiving radiation therapy for cancer in the hypopharynx or larynx suddenly gets obstructed and requires an urgent tracheostomy. As a rule patients receiving radiation therapy do not have a tracheostomy performed on them prior to the treatment, but they are followed up very carefully and are warned regarding its necessity and advised to report as soon as difficulty in breathing becomes manifest.

In recent years great stress has been laid on a prophylactic or an elective tracheostomy which is performed not because a case is obstructed but because it is considered a valuable adjunct in the surgical treatment of a malignant growth in the region of the head, neck, thorax and abdomen.

Frequently, in the past, a major surgical procedure for a malignant growth in an old and debilitated person used to end in a fatal "terminal pneumonia". It is now known that this fatal outcome was due to a combination of the following processes: (a) accumulation of secretions in the tracheo-bronchial tree and (b) failure of the cough reflex to clear the respiratory passages of these secretions. Such retained secretions, saliva and occasionally vomitus, caused oedema and spasm of the bronchioles and led to scattered atelectatic areas which in turn led to bronchopneumonia and pulmonary oedema.

Blalock [1] et al have shown that obstruction to the airway causes retention of CO_2 and fall in the pH of the blood, followed by anoxaemia as the obstruction increases. The triad of hypercapnoea, acidaemia and anoxaemia as shown by Gray [4] constitutes the syndrome of obstructive asphyxia. In the early stages these asphyxial blood changes stimulate the respiratory centre and increase the respirations; but when obstruction persists, the progressive hypercapnoea, acidaemia and anoxaemia, depress the respiratory centre with consequent depression of cough reflex and respirations. When the respirations weaken and the explusive power of the lungs fail, the secretions at first accumulate in the tracheo-bronchial tree and later become viscid. This vicious cycle ultimately proves fatal.

Through bitter experience one has learnt to perform a prophylactic or an elective tracheostomy on patients who have undergone radical surgery in the region of the head and neck. When the utility of this minor surgical procedure was not well

* From the Dept. of Surgery, Tata Memorial Hospital, Bombay.

understood many cases were lost due to sudden acute respiratory obstruction or from pulmonary complications following major surgery. In all of the so called "combined operations" or excision of large intra-oral cancer with half of the mandible and a radical neck dissection in continuity, a prophylactic tracheostomy is always performed at the close of the operation. In such operations, the support to the tongue is severed and there is a tendency for it to fall backwards and obstruct the airway in the immediate post-operative period. Secondly, during the latter period the cough reflex is slow to return and the act of deglutition may not be co-ordinated for quite sometime; these lead to retention of secretions in the tracheobronchial tree and trickling of saliva and liquids into the respiratory tract. A tracheostomy will permit easy aspiration of the secretions, saliva etc. and thus prevent serious pulmonary complications.

The utility of an elective tracheostomy does not end here. It has proved to be of immense value in operations in other regions: for instance in a trans-thoracic resection of carcinoma of the oesophagus or the cardiac end of the stomach or the lung. Those who have performed a tracheostomy along with operations for malignant growths in the upper abdomen have highly recommended its use, particularly in the debilitated, whose pulmonary reserve has been below par. A tracheostomy in such cases helps to get rid of the secretions in the tracheobronchial tree which are otherwise retained because of general debility, post-operative pain, weakness of the respiratory muscles and retarded cough reflex.

Some observers, who are not yet convinced about the utility of an elective tracheostomy argue in favour of repeated per oral or per nasal tracheobronchial suction. The latter calls for the services of some one skilled in the technique, and repeated aspirations may traumatise the pyriform fossae, the vocal cords and the trachea, thus increasing the morbidity in a desperately ill patient. A tracheostomy on the other hand needs to be sucked out, three to four times an hour to start with and much less frequently later, a job which can easily be relegated to a junior nurse on duty or even an intelligent and co-operative relative or attendant. In the case of a large intra-oral cancer, after excision and careful repair, manipulations required for repeated tracheobronchial suction, in the immediate or early post-operative period are detrimental to the healing process and good union of the approximated tissues. Here again an elective tracheostomy is most helpful. Moreover, Carter and Giuseffi [2, 3] have scientifically demonstrated the important physiological alterations which take place after a tracheostomy, in the dead space air volume, which is reduced from the normal 150 cc. to 50 cc. i.e. by 100 cc. This large decrease in the dead space contributes towards a more effective utilisation of tidal air, which may be normal (500 cc.) or less in amount from any cause which diminishes the respiratory excursions.

Thus a tracheostomy provides maximum oxygenation with shorter and fewer respiratory excursions. It has also been proved that a tracheostomy removes the resistance to inspired and expired air provided by the glottic chink, a fact which has been demonstrated by studies and graphic recordings on intrapleural pressure before and after a tracheostomy.

The following case reports illustrate some of the points which have already been discussed in an early part of this paper:

Case No. S. 2899 — A male, aged 58, short and plethoric in build, came with ulceration of the left lower alveolar mucous membrane with no palpable lymph nodes in the neck. Biopsy was reported as epidermoid carcinoma. He was offered surgery but he preferred radiotherapy. Accordingly he received a few treatments and then discontinued of his own accord. When he returned after a lapse of ten weeks, the primary lesion was almost of the same size but, he had developed a metastatic lymph node in the left submaxillary region. He was again offered surgery to which he now agreed. On 17-9-1956 a wide excision of the malignant ulcer together with the left half of the mandible and a radical neck dissection in continuity was performed. As a large part of the oral mucous membrane was excised, the size of the oral cavity now reconstructed was much reduced. Besides this patient had a short neck and was of plethoric build and so it was decided to perform an elective tracheostomy. Incidentally, for the first three post-operative days there were sufficient secretions to warrant a tracheostomy. The secretions diminished by the fifth day, the tracheostomy tube was plugged on the sixth day and removed on the seventh day. The wound healed very well and on the whole his recovery was uneventful.

The second case had a similar surgical procedure performed on her; but the surgeon omitted the tracheostomy at the end of the operation because he believed that it was not necessary. Case No. S. 5106 — a female, aged 60, slightly underweight but otherwise in a fair state of health, had a carcinoma of the left lower alveolar mucous membrane with a palpable metastatic lymph node at the angle of the mandible. Excision of the ulcer with half of the left mandible and a radical neck dissection was performed in one block on 5-11-1956. At the end of the operation an elective tracheostomy was ruled out. The next morning her general condition was quite good but she experienced slight difficulty in coughing out the secretions. During the course of the day retention of secretions in the tracheobronchial tree was detected and aspirated several times. Towards the evening she became cyanosed and was not relieved by oxygen inhalation and the lungs were full of moist sounds. A tracheostomy was promptly performed and the secretions were aspirated. Cyanosis was relieved immediately and the secretions diminished the next day. Hereafter she had an uneventful recovery and the tracheostomy tube was removed by the fifth day. This case illustrates that one cannot predict which patient will require a tracheostomy in the post-operative period.

Case No. S. 3821 — a male, aged 72, of short build, was admitted for a gradually increasing dysphagia of four months duration. His general condition was fair but he had severe diabetes mellitus responding to Insulin therapy. His usual pressure was 185/100 mm. of Hg. and had left ventricular hypertrophy. Clinical and radiological investigations revealed a localised cardio-oesophageal carcinoma. On 11-8-1956 a left exploratory thoracotomy was done. The lesion was found to be resectable and hence excised, and an oesophagogastrostomy was performed. The left lung appeared emphysematous. The thorax was closed with an intercostal drain. After such a procedure it is customary to leave a thin stomach tube past the anastomosis for the purpose of continuous gastric suction for a couple of days. This tube often hampers effective expectoration of bronchial secretions. Considering the patient's age, diabetes, ventricular hypertrophy, emphysematous chest and the nature of the operation an elective tracheostomy was performed at the end of the operation. He did have a fair amount of secretions in the tracheo-bronchial tree till the fourth post-operative day. Later, these secretions diminished and the tracheostomy tube was removed. He made a complete recovery and was discharged on the 14th day after the operation.

Case No. S. 5658 — a feeble male, aged 75, was radiologically diagnosed to have a carcinoma of the oesophagus in the middle third. An exploratory thoracotomy was performed from the right side. The lung was found firmly plastered to the parietal pleura at many places and the lesion too advanced for resection. The thorax was closed and as the patient was completely obstructed a catheter type of gastrostomy was performed. Since there was a minimum of manipulation inside the thorax a tracheostomy was not performed. During and after the operation he received 1,500 cc. of 5% Glucose in water by an intravenous drip in 24 hours. The next morning he presented moist sounds in the lungs and tracheobronchial suction was done. Oxygen was administered to relieve the cyanosis. At this juncture it was felt that his condition was due to a left ventricular failure and supportive measures for the heart were promptly instituted. In spite of repeated tracheobronchial suctions the secretions accumulated and his condition suddenly became moribund and he expired.

No autopsy was performed on this case to confirm the cause of death. Looking at this case in retrospect, could be the retained secretions have been incidental to a primarily left sided heart failure as was presumed or, was the failure secondary to the secretions retained in the tracheobronchial tree and the consequent syndrome of obstructive asphyxia? Perhaps in the latter case an elective tracheostomy may have helped.

Comment

It is wrong to assume that every case which does not have a tracheostomy, develops serious pulmonary complications post-operatively. The above cases are cited, from a large group of cases operated on, just to stress the following facts:—

It is extremely difficult to predict at the end of a major operation, which particular case will develop a respiratory obstruction and pulmonary complications from retained secretions and aspirated saliva, vomitus etc. It would therefore be a wise policy to anticipate and prevent such complications by a simple surgical procedure — a prophylactic or an elective tracheostomy.

ACKNOWLEDGEMENT

I am much indebted to my Chief, Dr. J. C. Paymaster, for his valuable guidance and encouragement, and thank Col. P. B. Bharucha, Superintendent, for his kind permission to quote from hospital case records.

REFERENCES

1. Blalock, A. et al.: Partial tracheal obstruction. Archives of Surgery. 12: 81-95, 1926.
2. Carter, B. N. and Giuseffi, J.: The use of tracheostomy in the treatment of crushing injuries of the chest. Surg., Gynec. & Obst. 96: 55-64, 1953.
3. Carter, B. N. and Giuseffi, J.: Tracheostomy, a useful procedure in thoracic surgery with particular reference to its employment in crushing injuries of the thorax. J. Thor. Surg. 21: 495-505, 1951.
4. Gray, J. S.: Physiology of Respiratory Obstruction. Ann. Otol. Rhin. & Laryng. 59: 72-77, 1950.
5. Guthrie, D.: Early records of tracheostomy. Bull. Hist. Med. 15: 59-64, Jan. 1944.

Received for publication on 20-2-'57.

TRAUMATIC RUPTURE OF THE PANCREAS

by H. S. BHAT and L. B. M. JOSEPH, Vellore.

Isolated injuries to the pancreas are uncommon as the pancreas is deeply placed and well protected anatomically in the upper abdomen with air-filled viscera anteriorly, the ribs on the lateral aspect, the rigid spine behind and the strong muscles all around. Most of the reports are on isolated cases and in view of the meagre experience of individuals very few cases of injuries to the pancreas have been diagnosed correctly and early.

Travers is mentioned as the earliest one to have recorded a case of traumatic rupture of the pancreas in 1827. Garre quoted by Aldis [1] in 1946 reviewed eigh such cases of injuries involving the pancreas only and described in detail one of his personal cases. Stern reported on forty cases of traumatic pancreatic rupture in 1930. Charles Venable [6] in 1932 discussed six cases of which five were successfully treated by early surgery. Wright et al [7] in 1950 mentioned four patients with traumatic damage to the pancreas and all made a satisfactory recovery.

Penetrating injuries due to bullets and stab wounds are chiefly responsible for rupture of the pancreas but the neighbouring viscera are usually involved concomittantly. Injuries to pancreas during surgical procedures on the stomach, duodenum, biliary tract and spleen are frequently recorded. Sudden crush injuries sometimes damage only the pancreas and produce their effects before the surrounding muscles have time enough to guard against the force. These injuries are so often apparently trivial that the parietes may not show any evidence more than slight bruising. Severe upper abdominal pain, tenderness and rigidity, free fluid in the peritoneal cavity, pain referred to the left shoulder and profound shock, all occurring immediately within a short time after a crushing injury to the upper abdomen, are highly suggestive of trauma to the pancreas.

The signs and symptoms do not always signify the extent of pancreatic damage. Wright et al emphasised that significant injury to pancreas may occur in the absence of dramatic symptoms. Thus in a few cases where the injury is severe, early exploration is undertaken even in the absence of a correct diagnosis. In many cases the clinical signs and symptoms do not warrant early surgery. These are the cases that frequently return later with formation of a pancreatic cyst or a fistula.

The mechanism by which the pancreas alone is damaged is not yet fully understood. The body of the first lumbar vertebra may be responsible for crushing the pancreas which is intimately related to it. The pancreas being a solid organ is crushed by contrecoup, being unable to transmit the force through its substance —. "The ship on the rock is soon torn to pieces by the waves while a vessel afloat can withstand the terrific force of a storm crashing against its sides" (Charles Venable).

We are herewith reporting a case of injury to the pancreas together with a tear in the wall of the portal vein which was treated by operative procedure successfully.

CASE REPORT

G.M., aged 35, was admitted to the Christian Medical College Hospital on 28th September 1954 at 10 A.M., seventy hours after a fall on the abdomen while being chased by a bear. He had had no recognised form of therapy prior to admission and he had not lost consciousness. When first seen in this hospital, he was extremely dehydrated and he was in pain. The abdomen was markedly distended, tense, tender and rigid. Shifting dullness was present. Bowel sounds were not audible over the abdomen but heart sounds were well conducted to the right iliac fossa, strongly suggestive of large quantity of free fluid in the abdomen. Liver dullness was evident. No

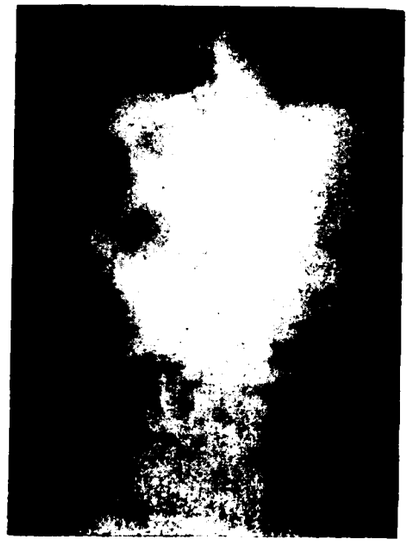


Fig. 1.

other injuries except for a few abrasions on the hands and anterior abdomenal wall, were seen. Pulse 120 per minute. Respiration 36 per minute. Temperature 100.8°F. and blood pressure 90/60 m.m. of mercury. Haemoglobin — 8 G. R.B.C. — 6.4 mil. W.B.C. — 14,100. Blood urea — 36 mgms. per cent. Urine — no abnormality noticed. X-ray of the abdomen showed no evidence of air under the diaphragm. There were some gas filled loops of small intestines. The spaces between the loops were wide, suggestive of fluid in between the loops — ? blood (Fig. 1). No evidence of mechanical intestinal obstruction. Impression: Intra-abdominal fluid ? haemorrhage.

Six hours after admission an emergency laparotomy was done as the pulse was rising, the patient was restless and the distension was increasing inspite of the continuous gastric suction. The temperature at 3 p.m. was 101.4°. Pulse 130, Respiration 38 and Blood Pressure 80/60 m.m. of mercury.

Under general anaesthesia, the abdomen was opened by a middle line incision. The peritoneal cavity was full of fresh and clotted blood. There was extensive extravasation of blood in the retro-peritoneal space. The stomach, liver, gall bladder, spleen and colon showed no evidence of injury. The lesser sac was opened through the gastro-colic omentum and the pancreas was found covered by a large blood clot filling the whole of the lesser sac and extending to the splenic hilum,

Fig. 2.

the spleen itself showing no evidence of any injury.

The blood in the peritoneal cavity was removed and the pancreas examined. There was a complete tear of the pancreas into two parts in the region of the portal vein. The edges of the pancreatic fragments were ragged, friable, oedematous and bleeding profusely. Bleeding was continuing from a minute tear in the portal vein. The distal piece of the pancreas was freely mobile with large clots of blood behind it. The splenic hilum was similarly covered by blood cot and bleeding commenced on removal of the clot.

The tear in the portal vein was repaired. Attempts at controlling the bleeding from the damaged pancreas failed owing to the excessive friability of the tissue. Hence the damaged segment of the pancreas (Fig. 2) was removed along with the spleen. The raw end of the proximal pancreatic segment was covered by peritoneum with interrupted cotton stitches. The peritoneal cavity was left dry and two drains were brought out through separate stab wounds, one from the region of the pancreas and the other from the splenic fossa. He received 1,500 c.c. of blood and 500 c.c. of gelatin during operation. When he left the operating room the blood pressure was 110/70 m.m. of mercury and pulse 142 per minute. During the post-operative period, he was on continuous gastric suction and intravenous infusions for the first 72 hours. He received antibiotic therapy in the form of penicillin and streptomycin parenterally. Except for collection of a little fluid in the chest there were no other serious complications post-operatively. The sutures were removed on the fourteenth day after operation and the drains four days later. Egg albumin dressings were given for the drainage wounds which healed rapidly. The fluid in the left pleural space needed aspiration on the eighteenth day. He was given normal diet from the fourteenth day onwards.

Biochemical tests done during the post-operative period:

Blood drained from the peritoneal cavity during the operation showed an amylase content of 2820 units (Somogyi).

Post-operative days	1	3	5	16	26	40
Serum amylase I	570	320	280	300	120	—
Urinary diastase (wholgmuth units) II	900	820	630	310	162	64
Amylase content of fluid from the drainage tubes III	1070	730	520	190	—	—
Blood sugar (fasting)	150 mg.	159 mg.	110 mg.	79 mg.	65 mg.	44 mg.

Somogyi normal. 60 - 160 units per 100 mls. Wholgmuth normal. 6 - 32 units per ml

The fluid drained from the tubes showed tryptic activity. The patient was discharged from the hospital on 10th November 1954. His only complaints then were pain over the abdominal scar, tired feeling in the early part of the day and constipation relieved only by purgatives every four to six days.

He was followed up on 18th August 1955. He complained of a feeling of abdominal distension after feeds, intense lassitude, constipation, excessive thirst. As he was not willing for any tests being done only a specimen of blood was taken for estimation of sugar and amylase. The blood sugar was 304 mg. and the serum amylase 30 units (Somogyi). He had his last feed of rice eight hours before the tests. Follow up on 19th November 1956 revealed most interesting findings. He has been attending to his normal activities, his appetite normal, no lassitude and he has no abdominal symptoms related to intake of food. He looked well nourished. Serum amylase 66 units (Somogyi). Urinary diastase 10 units (Wholgmuth). Urine showed no sugar. Glucose tolerance test showed a fasting blood sugar reading of 72 mg. percent rising to a maximum of 166 mg. percent at the end of one hour and 60 mg. percent at the end of two hours.

The case report illustrates some interesting features. The effect of trauma on the pancreas varies from a slight bruising to complete avulsion and the symptoms are not dependent on the extent of damage to the organ. The proximity of large blood vessels, disturbance in the clotting mechanism and the vascularity of the gland itself are responsible for the profuse and continuing haemorrhage that accompanies injury to pancreas. The proteolytic activities of the free pancreatic ferments may be responsible for the shock and peritonitis that is often associated with pancreatic injuries. While no single test can be stressed as diagnostic, Naffziger and McCorkle [4] however believe in the diagnostic significance of raised serum amylase in traumatic conditions of the pancreas. Estes et al [3] have discussed cases and have emphasised the value of serum amylase estimation for patients suffering from upper abdominal trauma. In any case a high serum amylase value indicates the urgency for a careful examination of pancreas. A plain X-ray of the abdomen with the patient in upright posture excludes rupture of any hollow viscus. The differential diagnosis chiefly rests between injury to the spleen, liver and the coeliac plexus in view of the shock that often accompanies injuries to pancreas.

In our patient the presence of fluid in the peritoneal cavity after a direct trauma to the abdomen with signs of shock and the radiological findings suggested rupture of a solid organ. A diagnostic abdominal tap and estimation of the amylase content of the peritoneal fluid would have given the clue.

The problems involved in the management of such cases are complicated. Importance is attached to the correction of fluid balance and shock, repair of the injured pancreas, prevention of tissue digestion by the free pancreatic enzymes and the institution of an adequate dietary regime to counteract the asthenia that follows so frequently. Correction of fluid balance and treatment of shock may follow the known methods. Repair of the injured pancreas depends on the extent of the damage. While the lacerations may be amenable to repair, the cases where a part of the gland is avulsed adrift, repair is not possible. Thus a large part of the pancreas needed removal in our patient. When

the gland shows only contusion, drainage of the lesser sac with drain leading from the injured area may be all that is needed. The digestion by the ferments was minimised to a large extent by instituting suction to the drainage tubes and using egg albumin dressings to the wounds.

In the post-operative period the amylase values for the fluid drained from the tubes and the diastase values for the urine show gradual fall indicating the progress. The blood sugar estimation during the period of hospitalisation suggest marked hypoglycemia inspite of the loss of a major portion of the pancreas. Experimental evidence by Best and co-workers [2] confirms the fact that partial pancreatectomy sufficient to produce diabetes melitus causes (1) marked stimulation of the insulin producing islets of Langerhans (2) subsequent degenerative changes and loss of insulin. Thus the symptoms complained of by the patient subsequently and a blood sugar of 304 mg. percent suggest a diabetic state at the time of follow-up. But the subsequent follow-up reports on 19th November 1956 suggest a normal state of affairs. This may indicate that the portion of the remnant of the pancreas is still maintaining a compensatory function for nearly twentysix months after the operation.

High values for amylase in the serum and the peritoneal fluid drained at operation strengthen the ideas expressed by Naffziger and MeCorkle, and Rotham [5] who state that raised amylase content of the serum and the aspirated fluid have a diagnostic significance in doubtful cases of pancreatic injury. The gradual fall indicates the progress of repair.

Summary

Isolated injury to pancreas is uncommon. Diagnosis varies between damage to the spleen, liver or the coeliac plexus. Diagnosis may be easier if the amylase content of serum and peritoneal fluid are found to be elevated. Repair of the pancreas depends on the extent of injury. Rarely excision of the damaged pancreatic segment may be needed. A case of traumatic pancreatic rupture after an apparently trivial fall is described.

REFERENCES

1. Aldis, A. S.: Injuries to the Pancreas and their Surgical Treatment. Brit. J. Surg. 323-330, 1945-46.
2. Best Charles Herbert and Taylor Norman Burke.: Physiological basis of Medical Practice. 5th Edn., 1950, p. 675 (Williams & Wilkins Company).
3. Estes Jr. William, L., Bowman, T. L. and Meilicke, F. F.: Non-Penetrating Abdominal Trauma. Am. J. Surg. 83: 434-446, 1952.
4. Naffziger, H. C. and McCorkle, H. J.: Recognition and Management of Acute Trauma to Pancreas, with particular reference to use of Serum Amylase Test. Ann. Surg. 118: 594-602, 1943.
5. Rotham Milton.: Disturbances of the Pancreas and the Use of the Amylase Test. Am. J. Surg. 78: 256-258.
6. Venable Charles, S.: Rupture of the Pancreas. Surg., Gynec. & Obst. 55: 652-658, 1932.
7. Wright Louis, T., Prigot Aaron and Hili Lyndon, M.: Traumatic Subcutaneous Injuries to the Pancreas. Am. J. Surg. 80: 170-175, 1950.

Received for publication on 13-1-'57.

ENCYSTED PNEUMOCELE OF A STRANGULATED INGUINAL HERNIAL SAC

(A case report)

by G. S. SEKHON, Patiala.

Various types of contents of inguinal hernial sacs have been described, e.g. omentum, bowel, bladder, ovary and tube, fluid and loose bodies, appendix and Meckel's diverticulum. Also well known complications of pneumo-peritoneum are air embolism, surgical emphysema, spontaneous pneumo-thorax. perforation of a viscus, peritoneal effusion and a hernia. But the example of an encysted pneumocele of a strangulated inguinal hernial sac could not be traced in the literature. Therefore the recording of the following case report is considered amply justified.

CASE HISTORY

K.S. 40 S/M was transferred to the Rajendra Hospital on 16-6-1956 as a case of strangulated right inguinal hernia from Sangrur Sanatorium. He had an irreducible painful swelling in the right groin since 4 days. The swelling appeared during a bout of coughing when he received 950 c.c. pneumo-peritoneum refill for pulmonary tuberculosis 4 days previously. The swelling was tense and tender and was situated just outside the superficial inguinal ring. It was globular in shape and measured 2" x 1½". The patient never vomited and had passed a stool the day before his transfer to the Rajendra Hospital, Patiala. He was diagnosed as a case of strangulated inguinal hernia with probably omentum as its contents.

Through an inguinal incision a pencil like tubular, tense sac ½" in diameter was seen on incising the external oblique aponeurosis, with yellowish white content of omentum. The superficial inguinal ring was opened last of all and the globular swelling was delivered in continuity with its inguinal stem by gentle dissection. It very much resembled an encysted hydrocele of a hernial sac except that it was very light. Considering the history of pneumo-peritoneum a diagnosis of encysted pneumocele of the inguinal hernial sac was made. The reason for non-reducibility was clear; there was a constriction of the sac at the site of superficial inguinal ring and in the constricted area a knuckle of omentum had strangulated, thus entrapping air in its distal part. The ring of constriction was 2 m.m. in width and was blue indicating impaired blood supply, but it regained normal colour during the course of operation. The sac was excised near the deep inguinal ring along with the contained omentum and entrapped air beyond. The specimen floated on top of formalin solution when put in a museum jar (the photograph illustrates the specimen).

Fig. 1.

1. Pneumocele.
2. Ring of constriction caused by superficial inguinal ring.
3. Proximal part of hernial sac.
4. Omentum.

Comment

The possibility of encysted pneumocele should be kept in mind when an irreducible hernia develops under pneumo-peritoneum treatment for pulmonary tuberculosis, especially if it is translucent.

The rate of absorption of air from a serous cavity is pretty slow especially if the vascularity of the serous lining is poor, as in this case the swelling had persisted for 4 days without a change in size.

SUMMARY

1. An unusual case of strangulated inguinal hernia in which air was entrapped following pneumo-peritoneum, has been described. No reference of a similar case could be found in the literature.

2. This case also illustrates an example of unusual complication of pneumo-peritoneum and an unusual content of a strangulated inguinal hernial sac.

ACKNOWLEDGEMENTS

My thanks are due to Dr. R. C. Khanna, Professor of Surgery, Government Medical College, Patiala and Dr. Gurdial Singh, Reader in Surgery for necessary guidance and permission to publish this case. It is my pleasant duty to thank Mr. Gurinder Singh, the Photo-Artist for the help rendered.

REFERENCES

1. Ian aird.: Companion in Surgical Studies. First Edition (Reprinted). E. & S. Livingstone Ltd., Edinburgh, 1950, P. 527.

2. Pagel, W., Simmonds, F. A. M. and MacDonald, N.: Pulmonary Tuberculosis. Third Edition. Oxford University Press, London, 1953, P. 50.

Received for publication on 14-9-'56.

AN UNUSUAL CASE OF HAEMATURIA*

by K. D. KOSHAL, Gwalior.

CASE HISTORY

C.L., aged 50, a servant in the Jiwaji Intermediate College was admitted in the medical wards of J. A. Hospital, Gwalior, on 6-8-1953, for painless haematuria of one month's duration, and vague pain in the abdomen of 20 days' duration. Patient had pains in joints and fever about a month and a half prior to admission. The fever lasted for three days. He was given quinine injections by a local doctor and the fever subsided. Two weeks later the patient noticed that he was passing blood during micturition. Bleeding was present throughout the act of micturition. There was no pain in the beginning, but ten days after the onset of haematuria, patient started having pain in the abdomen, most marked in the hypogastrium and radiating towards the tip of the penis. The pain was often paroxysmal. He had disturbed sleep all those days.

On examination :

The patient was moderately built, poorly nourished and anaemic. There was slight oedema of both feet. Pulse rate : 62, regular, vessel wall not palpable. B.P. : 110/65.

There were no other physical signs in the abdomen except tenderness in the hypogastrium and paraumbilical regions. All other systems were clinically normal. Prostate was not enlarged.

Investigations :

1. Urine : Sp. Gr.—1012. Albumin—present in fair amount. Sugar—nil. Microscopic examination —abundant R.B.C.s. No pus cells and no casts.

2. Blood : Routine examination showed a moderate degree of anemia. There was no leucocytosis.

3. Blood urea : 42.8 mgms%.

4. Intravenous pyelogram (Figs. 1-2).

Revealed a small filling defect in the left renal pelvis and some distortion of the renal pelvis.

A provisional diagnosis of left sided renal neoplasm was made and the case transferred to the surgical unit.

Cystoscopy revealed, bladder capacity six ounces, no intravesical enlargement of the prostate, no evidence of cystitis or vesical neoplasm. Dark red blood was seen issuing in jets from the left ureteric orifice. The right ureteric orifice was normal.

On the basis of cystoscopic findings a diagnosis of renal neoplasm on the left side seemed almost certain, hence a nephrectomy was advised.

At operation on 8-9-1953 the left kidney was exposed through an ilio-lumbar approach. The kidney was of a normal size and shape and no obvious tumour was detected. A blood clot was present in the left ureter. A number of cysts were present on the surface of the kidney. These varied in size from $\frac{1}{2}$ cm. in diameter to about $1\frac{1}{2}$ cms. in diameter, and contained dark red blood. It was rather an unexpected finding. One wondered whether a nephrectomy would be justified. However, in view of persistent haematuria and no response to conservative treatment, nephrectomy was performed. Within two hours

Fig. 1.
Intravenous pyelogram.

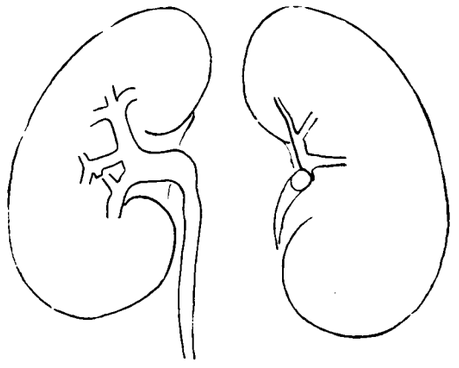


Fig. 2.
A line drawing of the same.

* This case was presented at the Association of Pathologists Conference, held in Gwalior, in November 1953.

of the operation patient passed urine unmixed with blood and thereafter passed clear urine.

Recovery was uneventful.

Blood urea on 14-9-1953 was 36 mgms%.

Urine was repeatedly examined in the ward but did not show any albumen or R.B.Cs or casts. Oedema of the feet disappeared in four days after the operation.

Pathological report :

Gross description : (Fig. 3).

The kidney was slightly enlarged and pale. The capsule stripped off easily. The surface was smooth but numerous retention cysts were seen. One large cyst containing haemorrhagic fluid was bulging into the pelvis. The cut surface revealed preservation of cortico-medullary markings. There was increase of peripelvic fat.

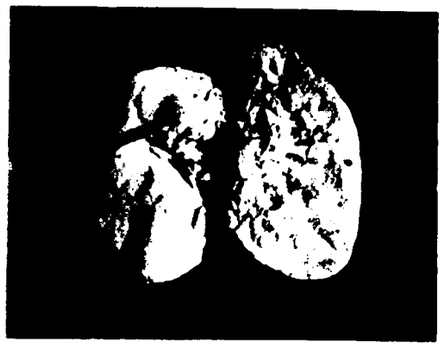


Fig. 3.
The kidney showing a cyst projecting into the renal pelvis.

Histology : (Fig. 4).

The kidney showed early changes of type II nephritis. There was intracapillary hyaline thickening of basement membrane of the glomerular tuft. Glomeruli showed lobulation and evidence of periglomerular fibrosis. Few glomeruli were hyalinised. Blood vessels did not reveal any evidence of hypertensive changes. In many areas glomeruli with degenerated capillary tufts were seen in the walls of the cysts. One such cyst was opening into the pelvis.

A section from one of the larger cysts close to the pelvis showed numerous congested veins in the wall.

Fundus examination on 17-9-1953 revealed no abnormality.

Patient was discharged cured on 19-9-1953.

Follow up :

1. On three occasions, i.e. on 26-9-53, 9-4-54 and 3-10-55 blood urea was 30.5 to 32 mgms%. Urine examination revealed no abnormality.

2 On 20-12-55 blood urea was 40.5 mgms%. Urine culture showed B. Coli. At this stage the patient had an attack of dysentery and complained of burning during micturition. A course of sulfatriad and alkaline diuretic brought symptomatic relief.

3. On 9-1-56 and 26-8-56, blood urea was re-examined and found to be 30 mgms%. Urine : Sp. Gr.—1020, reaction acid, no albumen, no sugar. Microscopically : no pus cells and no casts.

The patient is at his job and at present has no trouble whatsoever. There is no oedema of the feet since the operation.

Discussion

This case presented two problems. The minor one at operation regarding decision

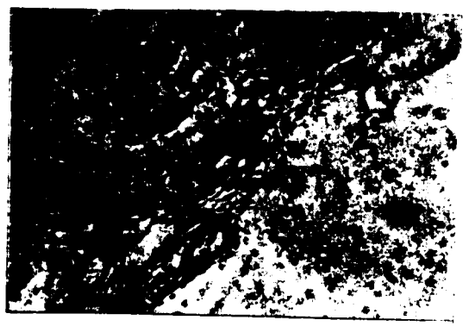


Fig. 4.
Microphotograph showing features of a type II nephritis. Section has been taken through the renal pelvis (low power).

Fig. 5.
High power view of a glomerulus.

in favour of or against nephrectomy. Subsequent events tend to show that the decision was correct. The main problem however remains how to reconcile the pathological report with the clinical behaviour of the patient. Firstly haematuria is an unusual feature of type II nephritis. Secondly even if very rarely it may occur, the disease being bilateral the patient must show evidence of the disease in the remaining kidney and lead to some albuminuria and presence of casts in the urine and presence of oedema of the feet. It is inconceivable that chronic nephritis would involve only one kidney. It is even more intriguing how a patient of chronic nephritis minus one kidney continues to enjoy a normal state of health. At present it is not possible to know the exact state of the opposite kidney except by a biopsy which is inadvisable in this case. Clinical evidence however, strongly suggests that it is functioning normally. A prolonged follow up might yield some valuable information. This is an interesting example where the clinical diagnosis of a renal neoplasm was almost certain but the subsequent pathological examination brought home an entirely different disease process.

Summary

A case of unilateral haematuria which clinically and radiologically appeared to be due to a renal neoplasm is being reported. Pathological examination of the excised kidney revealed it to be consistent with type II nephritis. The patient is alive nearly three years after the operation and symptom free.

ACKNOWLEDGEMENT

I wish to express my gratitude to Prof. B. K. Aikat, Director, Department of Pathology, Seth Karnani Memorial Hospital, Calcutta, for the pathological reports and Dr. J. N. Monga, M.D., Lecturer in Pathology, G. R. Medical College, for the microphotographs. My thanks are also due to Prof. B. N. B. Rao, Principal, G. R. Medical College, Gwalior, for helpful criticism and permission to publish this paper.

Received for publication on 25-9-'56.

MULTIPLE LYMPHATIC CYSTS OF THE GREATER OMENTUM

by SANGHAM LAL and A. UMAPATHY, Madras.

The infrequency of Omental Cysts makes the condition a curiosity. Its history shows that it has passed through the classical stages of chance autopsy discovery, establishment as a pathological entity, followed by attempts at removal, initially ineffectual, but now performed with uniform success. The first omental cyst was noted by Gairdner during an autopsy and presented before the Pathological Society of London in 1851; Gooding in 1887 performed the first successful removal (Stillman, 1911), followed by about 65 cases benefited by surgery till to-date. Thus, the condition has recently acquired a place for itself in the list of surgical malformations of the peritoneum and its extensions.

The following case report, deserves publication as the condition is still very rarely observed.

CASE REPORT

A Hindu boy of five years was brought to the Out-Patient Department of Paediatrics of the General Hospital, Madras, on the 18th May 1954, for gradually increasing distension of his abdomen, the complaint first noted about a year previously. He was admitted with a provisional diagnosis of "Cirrhosis".

None else in the family had a similar complaint. There was no history of cough or fever or diarrhoea or dysentery or oedema either in the boy or in his family. There was no history of any injury.

He never had any jaundice or nausea or vomiting; his appetite was good and bowel movements were normal. He had no difficulty in, or disturbance of micturition. He played as well as his prominent belly would allow him to. He always slept well. His parents too repeatedly asserted that apart from the protuberant abdomen, their boy had no other complaint.

The boy was of normal stature and build; he responded to instructions intelligently and moved about with unconcern regarding his large abdomen. The head, the limbs and the external genitalia were normal. The standing posture was a bit Napoleonic, but the spinal alignment was normal. His abdomen was protruding with slight asymmetry, the distension being more marked at the umbilicus and on the right side of the abdomen, than on the left (Fig. 1). The whole of the abdomen felt cystic. There was no tenderness in any quadrant of the abdomen. Liver and spleen were not enlarged, as elicited by the "dip method". Fluid thrill was present, but both the flanks and the renal angles were resonant. There was no shifting dullness. Abdominal auscultation and trans-illumination were not done. The whole abdomen was so distended that no particular movement of any (suspected) intra-abdominal cyst could be made out, nor was any further information gained by examining the body in the knee-elbow position. Rectal examination did not show any abnormality.

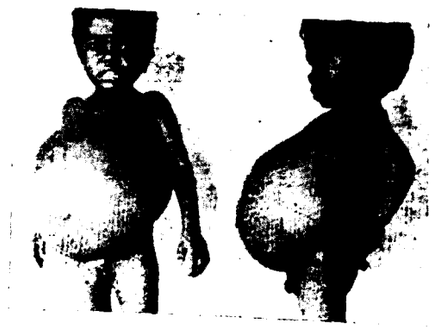


Fig. 1.

Before Operation: Circumference of the abdomen at the level of the umbilicus—29"; from xiphisternum to symphysis pubis—13.5".

Reviewing the clinical findings, the striking features were the asymmetry of the abdominal distension, and the absence of shifting dullness. The first salient conclusion was that the fluid was not free in the peritoneal cavity, ruling out cirrhosis. Resonance in both the renal angles excluded hydro-nephrosis. History also did not suggest any genito-urinary lesion. The young age of the boy eliminated the possibility of hydatid cyst. Pancreatic cyst never reaches this size, nor does it come to occupy the lower abdomen. Same reasons were against congenital cysts of the liver or spleen. The sex precluded consideration of ovarian cyst. The negative history and the healthy appearance of the boy weighed heavily against the condition being tuberculous peritonitis. And so, we were left with the dignosis of mesenteric cysts.

With these thoughts in our minds, the following investigations were done, apart from the routine laboratory tests:

Mantoux test: Negative.

Blood urea: 33 mgms.%

Blood sodium chloride: 700 mgms.%

X-rays of lungs: Normal.

Plain X-ray of abdomen: Stomach pushed up; colonic shadows were in proper places, but small intestine shadows were thrust to the centre, with a peculiar reversed brackets ())(() appearance. The bulging flanks were opaque due to the fluid.

Intravenous Pyelogram: Normal landmarks of the urinary tract.

Barium meal and barium enema: Central pooling of the small gut: large gut was in its normal situation. Only conventional views were taken; lateral views were not taken.

The negative Mantoux in this young patient, and the radiologically normal lungs ruled out tuberculosis. The normal pyelographic shadows excluded diseases of the genito-urinary system. The normal upper and lower barium series, while giving no additional information, did not contradict the diagnosis of mesenteric cysts. Hence, the final preoperative diagnosis was mesenteric cysts, probably large multiple ones.

As the general health and hydration of the boy were satisfactory, he was submitted to operation without further delay, on 20th June, 1954.

Operation Notes: (Col. Sangham Lal): Under general anaesthesia, laparotomy was done through right paramedian route; the posterior rectus sheath and peritoneum was opened into with silght difficulty due to the abdominal distension. A large shining cyst protruded into the wound, and 96 ounces of odorless, straw-coloured, clear fluid was aspirated from it. Its wall was attached to the peritoneum by filmy, avascular adhesions on either side of the wound; it was gently separated and an exploration was made: all the fluid came from the large thin-walled cyst arising from the anterior layers of the greater omentum which covered and thus excluded from view all the gut except the stomach in the upper part of the wound. The cyst wall above was adherent to the anterior wall of the stomach, but lower down, it was lying free in the peritoneal cavity. Further inspection revealed another large cyst, which also was arising from the greater omentum, and lying on the right side of the abdominal cavity. A hand was gently insinuated between the cyst and the parietes, and it was delivered out through the wound. Its slender pedicle was divided between clamps and ligated. Four smaller cysts of a darker hue and fleshy consistency were also present between the large ones. Now, separation of the originally punctured cyst was commenced and carried out quickly by blunt dissection and division between ligatures. Once this was over, the whole mass of cysts came off, disclosing a wide gap in what was left of the greater omentum, laying bare the lesser sac. It was thought that no herniation could remain incarcerated in the large rent in the greater omentum, and hence it was left alone. The raw area in the anterior wall of the stomach was peritonised by a few interrupted sero-muscular stitches. A rapid survey of the other viscera showed them all to be normal and the abdomen was closed in layers without a drain.

The whole procedure took 45 minutes and the boy received 300 ccs. of blood during and for sometime after the operation.

Post-operatively, 1/3 gr. of Luminal was administered intramuscularly for sedation, and Penicillin 2½ lakhs twice daily was given for four days. His convalescence was uneventful.

A plain X-ray of the abdomen on the 10th post-operative day showed a more equitable distribution of the intestinal gas-shadows.

He was discharged with a flat, if somewhat lax abdomen, on the 30th June 1954 (Fig. 2). His father wrote two years later that the boy is in the best of health.

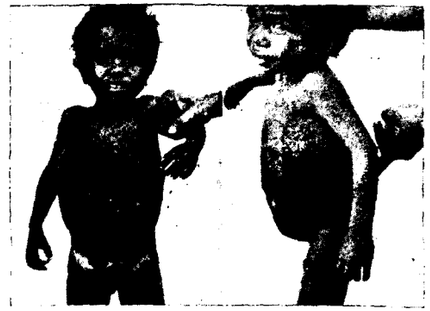


Fig. 2.

10 days After Operation: Abdominal circumference now was 19.5"; from xiphisternum to symphysis pubis—6.75".

Pathology: Gross Pathology: Two large cysts, one full and the other empty, each measuring 7" in length and 10" in circumference were seen. There were four small ones each the size of an egg and a few smaller ones (Fig. 3). The larger cysts were thin-walled and the unopened one contained straw-coloured, clear fluid. The smaller cysts were fleshy and the walls were thicker, their contents were somewhat glairy, but otherwise similar to that from the larger cysts.

Fig. 3.
The Omental Cysts.

Microscopically, the thick wall of a small cyst showed numerous cavernous lymphatic spaces with collection of lymphocytes, fatty crystals and foreign-body giant-cells. The wall of the larger cysts was also similar (Figs. 4 and 5).

Discussion

Peterson (1932) inferred from published reports that the incidence of omental cysts was about one-fifth that of mesenteric cysts. Stillman (1911) presented the first stimulating paper on omental cysts, wherein he quoted Jacobi's theory that all true cysts of omentum have their origin in lymph-vessels of that organ; he reported two cases and reviewed the 19 cases that he had collected from literature. Dowd (1911) stated that the causes and classifications of omental and mesenteric cysts were the same. Outerbridge (1914) discussed the vascular and lymphatic anatomy of the greater omentum in detail and explained the formations of the cysts on this basis. The next exhaustive paper on this subject was by Montgomery and Wolman (1935). They reviewed the literature, collected thirty further cases reported till then, added two of their own cases, and brought the total to 53. Hall (1940) reported one case; Ladd and Gross (1941) reported three cases; and Beahrs and Dockerty (1950) reported five cases.

Etiology of the lymphatic cysts of the omentum, as usual, seems to be the happy hunting ground of the pathologists. One has difficulty in picking one's way amidst the maze of theories. However, two of them need attention; one is the obstruction theory put forward by Rokitansky to explain lymphatic cysts forming anywhere in the body. The wide anastomosis of the lymph channels of the omentum, histological absence of any obliterative process and the absence of local oedema contradict this theory. To explain these anomalies, modifications have been put forward by various workers, but none is satisfactory.

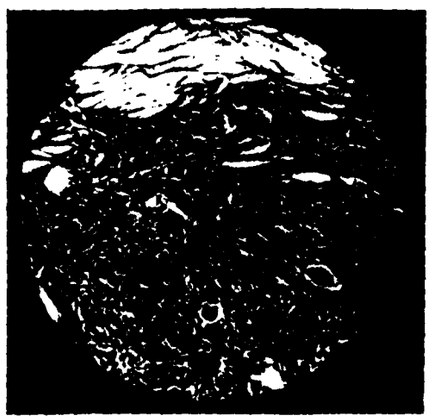


Fig. 4.

Fig. 5.

Figs. 4 & 5. Microphotographs of the Cyst Wall.

The other theory, propounded by Ribbert (quoted by Montgomery and Wolman, 1935) and elaborated by contemporary pathologists, states that these are true neoplastic growths developing by proliferation of the cellular elements of their wall, accompanied by secretion of the cyst content.

In recent times, much of the ancient teleological theories of cellular pathology have been replaced by more rational biochemical and biophysical explanations. Dowd (1911) mentioned that the specific gravity of the fluid from his case was 1008 and its albumin content was 1%. Grausman and Jaffe (1928) mentioned that its reaction was alkaline, and it coagulated on boiling due to its protein content. Martin, Grotzinger and Zaydon (1954) analysed the fluid from a chylous mesenteric cyst and reported the amount of sodium, potassium, specific gravity, proteins, total solids, mixed lipids, cholesterol and water content. They did not draw any conclusions. Apart from these sporadic findings, no coordinated biochemical study has been made on the fluid of the cysts. In this particular case, unfortunately, the aspirated fluid was not analysed. The specific gravity, reaction, qualitative and quantitative estimations of the electrolyte contents, proteins, cholesterol, and investigations using radio-active elements might throw some light. The fact that the fluid remains clear in these large cysts brings to one's mind the analogy of the clear fluid of hydronephrotic sac with its "circulation". Whether such a thing occurs in large omental cysts is a moot point, but may be possible.

Lymphatic cysts were classified by Wegner into simplex, cavernosum, and cysticum (Gerster, 1939). The last variety is the commonest in the omentum and differs from the first two by having no communication with the rest of the lymphatic system. Usually cysts belong to one or the other of these groups. But this boy had a combination of both cavernosum and cysticum varieties. The clarity or the chylous nature of the cyst content is of no significance. Gruenwald, Levine and Zeichner (1954) have stressed the commoner incidence of the endothelial lined lymphatic cysts in the omentum as opposed to the rare occurrence of epithelial lined enterogenous omental cysts.

The clinical features of omental cysts are not specific, but depend on their size, nature of the pedicle and the relation to neighbouring viscera. The cysts may be too small to be felt or too big to be recognised as such. In such cases, a useful point is that the abdominal distension is queerly shaped and not quite uniformly hemispherical as an ascitic abdomen is, a point well brought out by our case. The abdomen feels cystic with the characteristic elastic recoil of fluid. The loins, particularly the renal angles are resonant. The dullness usually does not shift, unless the cyst has acquired a pedicle. However, these criteria are not always fulfilled. Hence, any child with a protuberant abdomen should make one include omental cysts in the differential diagnosis.

The mesenteric cysts may announce their presence earlier because of their relative immobility in the midst of constantly moving intestines or because of gravity lending them unwarranted mobility. But omental cysts are situated in the upper abdomen, fairly well-tethered. They may push away the colon and the small intestines but rarely cause pressure symptoms. Thus the earliest symptom may be the large size of the abdomen due to the quietly expanding omental cyst, as in our patient. Amongst the various complications of mesenteric cysts like intestinal obstruction, rupture of the cyst or an adherent viscus, haemorrhage, infection, impaction into the pelvis, etc., only twisting of the pedicle may occur if the cyst is situated in the omentum and happens to be large. But this too, is rare. Other symptoms of fever, loss of weight, etc. are not described in straightforward cases of omental cysts. Abdominal pain may be present.

60 to 70 per cent of cases were children below 10, of both sexes.

Omental cysts may be single or multiple; uni- or multilocular. Usually they occur as an isolated pathological condition. Girwin and Speese (1921) reported a woman in whom the omental adhesion to a uterine fibroid was studded with cysts in a chain-like fashion. Rarely cysts are found both in the omentum and in the mesentery, as reported by Mills (1941).

Regarding treatment, surgical removal is the best. Montgomery and Wolman noted only two fatalities amongst the 53 in the literature. There are no records of recurrence. Apart from the young age, there are no great difficulties. Preliminary aspiration of the cyst may facilitate removal. Ladd and Gross (1941) point out that, if possible, the cysts must be shelled out, and that the fat of the omentum should not be unnecessarily sacrificed, as the omentum is known to act like the "good Samaritan" of the abdominal cavity in protecting the viscera from infection. If the rent in the omentum is small, it must be sutured; larger openings may be left unrepaired, as in this boy.

SUMMARY

A case of multiple lymphatic cysts of the greater omentum occurring in a boy of five is presented. He was cured by operation.

Etiological theories are mentioned. It is stressed that the biochemical aspects of the fluid contained in the cyst must be studied, and it is suggested that herein may lie an answer as to the causation of the cyst.

The literature is briefly reviewed.

ACKNOWLEDGEMENT

We thank Dr. S. T. Achar, Head of the Department of Paediatrics of General Hospital, Madras, who referred the case; Dr. V. Rajagopalan, Chief Anaesthetist, for anaesthetising this patient, and the Dean, Dr. C. K. Prasada Rao, for permission to publish this paper.

REFERENCES

1. Beahrs, O. H. and Dockerty, M. B.: Surg. Clin. N. America. **30**: 1073, 1950.
2. Dowd, C. N.: Ann. Surg. **54**: 617, 1911.
3. Girwin, J. H. and Speese, J.: Ann. Surg. **74**: 792, 1921.
4. Grausman, P. M. and Jaffe, H. L.: Ann. Surg. **87**: 66, 1928.
5. Gruenwald, P., Levine, W. and Zeichner, S.: Amer. J. Surg. **87**: 775, 1954.
6. Hall, D. P.: Ann. Surg. **11**: 605, 1940.
7. Ladd, W. E. and Gross, R. E.: Abdominal Surgery of Infancy and Childhood. Philadelphia, W. B. Saunders Co., p. 233, 1941.
8. Martin, W. L., Grotzinger, P. J. and Zaydon, T. J.: Ann. Surg. **140**: 132, 1954.
9. Mills, W. G. Q.: Brit. J. Surg. **29**: 275, 1941.
10. Montgomery, A. H. and Wolman, I. J.: Surg., Gynec. & Obst. **60**: 695, 1935.
11. Outerbridge, G. W.: Ann. Surg. **60**: 680, 1914.
12. Peterson, E. W.: Ann. Surg. **96**: 340, 1932.
13. Stillman, S.: J. Amer. Med. Assoc. **57**: 726, 1911.

Received for publication on 30-10-'56.

RECURRENT VESICAL CALCULI — AN UNUSUAL CAUSE

by U. MOHAN RAU, Madras.

Among several causes that may give rise to vesical calculi, foreign bodies in the bladder are a well recognised entity. These foreign bodies may enter the bladder (1) per urethram or (2) through the bladder wall.

Entry through the bladder wall may be:

A. As a result of surgical operations on the bladder: e.g. (i) pieces of rubber tubing left behind at the end of an operation or (ii) unabsorbable materials used for closing the opening in the bladder. This latter procedure is seldom done now.

B. As a result of violent trauma: e.g. pieces of projectile piercing the bladder wall in missile injuries during war.

C. As a result of migration from an extra-urinary source.

Migration of foreign bodies from an extra-urinary source:

A survey of literature on this subject reveals an interesting variety of objects that have found their way into the urinary bladder. Winsbury-white [3] has cited several such instances. An encrusted darning needle was removed from the bladder of a child four months after it had been swallowed. In another patient a rifle bullet that was accidentally ingested, was removed from the urinary bladder three months later as the patient developed dysuria and haematuria. Appendicular concretions, gall-stones, pieces of sequestra from osteomyelitis of the pelvic girdle are some of the other foreign bodies that have been removed from the urinary bladder (Winsbury-white [4]).

Chute (referred to by Winsbury-white [3]) has reported a case of vesical calculus resulting from a suture that had been inserted during an operation for right inguinal hernia carried out three years prior to the patient reporting with dysuria.

More pertinent to the case here reported are examples of unabsorbable sutures and ligatures that have been used in *extra-urinary pelvic operations* and *that have subsequently gained entry into the bladder* and have produced vesical symptoms.

Levack [1] has reported the case of a female aged 42 years, in whom in February 1950, nylon sutures had been used to transfix the two ends of the fascial sling above the bladder neck following the technique of the Millin I sling operation. This was done for relieving her from stress incontinence of urine.

She reported in 1952 with urinary symptoms and an X-ray done in October 1952 showed a vesical calculus. Cystoscopy revealed this to be "hanging" from a pedicle from the *anterior wall of the bladder*, in the midline, at a point about half-way between the bladder neck and the apex. A nylon stitch, part of it buried in the bladder wall and part of it incorporated in the vesical calculus, was removed by suprapubic cystostomy.

Levack [1] in the same paper has reported the case of a male aged 60 years, who had a transvesical prostatectomy done on him in April 1951. The bladder was closed with two layers of continuous *catgut suture*. Nearly five months later the patient reported with bladder pain and frequency of micturition. Cystoscopy showed a small calculus hanging from the scar on the anterior wall of the bladder. It was seen to be attached by a thread to the bladder wall and could not be detached. On the day following the cystoscopy, the patient voided the small calculus which had formed around a knot of linen thread. In this case, it was surmised that a ligature of

linen thread that was used for haemostasis on a vessel in the bladder musculature (outside the urinary tract), had eventually ulcerated through, to be exposed on the inner surface of the bladder.

Winsbury-white[3] has referred to two cases aged 38 and 32 years, who had had Caesarean sections performed on them about 5 and 7 years respectively, prior to their reporting with symptoms due to vesical calculi. These had formed around unabsorbable sutures. In the latter case the causative loop of suture material was removed from the middle of the posterior vesical wall during the suprapubic operation. In the same case, on palpating the uterus, the whole of its anterior surface was found to be adherent to the bladder.

CASE REPORT

A case of recurrent vesical calculi occurring five years after a Caesarean section is herewith reported :

Mrs. S. B., a short, emaciated and anaemic woman of 24 years reported in *June* '52 with a complaint of frequency of micturition and difficulty in passing urine.

She *gave a history* that in 1947, she had had a Caesarean section done on her for the delivery of her second child ; her first child also was a "Caesar." Subsequent to the second operation, she was quite healthy till early in February '52, when she had noticed slight frequency of micturition. She had some "symptomatic" treatment for this and had felt better. In *June* '52, her symptoms had recurred in a more severe form and had persisted in spite of treatment with alkalies and chemotherapeutic drugs.

Systemic and *local examinations* did not reveal any abnormality except for the scar of the second Caesarean section and a little tenderness in the suprapubic region. *Her urine* was alkaline and contained plenty of triple phosphate crystals.

A *roentgenogram* revealed a vesical calculus (Fig. 1).

On 2-7-'52, under local anaesthesia, suprapubic lithotomy was performed. After removal of the main calculus, examination of the interior of the bladder revealed another small calculus (½" in diameter) *adherent* to the vesical mucous membrane about 1" behind the interureteric bar and just to the left of the mid-line ; this calculus was "hanging" from a small strand (? old suture) projecting from the bladder wall into the lumen. The calculus was removed along with the entire projecting portion of the strand. It was hoped that whatever portion of the strand was still buried in the bladder wall would get covered over with vesical epithelium.

Post-operatively she had an uneventful recovery. She was discharged on 23-7-'52, completely free from symptoms.

In April '54, the patient reported again with recrudescence of dysuria. A *roentgenogram* showed a vesical calculus (Fig. 2). *Cystoscopy* done on 4-5-'54, revealed *two vesical calculi* — one, about 1" in diameter, lying free in the bladder and a second one, about ½" in diameter, suspended from the bladder wall by a stitch — in exactly the same position in which a similar "hanging" calculus was seen at the time of the suprapubic lithotomy on 2-7-'52.

As the patient was unwilling for a suprapubic lithotomy (she complained that she had had three "abdominal" operations already), it was decided to remove the larger calculus by lithotrity and to dissolve the smaller calculus by bladder-washes with "Solution G."

Lithotrity was done on 18-6-'54 and the bigger calculus was removed completely (as verified cystoscopically). She was receiving bladder-washes post-operatively.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

In September '54 her symptoms, which had cleared up very considerably (but not completely) after the lithotrity, increased again. *The urine* was turbid, highly alkaline and contained plenty of pus cells and R.B.Cs ; it yielded a growth of B proteus on culture. A *roentgenogram* done at this time revealed a vesical calculus (Fig. 3).

After a considerable amount of persuasion, she submitted to a *suprapubic lithotomy on 3-12-'54*. After the removal of the main calculus, the interior of the bladder was visualized clearly. The small calculus with the attached strand was seen; the opening in the vesical mucous membrane through which the strand was emerging was enlarged ; a loop of suture material with a knot was seen buried in the bladder wall ; this loop was cut and the entire strand together with the calculus and the knot was removed (Fig. 4). There was no obvious communication with any of the neighbouring viscera. The bladder was closed in layers, as usual. She progressed well and was discharged on the tenth post-operative day.

Analysis of the stone revealed it to consist of oxalate, phosphate of calcium, ammonia and uric acid.

The suture removed was a knotted strand of *silkworm gut* (Fig. 4).

A roentgenogram done in February '55 revealed no stone. Her urine was clean, acid and normal.

The patient is quite well and symptom free till todate (Feb. '57).

DISCUSSION

A. *Source of the silkworm gut suture :*

For the following reasons, it is presumed that the guilty silkworm gut suture did not come from a stitch in the bladder wall :—

(i) There was no record of the bladder having been injured at the time of the Caesarean operation.

(ii) Even if the bladder had been injured and the injury had not been recorded by the surgeon, fishing gut could not have been used for closing tears in the bladder ; only absorbable sutures are usually used.

(iii) If the injury to the vesical wall had not been noticed at the time of the Caesarean section, since no precautions were taken to prevent over-distension of the bladder in the post-operative period, the patient must have had some symptoms referable to the urinary tract or the peritoneal cavity ; none were present.

(iv) It is very unlikely that an accidental inclusion of the entire thickness of the bladder wall in a stitch used for closing the uterine incision, could have remained silent in this particular patient — a "stone former" — for nearly five years. The portion of the stitch projecting into the

vesical lumen should have given rise to infection, irritation and calculus formation.

Hence most probably, the silkworm gut must have been used for closing the incision in the uterine wall and must have gradually migrated and ulcerated through into the vesical lumen.

B. *Nuclei of the stones :*

Experimental work done on rats by Vermeulen [2] and co-workers has shown that when similar foreign bodies were introduced into the urinary bladder, different rats behaved differently both in the incidence, size and number of calculi that were formed. Generally, one of four things happened :—

(i) The foreign body remained as such, with no calculus formation at all.

(ii) A calculus formed around the foreign body.

(iii) The foreign body remained as such, but due to irritation produced by it and consequent inflammatory exudate, calculus or calculi were formed with the inflammatory exudate as the nucleus or nuclei, and

(iv) One calculus formed around the foreign body; besides this, one or more "daughter" calculi were also formed, with the inflammatory exudate as the nucleus or nuclei.

This last process seems to have taken place in the case of Mrs. S. B. There was a small "parent" calculus around the silkworm gut; there was a bigger "daughter" calculus lying free in the bladder (Fig. 4)

C. Why was there an interval of nearly twenty months after the first suprapubic lithotomy and the recurrence of the patient's symptoms ?

In the experiments of Vermeulen [2] referred to above, silk was used for closing the opening in the bladder. In some of these rats there were encrustations around the silk suture that was projecting into the bladder. In the majority, however, the silk suture was covered over by vesical epithelium and rendered innocuous.

Probably in the case of Mrs. S. B., after the strand projecting into the bladder was cut at the time of the first lithotomy, the discontinuity in the vesical mucous membrane was repaired by the vesical epithelium and the remaining suture was buried completely. Subsequently, this portion of the suture must have migrated again, ulcerated into the bladder and given rise to recurrent calculus formation.

Summary

1. A case of recurrent vesical calculus produced by silkworm gut ulcerating into the bladder is reported.

2. This silkworm gut was used for closing the incision in the uterine wall during the Caesarean section, done 5 years ago.

3. Other cases from available literature, where sutures used for extravesical pelvic operations had migrated into the bladder are briefly reported.

References

1. Levak, J. H.: "Hanging Bladder stones formed on unabsorbable suture and ligature." Brit. J. Urol. 27: 239-241, 1955.
2. Vermeulen, C. W., Grove, W. J., Goetz, R., Ragius, H. D. and Correll, N. O.: "Experimental Urolithiasis: I. Development of calculi upon foreign bodies surgically introduced into the bladder of rats." J. Urol. 54: 541-548, 1950.
3. Winsbury-white, H. P.: "Stone in the Urinary Tract." 2nd Edition. Pp. 222 to 225. Butterworth & Co., Ltd., London. 1954.
4. Winsbury-white, H. P.: "Textbook of Genito-urinary Surgery." P. 335. E. & S. Livingstone, Edinburgh. 1948.

Received for publication on 10-2-'57.

CEREBRAL FAT EMBOLISM COMPLICATING FRACTURE LEG

by K. C. JACOB, Madras.

In the course of a previous case report [4] (1956), it was stated by the Writer, that "while cases of fat embolism associated with fracture of long bones are well known and often reported, cases of fatal fat embolism following injury to subcutaneous fat are extremely rare." The first part of this statement might have caused slight surprise among certain surgical circles on account of paucity of authentic reports of such cases in India. Hospital records are not available to me to record the actual incidence of fat embolism complicating fractures of long bones among the cases admitted to our hospitals in South India. But, the following case is a good example of cerebral fat embolism proved at autopsy, to have been responsible for causing death in a case admitted to the Government General Hospital, Madras, for treatment of fracture of the bones of the right leg.

CASE REPORT

D., Hindu, male, aged 34 years, alleged to have been accidentally knocked down by a military motor cycle at about 11 hours on 23-12-1955 when he was walking along the road was immediately taken to the Casualty department of the Government General Hospital. On examination in the Casualty Department at 11-30 hours, abrasions over the right elbow, right knee and right leg and fracture of the lower ends of both bones of the right leg, with swelling and tenderness, were noticed. After giving A.T.S. and first aid, the patient was admitted to the hospital for further treatment. He was conscious at the time of admission and physical examination did not reveal anything abnormal in the Nervous, Respiratory, Circulatory, and Gastro-Intestinal Systems. Urine and blood examination was normal. Suitable treatment was given for the fracture in the leg. About 30 hours after admission, he became unconscious with rise of temperature and rigor. No abnormality was noticed in the pupils, in the urine, etc. The plantar response was extensor and he did not show response to painful stimuli. On 27-12-1955, he was deeply comatose, Cheyne-Stokes breathing set in, and pulse becoming very poor in tension, he expired at 8-50 hrs. The blood pressure recorded was 120/70 on 25th, 90/60 on 26th. The temperature recorded was 102.4° on 24th. normal on 25th, 100.5° on 26th and 101.5° on 27th.

Autopsy findings: The autopsy conducted by Dr. Chandrasekharan at 14 hours on 28-12-1955 revealed the following salient appearances. (1) well nourished individual, (2) dilated pupils, (3) slight cyanosis, (4) abrasions right thigh and right knee, (5) comminuted fracture of both the bones of the right leg at middle, with bruising of muscles, extravasation of blood around and marked swelling, (6) congested and oedematous lungs with Tardieu's spots, (7) clotted blood in the right chambers of the heart and Tardieu's spots; (8) 3 ozs. of dark fluid material in the stomach, (9) punctate haemorrhages in the brain and (10) generalised passive congestion of all viscera. There was no patent foramen ovale. Tissues from lung, brain and kidney were preserved for pathological examination.

Lung Sections showed areas of intense congestion, oedema and haemorrhage. Frozen sections stained with Sudan III clearly showed the presence of many globules of fat in the capillaries and even in the alveoli (Fig. 1).

Brain Sections presented ring haemorrhages containing pale poorly staining centres, and many petechial haemorrhages in the centre of which were to be found congested vessels surrounded by erythrocytes (Figs 2 to 4). In some areas, appearances suggesting oedema and liquefaction of perivascular tissue were observed. Unfortunately the frozen section of the brain was not stained for fat. Vacuolated spaces were observed in many glomeruli of the kidneys representing spaces left by the solution of fat globules during embedding and staining (Fig. 5).

Final Opinion was given after the microscopic study of the above sections that the cause of death was cerebral fat embolism following fracture of long bones of the leg.

Comment

Globules of liquid fat circulating in the blood causing obstruction in vessels have been reported mostly in traumatic cases and a few in non-traumatic cases. Among the traumatic cases, fractures of long bones especially femur and tibia were present in most of them.

Studies in experimental animals have repeatedly demonstrated that fat globules could block the passage of blood in a vessel. Dyeladen fat particles from bones of animals have been made to enter the

while in a few others it is so severe as to cause death.

Laboratory aids like examination of blood, sputum, urine and lung puncture have been suggested. Scuderi [8] has described what he calls the sizzle test for fat in the urine which is said to be very helpful according to Wilson [11].

Definite diagnosis is possible only after autopsy. In the case reported, the clinical course, the autopsy appearances especially in the lungs and the brain and the microscopic demonstration of fat globules in the pulmonary capillaries, the ring haemorrhages in the brain, vacuoles in many glomeruli of the kidneys establish the cause of death as systemic fat embolism following fracture of the leg bones.

In 164 cases of various types of injury, Vance [13] found evidence of fat embolism in 102 cases, it being severe in 11 and fatal in 3. Robb-Smith [7] reported a series of 115 accident cases and found in 25 per cent that fat embolism was the major lethal factor.

In a study of 1000 consecutive battle casualties admitted to the surgical ward of a military hospital, Wilson and Salisbury [12] described eight cases of clinical fat embolism, six of whom died. This gives a total incidence of 0·8% in all battle casualties and a mortality of 75%. Since they were dealing with a military and thus an entirely male adult population, it is to be expected that the incidence in ordinary civil surgery involving all age groups and both sexes, should be even lower than this figure of 0·8 per cent (Wilson [11]). Among the 100 consecutive cases of fat embolism reviewed by Warren [10], 91 were due to trauma with fracture of one or more bones and fat embolism of the Central Nervous System was present in 31 out of these 100 cases. In a recently published article Scully [9] says that of the 110 cases of Korean battle casualties studied by him, only 4 per cent showed more than slight systemic fat embolism as evidenced by the appearance of fat in the kidneys and only 1 per cent showed fatal cerebral fat embolism. According to him there was no evidence from the Clinico-pathologic analysis of these 110 cases that fat in the lungs causes pulmonary dysfunction or death. This finding being at marked variance with the concept of the significance of pulmonary fat embolism accepted in the literature, he concludes the article with the following challenging statement "It is possible that detailed clinical and laboratory investigation of injured patients may uncover a significance of fat embolism which is hidden by the more obtrusive complications of trauma in a routine clinical investigation".

Summary

1. A case of cerebral fat embolism following fracture of the leg bones is recorded.

2. A few comments are made on the pathogenesis, course, diagnosis and incidence of fat embolism.

REFERENCES

1. Brock, S.: Injuries of the Brain and Spinal Cord and their coverings — 681: The Williams and Winkins Co., Baltimore, 1949.
2. Gauss, H.: Arch. Surg. **9**: 592, 1924.
3. Gonzales, T. A., Vance, M., Helperm, M. and Umberger, C. J.: Legal Medicine, Pathology and Toxicology, II Edition, Appleton Century Crofts, New York, 1954.
4. Jacob, K. C.: Journal of Indian Medical Association. **26**: 424, 1956.
5. Moritz, A. R.: The Pathology of Trauma. Lead & Febiger, Philadelphia, 1954.
6. Rappaport, H., Raum, M. and Harrell, J. B.: Am. J. Path. **27**: 417, 1951.
7. Robb-Smith, A. H. T.: Lancet **1**: 135, 1941.
8. Scuderi, C. S.: Surg., Gynec. & Obst. **71**: 732, 1941.
9. Scully, R. E.: Am. J. Pathology. **32**: 379-397, 1956.
10. Warren, S.: Am. J. Pathology. **22**: 69, 1946.
11. Wilson, J. V.: The Pathology of Traumatic Injury. E. & S. Livingstone, Edinburgh, 1946.
12. Wilson, J. V. and Salisbury, C. V.: Brit. J. Surg. **32**: 384, 1944.
13. Vance, B. M.: Arch. Surg. **23**: 426, 1931.

Received for publication on 30-10-'56.

METAPHYSIAL ACLASIS

(Report of a case showing features of Metaphysial Aclasis and Achondroplasia)

*by J. N. BERRY and G. S. SAINANI, Nagpur.**

This condition known variously as Multiple exostoses, Diaphysial Aclasis or Metaphysial Aclasis is a developmental disorder of skeleton characterised by retardation of longitudinal growth, expansion of metaphyses and presence of cartilage capped exostoses near the growing ends of the shafts of the long bones.

The bones chiefly affected are the long bones which are developed both from cartilage and from membrane. The short bones (carpus and tarsus) and the flat bones (skull bones — scapulae) may also rarely show exostoses according to Fairbanks [1] but the epiphysis are never involved. The disease starts early in childhood and has a familial tendency.

The skeletal manifestations take three forms as follows :—

1. *Exostoses*: These consist of bony projections of varying sizes with thin cartilaginous caps. These outgrowths may be sessile or pedunculated. This is the commonest feature of all cases reported so far.

2. *Lack of remodelling of ends of long bones*: The normal tubulation of metaphysis is retarded so that metaphysis becomes abruptly broadened. The usual sites for this expansion are upper end of humerus, lower end of radius and lower end of femur. These are also the points from which exostoses take origin commonly.

3. *Retarded longitudinal growth of long bones*: This retarded growth is distributed unequally, the ulna and fibula being usually shorter than the radius and tibia. The latter bones growing uninterruptedly, become bent and produce ulnar deviation of the hand and lateral displacement and angulation of the talus.

A case is being reported here in whom, apart from the multiple exostoses, shortening of ulna and tendency towards achondroplasia were marked features.

* From the Dept. of Medicine, Medical College & Hospital, Nagpur.

CASE REPORT

Miss P. J., 17 years Hindu female, was admitted on 2-7-1956 with complaints of pain in abdomen and burning in micturition for the last 2 months. On enquiry she told about the bony swellings which according to her brother, were noticed when the patient was four years old. These bony swellings have been increasing in size as she has been growing. She never complained of any pain over the swellings or limitation of joint movements. There was nothing relevant in the past history.

Family History: Parents alive. Five brothers and one sister alive. No other family member had such trouble. Her elder brother was examined and there was no clinical evidence of exostoses. Patient was born full term normal delivery. Milestones of development were normal.

Physical Examination: A short statured young girl, normal intelligence, height 4'-5½", weight 71 lbs., skull circumference 20½", measurement from vertex to pubic symphysis 29½", measurement from pubic symphysis to heel 24".

Measurement of Arms —	Right.	Left.
Acromion process to lateral condyle to humerus.	10"	10¾"
Lateral condyle of humerus to styloid process of radius.	7½"	8"

Pulse 80. Resp. 18. Temp. 98.4°F. Systemic examination revealed nothing abnormal.

Examination of Skeleton: (Fig. 1).

Right Arm:—A big bony proturberance on antero-medial surface of upper end of humerus. Shoulder movements full. The styloid process of ulna 1½" short of styloid process of radius. The shaft of the radius curved with maximum convexity directed outwards. Small exostoses present at the lower end of ulna. Ulnar deviation was possible upto 90° at the wrist joint.

Left Arm:—A small bony swelling on antero-medial aspect of upper end of humerus. Left

Fig. 1.

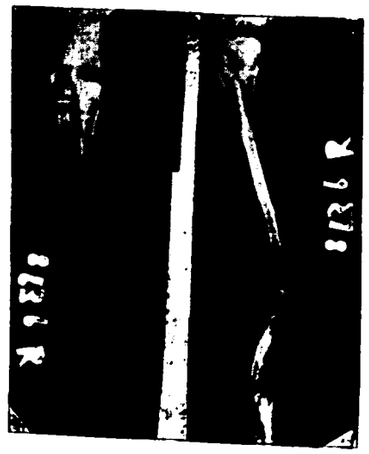


Fig. 2.

shoulder movements normal. The styloid process of ulna 1¾" short of styloid process of radius. The shaft of radius curved with convexity outwards. Ulnar deviation possible upto 80° at the wrist joint.

Right Leg :—The bony swellings present around knee joints, one at posteromedial aspect of lower end of femur, another projecting from upper end of tibia and still another small exostosis from the head of fibula. No shortening of fibula. Movements of right knee joint were free.

Left Leg :—The bony protuberances around the knee joint, one from anterolateral aspect of lower end of femur, second from posteromedial aspect of lower end of femur, third from medial aspect of upper end of tibia and still another from the head of fibula. No shortening of fibula. Movements of left knee joint were free.

Other bones — No exostoses detected.

Radiological Examination :

1. Rt. Humerus — Pedunculate exostosis at the upper part of the shaft of humerus. A small sessile bony projection below it. The lower end is deformed and the trochlea is extended downwards, a deformity described previously by Fairbanks [4].

2. Rt. Forearm — (Fig. 2) Radius is fully formed but is curved laterally. The ulna is stunted longitudinally with a tapering end, end falling far short of the wrist joint. The lower end of ulna is deformed. The cortex is thin, the cancellous structure is wide, translucent and lower articular surface of ulna is absent.

3. Lt. Knee joint — (Fig. 3) A big cancellous exostoses arising from posteromedial aspect of lower end of femur and a thin long bony projection from anterolateral aspect. A small bony projection from anteromedial aspect of upper end of tibia. The upper end of fibula is deformed and widened. The lower end of femur and upper end of tibia show parallel borders near the end of the shaft, the expansion beginning from the junction of the exostoses with the metaphysis.

4. Rt. Ankle joint — (Fig. 4) No shortening of fibula. A big bony exostosis arising from lateral surface of lower end of tibia and extending over the fibula.

5. Vertebral column, ribs, carpal and tarsal bones — No evidence of exostoses.

Comments

Besides the multiple exostoses and lack of tubulation this case shows two interesting features —

(a) marked shortening of ulna and

Fig. 3.

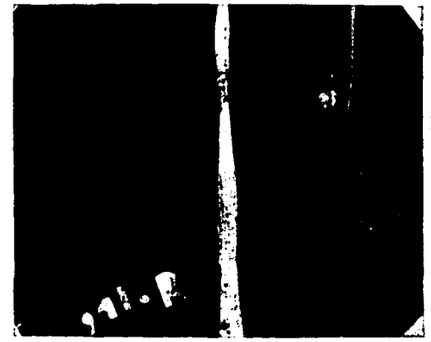


Fig. 4.

(b) dwarfism and the disproportion between the trunk and the lower limbs.

The height of the patient was only 4'-5½" though she was 17 years of age and otherwise fairly developed. The vertex to pubic symphysis distance was 29½" while pubic symphysis to heel measurement was 24". This is a feature of achondroplasia and stresses the close alliance of metaphysial aclasis to achondroplasia, both of which are disorders of cartilaginous bone development. Mercer [6] regards metaphysial aclasis as an intermediate condition between achondroplasia and other disturbances of endochondral ossification and Hunter [5] differentiates dyschondroplasia — a term under which he includes metaphysial aclasis in achondroplasia. Only in the former the defective endochondral ossification is neither symmetrical nor universal as in the latter.

The shortening of ulna in this case was marked. The styloid process of ulna being 1½" and 1¾" higher than the styloid process of radius on the right and left sides respectively. The ulnar deviation at the wrist joint could be done upto 90° to 80°. This shortening of ulna is present in only some of the cases of metaphysial aclasis. Fairbanks [4] found this feature in 3 out of 5 cases of diaphysial aclasis reported by him. In one of these three cases there was shortening of the fibula also. Ellis and Taylor [3] reported an unusual case of diaphysial aclasis in which lower end of ulna was stunted and ill formed on one side only. Amal Das and Bhattacharya [2] reported a case in which the stunting of the ulna was present in the patient and his elder brother. One of us (Berry [1]) reported a case of metaphysial aclasis in which shortening of ulna and also absence of modelling of metaphysis were important features. As is usual, the shortened lower end of ulna was deformed in this case.

Patient did not have any trouble pertaining to the bony swellings. Her complaints regarding pain in abdomen and burning in micturition were due to pyelitis, which subsided with the usual treatment.

The disease often shows familial tendency but in this case the brother did not show any exostoses clinically. Other members could not be examined.

Summary

A case of metaphysial aclasis is described in detail with clinical photographs and skiagrams. Its interest lay in the fact that besides the exostoses, lack of tubula-

tion and shortening of the ulna, it showed features of achondroplasia.

REFERENCES

1. Berry, J. N.: Metaphysial Aclasis. Ind. Med. Gaz. 85: 387-388, 1950.
2. Das, A. and Bhattacharya, R.: Hereditory Chondrodysplasia. Ind. Med. Gaz. 83: 219-222, 1948.
3. Ellis, V. H. and Taylor, J. G.: Diaphysial Aclasis. Report of an unusual case. Jour. Bone & Jt. Surg. 33-B: 100-105, 1951.
4. Fairbank, H. A. T.: Diaphysial Aclasis. Jour. Bone & Jt. Surg. 31-B: 105-113, 1949.
5. Hunter, Donald.: A text book of the Practice of Medicine by F. W. Price. 7th Edn. London. Oxford Medical Publication. P. 1404. 1947.
6. Mercer, Walter.: Orthopaedic Surgery. 4th Edn. London, Edward Arnold Co. P. 115. 1950.

Received for publication on 20-11-'56.

RECONSTRUCTION OF THE URETHRA IN WOMEN

(Preliminary Report)

by ROGER W. BARNES and H. S. BHAT, Vellore.

Reconstruction of the Urethra may be indicated following Urethrectomy or to replace the Urethra which has been severely injured during child-birth. Urinary continuance has been difficult to achieve following most methods of Urethral reconstruction and stenosis due to fibrosis sometimes occurs. The construction of the urethra with a tube from a full thickness flap of bladder wall is a method which gives promise of restoring normal urinary control and eliminating the danger of excessive fibrosis. Patients with partial or complete destruction of the Urethra due to injury from difficult prolonged labour have urinary incontinence which is difficult if not impossible to cure by any of the several methods of Urethroplasty. There is promise of restoring urinary control in most of these patients by constructing a new urethra.

Anatomic Considerations

The muscular wall of the bladder consists of complicated interwoven muscle bundles which contract in every direction while urine is being evacuated from the bladder. The blood supply of the bladder wall, including the mucosa, is richly anastamosing and the intramural nerve supply is sufficient to keep the muscle in continual good tone. These factors render the bladder wall especially adaptable to plastic procedures. A flap of bladder wall made into a tube usually remains viable when it remains attached to the bladder by a broad pedicle. The most important urethral sphincters in the female are not the muscles which encircle the urethra [1] but rather are those which are attached to the pubis such as the bulbocavernosus and levator ani, and which act also as vaginal sphincters (Fig. 1). Therefore a new urethra inserted through or between these muscles should have muscular control and tonicity.

Surgical Technique [2, 3]

The patient is placed in the lithotomy position; the antiseptic preparation includes the vagina. Two surgeons each with an assistant are preferable; one team does the vaginal work and the other the suprapubic, each working simultaneously. The urethra, if there is any urethra remaining, or the bladder neck when there is no urethra, is denuded of mucosa and closed tightly with several layers of No. 1 chromic catgut. While this is being done from below, the surgeon who is working above exposes the bladder through a midline suprapubic incision. The peritoneum is deflected upward from the anterior bladder wall until the area of firm attachment of the peritoneum to the bladder is reached. The bladder is then extra-peritonealized. The portion of the peritoneum which is firmly attached to the dome of the bladder is excised and left attached to the bladder wall. The peritoneum dorsal to this area is then separated from the bladder and the defect in the peritoneum is closed (Fig. 2). An incision is made through the bladder wall. Its lower end is 2 to 3 cm. above the bladder neck and 1 to 2 cm. to one side of the midline (Fig. 3). From this point the incision is extended diagonally upwards over the dome of the bladder for a distance of 10 to 12 cm. A second incision is then started at a point 4 to 5 cm. above the lower angle of the first incision and a little closer to the midline. It is extended diagonally upward converging slightly toward the first incision and is the same length as the first one. A transverse incision is then made joining the upper ends of the first two incisions, thus completing the isolation of the upper end of the bladder wall flap. The lower end is the pedicle of the flap and is left attached to the bladder wall. A tube is made from the flap by suturing it around a medium size catheter, the mucosa being

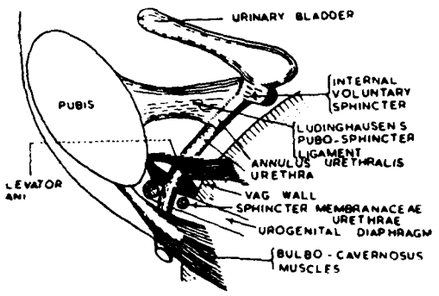


Fig. 1.

Diagramatic representation of the urethral sphincters. Adapted from J. J. O'Sullivan, British Surgical Practice, 1951, p. 260.

Fig. 2.

Extraperitonealizing the bladder. The area of firm attachment of the peritoneum to the dome of the bladder is excised and left attached to the bladder. The defect in peritoneum is closed.

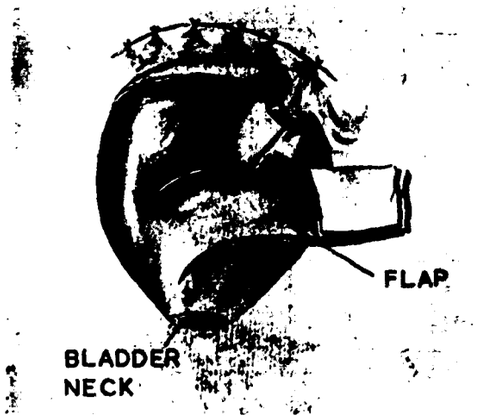


Fig. 3.

A flap is made from full thickness bladder wall leaving a pedicle 4 to 5 cm. wide attached to the bladder about 4 cm. above the bladder neck.

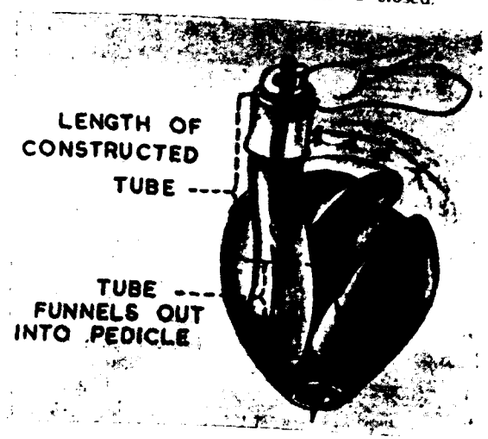


Fig. 4.

Construction of a tube from the bladder wall flap. The proximal end of the tube is about 4 cm. from the pedicle; from this point the flap widens out into the pedicle.

on the inside (Fig. 4). Two layers of triple-0 chromic catgut are used. The construction of the tube is terminated at a point about 4 cm. from the base of the pedicle and from this point the flap widens out into the pedicle.

The surgeon who is working from below, after closing the urethra, makes a small incision just below the clitoris, then, by blunt dissection with a hemostat the tissues are separated inward between the old urethra and the pubis. The points of the

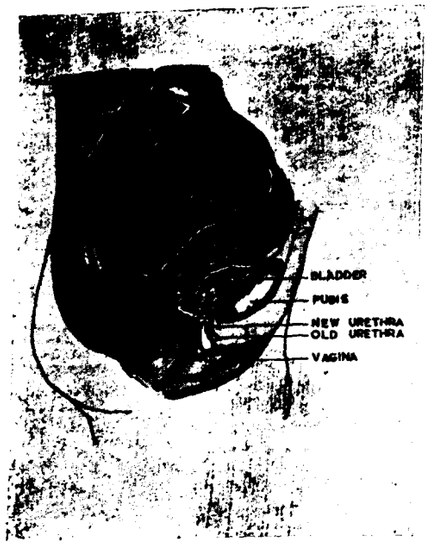


Fig. 5.

The new urethra in position between the pubis and the old urethra which has been closed.

hemostat emerge into the bladder just above the vesical orifice. The blades of the hemostat are then spread making a tunnel for the new urethra. The free end of the tube which has been constructed from the bladder flap is grasped with the hemostat and, together with the catheter in the tube, is pulled downward through the tunnel (Fig. 5). The proximal end of the tube should then be at the new bladder neck and from this point the flap is open and flares out into the pedicle attached to the ventral bladder wall. The mucosa of the outer end of the new urethra is sutured to the mucosa of the introitus just below the clitoria. The defect in the dome of the bladder is closed over the pedicle with 3—0 chromic, preferably in two layers. If the bladder is normal size it may be closed tightly; the catheter in the new urethra is depended upon to drain the urine. When the bladder is small, however, which is most often true in these cases, it is preferable to leave a catheter in the bladder through the suprapubic opening. A small rubber tissue drain is left in the prevesical space and the suprapubic wound closed.

Post-operative care consists of wide spectrum antibiotics, daily change of dressings and continual urinary drainaga from the bladder for 12 days through either the urethral or the suprapubic catheter or both.

Results

Two patients have had reconstruction of the urethra for correction of complete urinary incontinuance due to partial destruction of the urethra following prolonged difficult labour. One of these is able to hold the urine for a period of one hour, then urinary leakage through the new urethra occurs. When she voided every hour, there was no leakage. There is now no incontinence of urine when she lies down, whereas before surgery the leakage was continuous. The other patient's bladder was very small pre-operatively due to continual leakage for over a year and complicated by a vesical calculus which was removed by litholapaxy a week previous to the urethral reconstruction.

Following reconstruction of the new urethra, the old urethra would not remain closed even though it was at three different times denuded of mucosa and sutured tightly in several layers. This failure to obliterate the old urethra was probably due to a combination of persistent infection and the very small bladder capacity. A uretero-sigmoidostomy was done rather than trying again to close the opening through the old urethra.

Reconstruction of the urethra by the method described here has been done on two patients following urethrectomy for carcinoma of the urethra by one of the authors (R.W.B.). The only variation in the technique was the position of the new urethra; it was not put through a tunnel beneath the pubis because there was insufficient tissue left through which a tunnel could be made after the urethra

was removed. The new urethra was sutured to the small amount of tissue which remained under the pubis and its dorsal surface was covered by vaginal mucosa. Following surgery one of these patients had mild stress incontinence; otherwise micturition was normal. In the other a portion of the floor of the new urethra sloughed, probably due to inability to completely cover the urethra with vaginal mucosa. Subsequent plastic repair was done and the last follow-up report stated that she had only mild stress incontinence.

SUMMARY

A technique for reconstruction of the female urethra with a tube made from a full thickness bladder wall flap is given. The bladder is first extraperitonealised, then the flap is developed from the ventral and upper wall leaving a pedicle near the vesical neck. A tube is made from this flap and is drawn through a tunnel made by blunt dissection immediately under the pubis. The old incompetent urethra is obliterated by suturing it closed, or in case of carcinoma of the urethra a urethrectomy is done previous to the reconstruction. The results have been fairly good in one patient who had partial destruction of the urethra following prolonged difficult labour; in another the operation did not relieve the urinary leakage because of failure to close the old urethra after three attempts. Two other patients whose urethras were removed for carcinoma, had only stress incontinence following reconstruction of urethra.

BIBLIOGRAPHY

1. O'sullivan, J. J.: Stress incontinence. Brit. Surgical Practice, 1951, p. 259.
2. Barnes, Roger W. and Wilson, W. M.: Reconstruction of the Urethra with tube made from bladder flap. Urol. & Cutan. Rev. 53: 604, 1949.
3. Barnes, Roger W., Wilson, Wm. M., Bergman, R. Theodore. Farley, Stanley E. and Hadley, Henry L.: Plastic Surgery on the urinary bladder. Jour. Urol. 49: 641. 1953.

Received for publication on 1-1-'57.

THROMBOSIS IN ASCENDING AORTA WITH SADDLE EMBOLISM

(Report of a Case)

*by B. R. SOLANKI and J. B. SHRIVASTAV, Nagpur.**

INTRODUCTION

Sudden occlusion of the aorta by a thrombus or embolus results in a highly dramatic clinical episode in the field of Medicine and Surgery. Thrombosis is usually seen in the abdominal part; while the embolus is commonly encountered riding as a saddle at its bifurcation. Aortic occlusion of this nature is not common. Allen [2] at the Mayo clinic, in a review of 100 cases of sudden arterial occlusion, found only one case of aortic occlusion; and Albright and Leonard [1] found saddle embolism in 4-9% cases of peripheral arterial emboli. These conditions have also been reviewed by Rich [10], Morset et al [9], and Taylor [12].

Aetiological basis of aortic occlusion is varied. Taylor in a collection of 27 cases, found auricular fibrillation and mitral disease as a cause in 21 (78%) cases. His remaining 6 cases were due to severe congestive cardiac failure or due to myocardial infarction. Wilson [14] found only one case in which there was no cardiac lesion and was perhaps due to paradoxical embolism arising from varicose veins present in the case. Rich [10] in a study of 16 cases also found either a fibrillating auricle, endocarditis, myocardial infarction as the common causes. According to him, though thrombosis in anatheromatous aorta is possible, because of the swift moving stream it is not big enough to occlude the lumen. Simpson [11] also found a cardiac lesion in a case of Saddle embolism. The case reported here is of interest because the basic pathology of thrombosis and consequent saddle embolism was situated not in the heart but in the ascending aorta.

* From the Dept. of Pathology and Bacteriology, Medical College, Nagpur.

CASE REPORT

A well built man, aged 29 years, was admitted to the Medical College Hospital, Nagpur, on 22nd March 1955, with complaints of weakness and burning pain of sudden onset in lower extremities. He was perfectly well till 4 P.M. the previous day, when he vomited, had diarrhoea and developed symptoms pertaining to lower extremities. The man looked shocked: pulse was 120/P.M., regular; respiration 48/P.M. and B.P. was 140/110. His cardiac rythm was regular and there were no adventitious sounds or murmurs. The chest was emphysematous. Both his legs were cold and the skin was ashy white. The jerks and sensations were absent in the lower extremities. No pulse could be felt in the femoral and popliteal arteries on either side.

Investigations:

Urine contained bile and albumin in traces and showed few R.B.C. on microscopic examination. Total W.B.C. were 11200/Cmm., with 70% of polymorph neutrophils.

Progress:

The patient's condition gradually deteriorated after admission. He got epileptic fits, became drowsy and irritable. A spasmodic obstruction of both femoral arteries was diagnosed. He was put on anti-coagulant therapy. Next day paravertebral block of 1, 2, 3 & 4 lumbar nerves were done with 1% procaine. He was put on conservative line of treatment for shock and was given blood transfusion but the patient expired on the third day after admission.

Necropsy Findings:

The body was that of a well built middle aged man. Both the lower limbs were cyanosed. Heart was normal in size and weighed 220 gms. The left ventricle was hypertrophied. The muscles appeared healthy. The valves were normal. The coronary arteries showed athero-sclerotic changes. Just above the aortic cusps, in the sinus of valsalva, there were two ½ x ¼ cms., greyish coloured, corrugated friable pieces of thrombus attached to the aortic wall (Fig. 1). They were just above the coronary openings. The abdominal, thoracic and ascending portions of aorta showed atherosclerotic changes. There was no ulceration or thrombosis in any other part of aorta. At the bifurcation of abdominal aorta an

Fig. 1.

Photograph of the heart showing thrombus attached to the wall of the aorta just above the aortic valves.

Fig. 2.

Photograph showing saddle embolus at the bifurcation of abdominal aorta.

embolus was blocking the openings of both common iliac arteries; it was extending about 1½ cms. on right side and just blocking the opening of left iliac artery (Fig. 2). Both the lungs were voluminous and oedematous. Spleen, liver, kidneys and brain were normal. In the region of both kidneys, in the perinephric fatty tissue, there were hematomas, apparently due to paravertebral blocks.

Microscopic Descriptions :

Sections from different portions of aorta showed atherosclerotic changes. Sections of aorta at the region of thrombosis showed Linear streaks of lymphocytes in the adventitia and around vasa-vasorum. The media showed necrosis of muscle and elastic tissue, with lymphocytic infiltration. The elastic lamillae (special stained section) were seen to disappear near the lesion leaving only a few shreads. The intima was thickened and hyalinised at places. The histologic changes were characteristic of syphilitic aortitis. Section from thrombus showed layers of platelets and fibrin entangling R.B.C. and W.B.C. Absence of degenerative changes in the polymorph and absence of fibroblastic proliferation indicated that thrombus was of recent origin. Section from common iliac artery with the embolus did not show any pathologic lesion in the arterial wall and the embolus showed the same histologic features as the remains of thrombus in the ascending aorta.

Discussion

From the autopsy findings and microscopical study it is clear that the detached thrombus from the ascending aorta was responsible for the saddle embolism of the abdominal aorta at its bifurcation. It is also clear from the clinical picture and the post-mortem appearance of the heart that the thrombus while in the ascending aorta did not cause coronary insufficiency and the embolus did not originate from the heart. Absence of atheromatous ulcerations anywhere in the aorta also rules out this aetiology of thrombus formation. The histologic appearance of the aorta at the site of thrombosis is characteristic and typical of syphilitic aortitis, and from all the evidence present it appears to be the primary cause of aortic thrombosis. Though uncomplicated luetic aortitis is present in 70-90% of cases suffering from syphilis (Moore [8]) it rarely is a cause of thrombosis as confirmed by Albright in his series. So far, no case has been reported to our knowledge, in which syphilitic aortitis was the cause of thrombosis in aorta. The case reported therefore, is interesting as it shows syphilitic aortitis as the aetiological factor of aortic thrombosis. As regards treatment and prognosis, it has been

Fig. 3.

Photomicrograph of the aorta (Stained by Verhoeff's elastic stain). Showing loss of elastic lamillae (elastic tissue dark stained) and its replacement by fibrous tissue in the media.

Fig. 4.

Photomicrograph of aorta. (Stained by Haemetoxylin & Eosin.). The media shows necrosis of muscle, lymphocytic infiltration, vascularisation and endarteritis of Vasa Vasorum.

rightly remarked, that without operation the prognosis is almost hopeless, though Walker [13] has reported a case of survival without operation. In desperately ill patients most authors agree that conservative means such as treatment of shock and sympathetic block may be tried, as was done in the present case. Code et al [3] and Holf et al [7] have reported dangers of hematoma formation due to paravertebral block done during anticoagulant therapy. This complication was seen in the present case. It is safer to do the paravertebral block, before the anticoagulant therapy has been instituted.

Summary

A case of saddle embolism of aorta has been reported. The embolus originated from a thrombus formed in the ascending aorta.

The case is interesting and unusual because syphilitic aortitis was the cause of thrombosis.

REFERENCES

1. Albright, L. H. et al.: Embolectomy from the Abdominal Aorta. New Eng. Jour. Med. 242, 272, 1950.
2. Allen, E. V. et al.: Peripheral vascular diseases. W. B. Saunders Co., London, p. 313, 1946.
3. Code, F. et al.: Incompatibility of Lumbar block and anti coagulant therapy. J.A.M.A. 147: 1233, 1951.
4. Ewing, M. R.: Aortic Embolectomy. Brit. Jour. Surg. 38, 44, 1950.
5. Fraser, K. et al.: Saddle embolus of aorta. Lancet 2: 136, 1951.
6. Gordon, I.: Aortic Embolectomy. Lancet 2: 734, 1954.

7. Holf, P. R. et al.: Dangers of Lumbar sympathetic block during anticoagulant therapy. J.A.M.A. 152: 399, 1953.

8. Moore, J. E.: The modern treatment of syphilis. Charles C. Thomas, Springfield. Ill, 1944. P. 284.

9. Morset, F. S. et al.: Embolism at bifurcation of aorta; review of literature and report of first case surviving after gangrene. Am. Heart J. 36: 277, 1948.

10. Rich, N. E.: Occlusion of the abdominal aorta, a study of 16 cases of saddle embolus and thrombosis. Ann. Int. Med. 19: 36, 1943.

11. Simpson, J. J. et al.: Saddle embolus of the aorta. Lancet 2: 133, 1951.

12. Taylor, F. W.: Arch. Surg. 62: 38, 1951.

13. Walker, G. D.: Saddle embolus, survival without operation in a proved case Lancet 2: 732, 1954.

14. Wilson, H.: Aortic Embolectomy. J.A.M.A. 141: 389, 1949.

Received for publication on 12-1-'57.

ASSOCIATION NOTES

GOVERNING BODY

President
G. M. PHADKE (Bombay)

Vice-President
S. S. ANAND (Amritsar)

Founder President (Ex-officio Member)
K. G. PANDALAI (Madras)

Three Immediate Past Presidents (Ex-officio Members)
S. N. MATHUR (Lucknow)
C. P. V. MENON (Madras)
S. J. MEHTA (Bombay)

Hony. Secretary
A. VENUGOPAL (Madras)

Immediate Past Hony. Secretary (Ex-officio Member)
U. MOHAN RAU (Madras)

Hony. Treasurer
C. P. V. MENON (Madras)

MEMBERS
A. E. de SA', Bombay.
B. RAMAMURTHI, Madras.
R. NIGAM, Nagpur.
P. K. SEN, Bombay.
B. N. SINHA, Lucknow.
V. R. THAYUMANASWAMI, Madras.
A. K. SAHA, Calcutta.
V. P. MEHTA, Bombay.
M. KRISHNAMURTHI, Visakhapatnam.

THE XIX ANNUAL CONFERENCE

The XIX Annual Conference of the Association of Surgeons of India will be held at Nagpur during the last week of December 1957. The following papers will be discussed:—

1. *Non-malignant Stricture of Oesophagus*
   by Dr. Subrata Banerjee, Calcutta.
2. *Surgery of Intracranial Vascular Lesion*
   by Dr. B. Ramamurthi, Madras.
3. *Tumours of the Testis*
   by Dr. E. J. Borges, Bombay.

Besides this, a few short papers will also be read at the Conference. Further details about the Conference will be announced later.

* * *

Library of the Association of Surgeons of India

The Hony. Secretary acknowledges with thanks the receipt of the following 7 books so kindly donated to our Library by Dr. U. Mohan Rau, M.S., F.R.C.S. (Eng.) of Madras:—

1. The Radiology of Bone & Joints by James F. Brailsford (3rd Edition) 1944.
2. Campbell's Operative Orthopaedics by J. S. Speed & Hugh Smith (Vol. I) 1949.
3. -do- (Vol. II) 1949.
4. Clinical Tuberculosis by Benjamin Goldberg (Vol. II) 1946.
5. Bone & Bones by Joseph P. Weinmann & Harry Sicher (1947).
6. Vascular Abnormalities and Tumours of the Spinal Cord by Roger Wyburn-Mason, 1946.
7. The Normal Encephalogram by Leo M. Davidoff & Cornelius G. Dyke (II Edn.) 1946.

Subjects for discussion at future meetings

20th Meeting:

1. *Acquired Facial Defects*
   by Dr. M. Mukherji, Calcutta.
2. *Hydronephrosis—Experimental and Clinical Studies*
   by Dr. B. N. Balakrishna Rao, Gwalior and Dr. A. E. deSa', Bombay.
3. *Cysts of the Lung*
   (i) Hydatid Cyst of the Lung—
   by Dr. S. K. Sen, New Delhi.
   (ii) Cystic disease of the Lung—
   by Dr. P. K. Sen, Bombay.

21st Meeting:

1. *Place of Vascular grafts in Obliteralose vascular disease*
   by Dr. R. Nigam,
   & Dr. V. V. DaSilva.
2. *Uses of Radio-active Isotopes in Surgery*
   by Dr. Miss P. Parvathi,
   & Dr. S. R. Mukherjee.

CONTRIBUTORS—April, 1957

1. Dr. M. V. Sirsat, M.D., Pathologist, Dept. of Pathology, Tata Memorial Hospital, Parel, Bombay-12.
2. Dr. P. N. Wahi, M.D., M.R.C.P. (Lond.), &
   Dr. Pashpati N. Wahi, M.D.,
   Dept. of Pathology, S. N. Medical College, Agra.
3. Dr. A. K. Basu, M.S., F.R.C.S.,
   Dr. S. R. Konar, &
   Dr. G. S. Karai, M.B., F.R.C.S.,
   S.S.K.M. Hospital, Calcutta.
4. Dr. Timothy Takaro, M.D., Director of Surgery, Wanless Tuberculosis Sanatorium, Wanlesswadi and Consultant in Thoracic Surgery, Wanless Hospital, Miraj, &
   Dr. James R. Donaldson, M.D., Consultant in Orthopaedic Surgery, Wanless Hospital, Miraj.
5. Dr. B. N. Balakrishna Rao, F.R.C.S., &c., &
   Dr. B. K. Aikat, M.D., Ph.D., D.C.P. (Lond.), Director,
   Dept. of Pathology, Seth Karnani Memorial Hospital, Calcutta.
6. Dr. D. M. Anklesaria, M.B.B.S., Dept. of Surgery, Tata Memorial Hospital, Parel, Bombay-12.
7. Dr. H. S. Bhat, M.B., M.S., &
   Dr. L. B. M. Joseph,
   Dept. of Surgery, Christian Medical College Hospital, Vellore (S. India).
8. Dr. G. S. Sekhon, F.R.C.S., Sant Niwas, New Patiala.
9. Dr. K. D. Koshal, M.B.B.S. (Pb.), F.R.C.S. (Eng.), Reader in Surgery, G. R. Medical College, Gwalior.
10. Col. Sangham Lal, D.O.M.S., F.R.C.S. (Eng.), Director of Medical Services, Madras, & Dr. A. Umapathy, M.S., Tutor in Surgery, Madras Medical College, Madras.
11. Dr. U. Mohan Rau, M.S., F.R.C.S. (Eng.), Hony. Surgeon, Govt. General Hospital, Madras-3 (Surgical Clinic, 207, Poonamallee High Road, Madras-7).
12. Dr. K. C. Jacob, B.A., M.D., Professor of Forensic Medicine, Madras Medical College and Police Surgeon, Madras.
13. Dr. J. N. Berry, &
    Dr. G. S. Sainani,
    Dept. of Medicine, Medical College and Hospital, Nagpur.
14. Dr. Roger W. Barnes, M.D., F.A.C.S., &
    Dr. H. S. Bhat, M.B., M.S.,
    Christian Medical College, Vellore (S. India).
15. Dr. B. R. Solanki, M.B.B.S., M.Sc., &
    Dr. J. B. Shrivastava, M.D., D.B.,
    Dept. of Pathology & Bacteriology, Medical College, Nagpur.

Dalda
and its place in the diet

In a recent address on "Fundamental Problems of Vitaminology," Prof. Wilhelm Stepp, Emeritus Director of the Munich Medical Clinic, observed: "Even authoritative writers hold that in this epoch when foodstuffs abound, vitamin deficiencies are no longer seen. This is a fundamental error."

Prof. Stepp cited as an example the U.S.A., one of the well-fed nations of the world. "The addition of vitamins to the flour used for bread now practised in the U.S.A. goes on to show that insufficient vitamins seem to be a great peril which must be avoided at all costs. In effect it is not possible to buy bakery flour in the U.S.A. which has not been reinforced with vitamins and some minerals."

If this is the case in America the condition must be far worse in a country like India where the intake of milk, milk products and other animal foods is extremely low. To quote from the special report No. 27 published by the Indian Council of Medical Research: "According to Health Bulletin No. 23 (1951), issued by the Nutrition Research Laboratories, Coonoor, *vitamin A deficiency is the single factor responsible for a large number of nutritional deficiency diseases.* The daily allowances for an adult are in the neighbourhood of 3,000 to 4,000 I.U. of vitamin A. Animal foods, which are rich in vitamin A, are however, many times more expensive; hence this rich source of vitamin A cannot be utilised."

With a view to making good a part of the vitamin A deficiency in this country the Food Fortification Sub-Committee of the Indian Council of Medical Research had recommended that the vitamin A content of vanaspati should be raised to 700 I.U. per oz. thus making available to the people a good and nourishing fat at an economical price. This has been done with Dalda.

Dalda is a pure cooking fat made out of vegetable oils according to strict Government specifications. The ordinary oils of everyday use are refined, hydrogenated and enriched with 700 I.U. of vitamin A per oz. and 56 I.U. of vitamin D per oz. By virtue of this enrichment the vitamin content of Dalda is now the same as that of good quality ghee.

Dalda is not a substitute for but an alternative to ghee. Fats like butter and ghee are good but their supply is far short of requirements and they are too expensive for the everyday use of most people. Further, the consumption of milk as milk is more beneficial than the consumption of ghee which is a product of milk, as then the consumer gets the animal protein as well as the calcium and vitamins. In most western countries people are increasingly consuming milk as milk. This should be the ideal trend in India also.

In addition to being a fat enriched with the two essential vitamins, Dalda is easily digested and utilised by the body on account of its low melting point. The standards of quality laid down for the manufacture of this product are so high that it compares favourably with its other counterparts such as "shortening" and "margarine" used extensively in the United States, England and other European countries. Each ounce of Dalda yields 250 calories, as much as 1 oz. of any good quality ghee and over twice as much as an ounce of wheat or rice.

Dalda is, therefore, a very valuable addition to the average Indian diet which is so often lacking in essential nutrients, particularly vitamins and fats.

HVM. 295-23

STATEMENT ABOUT OWNERSHIP AND OTHER PARTICULARS ABOUT "THE INDIAN JOURNAL OF SURGERY"

Registration of Newspapers (Central) Rules, 1957

FORM IV (SEE RULE 8)

1.	Place of Publication	... Madras.
2.	Periodicity of its Publication	... Bimonthly.
3.	Printer's Name	... Sri G. Raghavan.
	Nationality	... Indian.
	Address	... The Huxley Press, 114, Armenian Street, G.T., Madras-1.
4.	Publisher's Name	... Dr. A. Venugopal, M.B., M.S., F.A.C.S.
	Nationality	... Indian.
	Address	... 164, Poonamalle High Road, Madras-10.
5.	Editors' Name	... Dr. C. P. V. Menon & Dr. S. R. Joglekar.
	Nationality	... Indian.
	Address	... Jt. Editors: Dr. C. P. V. Menon, M.S., F.R.C.S., "Binfield", Madras-10 Dr. S. R. Joglekar, M.B., B.S., F.R.C.S., (Eng.), Patel Chambers, French Bridge, Bombay-7.
6.	Name and Address of individuals who own the Newspaper and partners or share-holders holding more than one per cent of the total capital.	By Association of Surgeons of India, Office at 164, Poonamalle High Road, Madras-10.

I, Dr. A. Venugopal, hereby declare that the particulars given above are true to the best of my knowedge and belief.

Date 13—5—1957.

(Sd.) A. VENUGOPAL,
Signature of Publisher.

876
3-57

THE INDIAN JOURNAL OF SURGERY

JUNE, 1957

BIMONTHLY

Annual Subscription Rs. 24

The Indian Journal of Surgery

Vol. XIX No. 3

CONTENTS JUNE 1957

NOTICE TO CONTRIBUTORS

The Indian Journal of Surgery publishes original articles in all branches of surgery and allied subjects. Papers for publication and all editorial communications should be addressed to the Editorial Secretary, Indian Journal of Surgery, 164, Poonamallee High Road, Madras 10. Papers sent to the journal are sent to a panel of referees and are accepted for publication on their recommendation. The accepted papers are published on the understanding that they have not been, and will not be published in whole or in part in any other journal.

Orthopaedic Section: Articles intended for publication in the Orthopaedic Section of the Journal may kindly be sent to the Sectional Editor, Dr. N. S. Narasimhan, F.R.C.S., 221, Thambu Chetty St., Madras-1.

Style: Manuscripts must be typewritten on one side on quarto or foolscap sheets, double space and with a margin of not less than two inches. They should bear the name and full address of the author to whom the proofs are to be sent. The paper should conclude with a brief summary stating the conclusions described in the paper.

Tables and Illustrations: Tables should be numbered in Roman numerals and set out on sheets separate from the text. The illustrations should be kept separate from the text and should be numbered consecutively in Arabic numerals. Each figure should be referred to in the text and the descriptive legends should be typewritten on a separate sheet of paper. Nothing should be written or typed on the back of the illustrations. Photographs and photo-micrographs should be printed on glossy paper and generally should not be larger than 6.5 x 6.5 cms. If transmitted through the post they should not be folded and should be protected by corrugated cardboard paper.

Illustrations will not be accepted unless they reach a certain standard of excellence technically, present an attractive appearance and add significantly to the value of the presentation.

References: These should be arranged alphabetically by authors. For citation of a book, give in order author's name, initials, complete title, place of publication, name of publishers, year and page. For an article author's name, initials, full title of paper exactly as it appears, name of journal (abbreviated as in the Quarterly Cumulative Index Medicus), volume number (in heavy type Arabic numerals), inclusive page numbers and year. The following example illustrates the desired punctuation and arrangement.

> Christopher, F.: Minor Surgery. 5th Edition, Philadelphia and London: W. B. Saunders Company, 1945, p. 348.

Citations in the text should give the author's name followed by the number listed in the reference.

Proofs: Contributors will receive one proof in galley by air mail, if necessary, which should be immediately corrected and returned by air mail to the Editorial Secretary. Only minor alterations will be accepted in the original manuscript at the time of the correction of proofs.

Reprints: 25 reprints of an article will be sent to the author or divided among the authors. Additional reprints can be supplied at cost price if application is made when the proofs are returned.

All communications regarding membership of the Association, subscription to the Journal, and advertisements may be addressed to the Hony. Secretary, Association of Surgeons of India, 164, Poonamallee High Road, Madras 10.

THE
INDIAN JOURNAL OF SURGERY

Vol. XIX JUNE 1957 No. 3

EXPERIENCES IN THE SURGICAL CORRECTION OF CARDIOVASCULAR ABNORMALITIES * **

by REEVE H. BETTS, T. THOMAS and N. GOPINATH, Vellore.

INTRODUCTION

There is no more thrilling chapter in medicine or surgery then the development of the surgical correction of cardiovascular lesions during the past one to two decades. The more recent work has of course been based on the isolated attempts of a number of earlier investigators, but for all practical purposes the modern era of cardiovascular surgery can be said to have originated in the late 1930s. The development of satisfactory anesthetic technics for intrathoracic procedures which enable the surgeon to carry out a careful, unhurried operative procedure within the open thorax made the attack on cardiovascular lesions possible. Much of the early experience with operative procedures on the heart was gained by the treatment of constrictive pericarditis and stab wounds or other injuries of the heart. The surgical correction of such abnormalities is considerably different from the procedures that are now thought of as cardiovascular operations; still the experience gained thereby was a starting point for further developments.

In 1938 Gross [1] first successfully ligated a patent ductus arteriosus. He had been spurred on in his efforts to develop a surgical procedure for this lesion by his medical colleague Hubbard and after perfecting the technic on dogs was able to apply it successfully to human patients. Actually Strieder [2] two years previously had carried out a partial obliteration of a patent ductus in a patient with subacute bacterial endarteritis. Unfortunately, his patient died shortly after operation and the case was not published until later. In spite of the world war which developed soon after this triumph of Gross progress continued to be made and in 1945 Blalock and Taussig [3] reported their work on patients with the tetralogy of Fallot. This was largely an experimental report but also included the first in their series of human cases. Again the medical part of the team, Dr. Taussig, was responsible for the development of the surgical treatment as she had observed many times that patients with the tetralogy of Fallot but with an associated patent ductus arteriosus were much better off and had a far greater exercise tolerance than those in whom the ductus closed normally. Again the results of the experimental surgical laboratory were transferred to the benefit of human patients. At about this same time Crafoord and Nylin [4] reported their first successful resection and end-to-end anastomosis for coarctation of the aorta. Gross [5] had been working on the same problem independently and he also carried out a successful resection before he became aware of Crafoord's work. These striking successes were powerful stimuli to many others who had been either considering such procedures independently or perhaps even actively working on them.

It was inevitable that with the success of the surgical attack on many of these congenital cardiovascular lesions that there would be a renewed interest in the surgical correction of some of the acquired cardiac abnormalities. The problem of mitral stenosis has engaged the attention of numerous investigators over a period of many years and there had been one or two striking successes in the past but they had not received a great deal of attention. The credit for most of the pioneer work in the surgical correction of mitral stenosis goes

* From the Department of Thoracic Surgery, Christian Medical College and Hospital, Vellore, S. India.

** Presented at the V Burma Medical Conference, Rangoon, January 22-27, 1957.

to Bailey and Harken both of whom were working on the problem independently during this period. In 1946 Bailey[6] operated on a patient with mitral stenosis and was able to split the valve but the patient died in the immediate postoperative period and it was not until 1948 that he was given another opportunity of carrying out such a procedure. This fortunately turned out successfully and shortly thereafter Harken[7] also had his first successful case. There proably has been no operation in the modern era that has swept the medical world as rapidly as has the operation for the surgical correction of mitral stenosis. The technic of the operation is such that it can be acquired comperatively easily by anyone with good surgical training and experience. The proper selection of cases for operation is a more difficult problem than the actual operative procedure itself.

Since 1948 there is practically no lesion of the heart, either congenital or acquired, that has not had attempts made at surgical correction either in the experimental laboratory or in human patients. There have been some signal successes and also some bitter disappointments. Considering the short span of years during which proper technics have been available and investigators with adequate cardiovascular experience have been able to work on these problems the progress that has been made has been phenomenal. There is no doubt that many more cardiac lesions will soon be amenable to surgical correction with an acceptable mortality and morbidity rate.

The purpose of this report is to review our experience in the treatment of cardiovascular lesions and it will be limited to those with which we have had actual experience. The cases largely fall into three groups : patent ductus arteriosus, tetralogy of Fallot and mitral stenosis. A few other lesions which we have treated will also be included, as well as a series of ten patients undergoing pericardiectomy during the period of this report. The results will be broken down into two groups, those cases done prior to July 1954 and those done from July 1954 to 15 November 1956 when this report was prepared. The comparatively small number of patients in the first group is due to the necessary difficulties of developing a thoracic surgical department during which period it was necessary to concentrate on standardizing the procedures for pulmonary and esophageal surgical procedures. It is only since mid 1954 that we have made any real effort at developing the cardiovascular side of the program.

DIAGNOSIS

It is fortunate that the diagnosis of most surgical cardiovascular lesions can be reasonably well established by the average physician with no more than the usual diagnostic facilities which are available everywhere. A careful history and physical is, of course, the first essential and will often permit a presumptive diagnosis of considerable accuracy. With the added information obtained by fluoroscopy and roentgenographic examination of the chest and electrocardiographic tracings it is possible to make a diagnosis with considerable certainty in practically all cases that are here under discussion. There are many congenital abnormalities of the heart that are extremely complicated and can be unravelled only with the greatest difficulty and by the use of extensive diagnostic apparatus and usually only by cardiologists with extra training and experience.

Patients with patent ductus arteriosus, tetralogy of Fallot, tricuspid atresia, pure pulmonic stenosis, vascular rings and coarctation of the aorta as well as patients with mitral stenosis can, with very few exceptions, be diagnosed with accuracy with no more than the ordinary diagnostic facilities. When there is any difficulty about establishing the diagnosis, recourse should be made to a thoracic surgical center, if that is at all possible, where the more elaborate procedures can be used, including cardiac catheterization with accompanying blood gas analyses. It is highly essential that if these other procedures such as cardiac catheterization are going to be used, they should be attempted only by experienced personnel an with proper equipment. Pressures readings in the various chambers of the heart can be relied upon only when taken by an electromanometer and record-

Fig. 1.
Photograph taken during cardiac catheterization.

ed on some type of direct writing cardiograph. At the same time the position of the catheter should be checked by fluoroscopic control and a blood sample removed for gas analysis, both as a further check on the position of the catheter and also to determine the presence of any shunt. Unless these investigative procedures are carried out under carefully controlled conditions unreliable results may be obtained which will be misleading rather than helpful (Fig. 1).

Full use of X-ray facilities in investigating any of these cardiovascular cases should be obtained although a plain six foot X-ray of the chest may give considerable information. One should never omit a careful fluoroscopic examination of the patient together with a barium swallow to show any deviation of the aorta or enlargement of the left auricle as well as to determine whether the arch of the aorta is on the right or the left side. In cases with vascular rings the fluoroscopic examination is of the utmost importance and here one may find an indentation on the posterior wall of the esophagus as well as laterally.

It is not possible on a plain posteroanterior X-ray of the chest to determine whether any noted cardiac enlargement is left ventricular or right ventricular. It is only by studying the patient in the two oblique positions that such differentiation is possible. Attention is also directed to the vascularity in the pulmonary hila, the increased vascularity of patent ductus arteriosus being in striking contrast to the decreased vascularity of the hilar structures and lung fields as seen in patients with the tetralogy of Fallot.

CONGENITAL LESIONS

Extracardiac :

The most important extracardiac congenital cardiovascular lesion is the patent ductus arteriosus. This is the lesion which is perhaps the most readily diagnosed and in most series is the most common anomaly of these structures. The abnormality may be noted in early infancy or not until somewhat later in childhood. The typical "machinery" murmur of patent ductus arteriosus is almost unmistakable and when it is present the diagnosis is usually quite straightforward. It must be remembered, however, that in the younger age group the murmur may not be characteristic and sometimes the diastolic phase is absent. Also, in older patients who have developed pulmonary hypertension the pressure in the lesser circuit may be sufficiently high that the blood does not flow thru the ductus during diastole but only doing systole and therefore the diastolic element is not found. This is an important consideration and when extreme pulmonary hypertension is suspected the patient should be studied most carefully including cardiac catheterization. There is much doubt whether the patient with such a high degree of pulmonary hypertension that there is a reversal of flow thru the ductus should be treated surgically.

Most patients with patent ductus arteriosus will show increased vascularity of the pulmonary hila and in some instances a "hilar dance" can be observed. (Fig. 2-A & B). The pulmonary artery is enlarged and shows up as a convexity

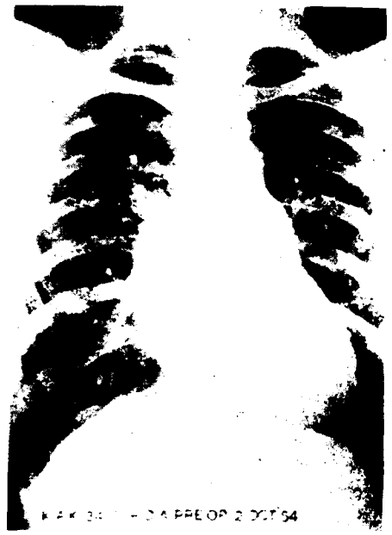


Fig. 2-A.

Fig. 2-B.

Fig. 2-A. Posteroanterior roentgenogram of the chest of a patient with patent ductus arteriosus of a mild degree. There is very little increase in the vascularity of the lung fields, but the shadow of the pulmonary artery is marked on the left cardiac border and there is some evidence of cardiac enlargement.

Fig. 2-B. Posteroanterior roentgenogram of a patient with a more severe patent ductus arteriosus showing the marked cardiac enlargement, large pulmonary artery shadow and marked vascularity of the lung fields.

on the left cardiac border. The pulse pressure is increased and can usually be further increased by moderate exercise.

Patients with patent ductus arteriosus often have very few symptoms. Mainly they complain of a vigorous heart action and palpitation together with tachycardia. Also, there is often a diminished exercise tolerance and frequently such patients do not grow and develop as do their playmates.

There are three reasons for advising surgical closure of the patent ductus arteriosus, the most important probably being to relieve the heart of the added burden of the recirculating volume of blood that is returned to the lungs with each systole. It is of importance, especially in childhood, that the ductus be closed so that the patient will grow and develop normally. The third reason is to obviate the possibility of development of a subacute bacterial endarteritis. This was of more serious consequence a few years ago before the development of the modern antibiotics, but it is still a real threat.

The patent ductus can be occluded either by the multiple suture ligature technic or by division and closure of the two ends of the ductus. Early in experience with patent ductus arteriosus there were some reports of recanalization of the ductus and consequently Gross [8] and then others developed a technic for dividing the ductus and closing over the ends with a continuous suture This is no doubt a more surgical procedure, but there is also little argument that in the hands of the occasional cardiovascular surgeon multiple ligatures are safer than division and there is little evidence to show that a properly performed ligation with suture ties at either end of the ductus and a transfixion sutured in the middle gives any less satisfactory results than complete division.

Exposure of the patent ductus arteriosus can be either thru a left anterior or left posterior thoracotomy. Everyone agrees that for the difficult case it is better to go posteriorly and it has been our practice to use this exposure in every instance. Should difficulties be encountered they are more easily coped with thru the posterior thoracotomy than thru the more limited anterior exposure. We have also made it a practice to free up the aorta both above and below the ductus before the ductus itself is dissected out. Thus if difficulty is encountered with the ductus, hemorrhage can be more speedily controlled by the tapes that have been placed around the aorta.

There are many large series of cases of patent ductus arteriosus with extremely low operative mortalities. The best series we know of is one recently reported by Potts [9] of 347 operations with no fatality. We have been greatly disturbed by the fact that in our series, operations for patent ductus arteriosus have carried the highest operative mortality of all our cardiovascular operations. As will be seen in the accompanying Table I, we have had a total of 25 cases with six deaths or a mortality of 24%. Half of this high mortality has been due to three cases with degenerative disease of the aorta or pulmonary artery. In two instances the aorta split at the time of the dissection and in another case the pulmonary artery gave way after the ductus had been divided and the pulmonary end closed over with a continuous suture. This is a condition that is being studied rather extensively in several centers in the West and it is hoped that further light will be forthcoming shortly. It certainly is our impression that such changes occur more frequently here in the Orient than has been found in other countires. We believe this is another reason for urging patients to be operated on comparatively early in childhood, that is by the time they are ten years of age, before extensive changes may have set in in the accompanying large vessels. The other fatalities are just as much regretted, but somewhat easier to explain. One was in a young child who developed bronchopneumonia and the second was a girl who was operated on by a visiting W.H.O. surgeon and at operation was found to have an associated pulmonic stenosis. The ductus was not ligated, but the child died two days later. Our latest fatality was due to anuria for which no cause could be ascribed. Rechecking of the 500 c.c. of the blood that was given at operation showed no incompatibility and yet very marked oliguria developed from the day of operation and progressed to a fatal issue nine days later in spite of every effort to overcome it.

Included in this series is one patient who had subacute bacterial endarteritis and who at operation was found to have an atelectatic segment of the left upper lobe, presumably on the basis of an embolus and in whom the atelectatic segment was removed at the same time the ductus was obliterated.[10] This patient had an uncomplicated convalescence although he represents the only late death in the series of which we are aware as he committed suicide after a domestic quarrel some four months after operation.

Coarctation of Aorta:

Patients with coarctation of aorta usually consult their doctor because of the symptoms of hypertension. There are no symptoms referrable to the heart itself, but the hypertension is either picked up in the routine physical examination or because the patient complains of headache or some other difficulty related to the increased tension. Occasionally patients notice that they are unable to walk as far as they should and an occasional patient has distinct intermittent claudication. There seemingly are two periods in life when coarctation of the aorta may be the most serious. One is in the early months of infancy, apparently before time has elapsed for collateral channels to develop and thus bring

some relief to the marked hypertension. If the patient can survive the first three or four years, usually good collateral channels will be established and although the hypertension may be moderately severe they seem to go thru until the age of puberty without great trouble in most instances. It is therefore advised by surgeons with the most experience that operation be deferred until around the tenth to the fifteenth year, if at all possible, as surgical repair before most of the growth has been obtained may result in a relative coarctation later on if the aorta does not grow proportionately in the region of the anastomosis.

Any patient with hypertension should have the blood pressure taken not only in the arms but in the legs. When there is a discrepancy between the two figures with the legs showing lower levels than the arms, one is justified in making a presumptive diagnosis of coarctation of aorta. In many instances the femoral and other lower leg pulsations will be markedly diminished or absent. When facilities are available for carrying out proper measurement it can be shown that there is a delay in the systolic impulse reaching the femoral compared with the brachial arteries. This is quite characteristic of coarctation.

The heart is often moderately enlarged due to the hypertension and the enlargement is mainly of the left ventricle. The aortic knob may be difficult to make out or not visible at all in the plain posteroanterior roentgenogram of the chest. In older children and adults a characteristic notching of the lower ribs of the thorax is often found and is considered a pathognomonic sign of coarctation. On careful inspection and palpation of the thorax, especially posteriorly in the interscapular area, one can often see and palpate pulsations over the dilated accessory channels. Angiocardiographic studies, although not usually indicated for diagnosis, often show a very striking development of collateral channels to by-pass the constriction. When other diagnostic studies are indicated, a retrograde aortography with dye being injected thru a cardiac catheter passed retrograde up the left brachial artery is usually more helpful than a venous angiocardiogram. When grafts are available it is usually considered unnecessary to carry out contrast X-rays of the aorta, but where grafts are not available this information is necessary as it may save the patient a needless operation should the examination demonstrate a long constricted segment that could not be resected without a graft. The previously accepted terminology of infantile and adult types of coarctation has largely been given up as it has been found that the lesions vary appreciably and various segments of the aorta may be involved. The most common site is either just above or just below the origin of the ductus arteriosus and a more suitable term would therefore seem to be preducted and postductal.

Patients with coarctation of the aorta are subject to two risks, one being the hypertension itself although it does not usually progress as the so-called malignant type of essential hypertension. Vascular accidents, however, are quite common and the outlook for a normal longevity is not good. The second risk is bacterial infection at the site of the constriction giving rise to endaortitis. Both of these reasons are ample justification for resecting the lesion and carrying out an end-to-end anastomosis. Our experience has been limited to one case, a boy of five, with a severe hypertension of 210—220 systolic in the arms with a much lower tension in the legs. He was already in moderate cardiac decompensation and it was thought that he would not survive to reach a more acceptable age. At exploration it was found that there was a complete absence of the aortic isthmus and a huge patent ductus arteriosus joined the main pulmonary artery and the descending portion of the aorta (Fig. 3-A). A large left subclavian artery was anastomosed to the descending aorta as in a Blalock operation and then the ductus was ligated. (Fig. 3-B). There has been a moderate fall in the pressure of the upper arms but it is too soon after operation to know how good the final result will be. Usually such cases do not obtain as good

Fig. 3-A.

Fig. 3-B.

Fig. 3-A. Artist's conception of the findings at operation in a patient with absent aortic isthmus. The left common carotid and the left subclavian are markedly enlarged and the huge ductus arteriosus connecting the pulmonary artery and descending aorta is well shown. There was no connection whatsoever between the aortic arch and the descending aorta.

Fig. 3-B. Procedure carried out for absence of the aortic isthmus. The much enlarged left subclavian was turned down and anastomosed to the descending aorta after which the huge patent ductus arteriosus was occluded.

results as in the more common type of coarctation as the subclavian-aortic anastomosis does not provide as large a channel as when resection and end-to-end anastomosis of the aorta is possible.

Cyanotic Group :

The tetralogy of Fallot is the most common cause of congenital cyanotic heart disease. Ordinarily such patients exhibit cyanosis either from birth or in the first few months or years thereafter. The degree of cyanosis varies with the amount of dextraposition of the aorta and the severity of the pulmonary stenosis. Although such children seem to be of normal mentality they often are very fretful and un-cooperative and their physical development does not progress as rapidly as it should. Walking is apt to be delayed and the exercise tolerace is markedly diminished. Characteristically these patients assume the squatting position after any type of exertion. In the more severe instances anoxic syncope may develop, especially after a severe crying spell or some other form of exertion. The cyanosis is most easily noted in the mucous membranes and the fingers and generally clubbing of the digits is observed. Suffusion of the conjunctivae is practically always present. The values for red blood cell count and hemoglobin are both apt to be markedly elevated, the hemoglobin going up as high as 22 or 23 grams and the red blood count occasionally as high as ten million per cubic millimeter.

The heart is not enlarged on physical examination and almost always a rather marked systolic murmur is audible maximal over the third or fourth intercostal spaces near the left sternal border. Usually other murmurs are absent unless there are associated congenital abnormalities. Roentgenographic examination of the chest reveals a heart that is not grossly enlarged but has a characteristic tilting upward of the apex giving a rounded appearance and because the pulmonary arteries are small the aortic window is clear and the pulmonary artery shadow of the cardiac silhouette in the A.P. view is diminished giving a

Fig. 4.

Posteroanterior roentgenogram of the chest of a patient with classical signs of tetralogy of Fallot. The heart is a typical "coeur en sabot" shape and there is markedly decreased vascularity of the lung fields.

Fig. 5.

Posteroanterior roentgenogram of the chest of a patient with tetralogy of Fallot and right descending aorta. The shape of the heart is quite characteristic and there is decreasing vascularity of the lung fields.

more marked angulation to this side of the cardiac border (Fig. 4). The aortic shadow is apt to be small and in about 20% or 25% of the cases a right descending aorta is found (Fig. 5). This should always be determined by giving the patient a swallow of barium as it may influence the decision of the surgeon as to which side he will approach the lesion.

Because of the increased red blood cell count and increased viscosity of the blood these patients may develop cerebral thrombosis. The severe strain on the right side of the heart because of the pulmonary stenosis may lead to heart failure. The right heart becomes markedly hypertrophied and this is demonstrated by the electrocardiogram which shows right ventricular hypertrophy and right axis deviation. If the lesion is not ameliorated, the outlook for a normal life span is poor although an occasional mild case may live well into adulthood.

The operation of Blalock and Taussig is based on the principle of creating a patent ductus arteriosus to increase the flow of blood to the lungs. This can be done as in the original Blalock-Taussig technic by anastomosing one of the subclavian arteries to the pulmonary artery of the same side or the Potts-Smith procedure will produce the same effect by doing a direct anastomosis between the aorta and the pulmonary artery. This is usually possible only when there is a left descending arch. The relationship when the arch goes down the right is such as to make a direct anastomosis very difficult. When operation is necessary for very young patients, that is, below the age of four, we believe that a Potts-Smith operation is better as one can make a somewhat larger anastomosis; beyond the age of four we prefer to do the Blalock-Taussig operation as the subclavian artery is large enough to provide an adequate channel. The main difficulty with the Potts-Smith type of

operation is that one is tempted to make the actual anastomosis a little bit larger than it ought to be. If it is over 4 or 5 m.m. there is apt to be such a large shunt of blood returned to the pulmonary artery that the patient goes into congestive failure. The one late death in our series has been due to just this complication. We therefore believe that it is wiser to use the Potts-Smith operation only for the very small children in whom a satisfactory Blalock operation is difficult because of the small size of the pulmonary artery.

Although the Blalock or Potts operations do not return these patients to normal but simply add another anomaly to the four they already have, these operations do produce a very striking relief of symptoms and apparently enable the patients to live a fairly normal life. There is no doubt, however, that a more surgical approach to the problem would be to attack the abnormalities themselves by relieving the pulmonary stenosis and closing the interventricular septal defect. This is being attempted in a number of centers and now quite a few surgeons when they find that a patient has a valvular type of pulmonic stenosis do a transventricular valvotomy instead of the shunt type of operation. Relieving the infundibular obstruction by a direct approach is a more risky procedure and the closure of the ventricular septal defect is possible only under cardiac inflowstasis with hypothermia or by using some type of artificial heart-lung preparation. Undoubtedly these technics will become standardised in the near future and it may then be possible actually to relieve the abnormalities that are present rather than to add another one to those already present.

As was to be expected in our early series when a few sporadic attempts were made to relieve some badly handicapped children we did not meet with a great deal of success. However, the more recent series from July 1954 onward have shown a marked improvement and in the last 24 cases operated on as seen in Table II there has been no operative death and the only late death that we are aware of is the one mentioned above of a Potts-Smith type of operation in which the anastomosis was made a little too large.

Tricuspid atresia with hypoplastic right ventricle and auricular septal defect presents a clinical picture that is very similar to a tetralogy of Fallot. Fortunately, the same type of operative treatment is also indicated. They should be differentiated beforehand as the prognosis is not quite as good as it is for the case with a straightforward tetralogy of Fallot. The two features that make the condition distinguishable from the tetralogy are the changes that are noted in the postero-anterior roentgenogram of the chest and the electrocardiographic tracing. Due to the hypoplasia of the right ventricle the right cardiac border does not as a rule project beyond the right border of the vertebra in a straight P.A. roentgenogram of the chest, whereas a normal heart or a patient with a tetralogy of Fallot will usually show a small part of the cardiac border beyond the right vertebral border. On electrocardiographic examination a left axis deviation is found instead of the right axis deviation as seem in the tetralogy of Fallot. We have had one instance of tricuspid atresia in our series and a Blalock type of operation was done with moderate improvement. Table I. The patient did not improve as much as some of the straightforward tetralogies.

TABLE I

CARDIOVASCULAR OPERATIONS

(Excluding Aneurysms)

	Cases	Deaths	Percentage
Patent Ductus Arteriosus	25	6*	24
Tetralogy of Fallot	29**	4	13
Tricuspid Atresia	1	0	—
Mitral Stenosis	48	8*	17
Pure Pulmonic Stenosis	1	0	—
Foreign Body in Heayt	1	0	—
Coarctation of Aorta	1	0	—
Vascular Ring	1	0	—
Constrictive Pericarditis	10	0	—

* Two patients operated on by visiting sugeon.

** Two cases operated on by visiting surgeons.

TETRALOGY OF FALLOT

15 July 1954 — 15 November 1956

Cases	Deaths
24	0

(1 Patient lost left arm due to gangrene)

Acyanotic Group :

The only such condition that will be discussed in this presentation is " pure " pulmonic stenosis. This term is used for those cases that have stenosis of either the pulmonary valve or the infundibulum, either with or without an associated auricular septal defect but without a ventricular septal defect. Patients with this lesion usually can be distinguished easily from patients with tetralogy of Fallot as they do not exhibit severe cyanosis and in many cases cyanosis is entirely absent. The usual complaint is dyspnea and this is apt to come on later in childhood or only during adolescence. As the body grows and the need for oxygen increases the relative atresia of the pulmonary outflow tract becomes more pronounced. Inasmuch as there is no ventricular septal defect the oxygenated and unoxygenated blood do do not get mixed ; so there is not the severe cyanosis seen in the tetralogy of Fallot. Occasionally with marked exertion the circulating hemoglobin becomes so reduced that cyanosis becomes apparent.

Physical examination of patients with pure pulmonic stenosis may reveal surprisingly little in the way of abnormality. Some patients are of poor physical stature and there is often bulging of the precordium, due to the enlargement of the right ventricle. On roentgenographic examination of the chest the heart shadow is usually not much enlarged, but in those instances where the stenosis is in the valve and poststenotic dilatation is present, the shadow of the large pulmonary artery may be seen and can be misleading as one would ordinarily expect a small artery with pulmonic stenosis. It has been conclusively shown, however, that wherever there is stenosis in a blood vessel, the jet of blood coming thru the constricted area causes a dilatation beyond the constriction and so it is quite possible to have an enlarged pulmonary artery with less than the normal amount of blood going thru the vessel. In contrast to the enlarged pulmonary artery shadow is the decreased vascularity of the lung fields that is usually found.

Although a good presumptive diagnosis of pulmonic stenosis can be made on physical examination, roentgenographic studies and electrocardiographic tracings it is advisable to learn as much as possible about the patient preoperatively, especially as to whether or not the stenosis is in the valve or in the infundibulum or both. To settle these points either angiocardiographic studies or cardiac catheterization or both should be carried out. In those instances where the stenotic area is in the valve and a post-stenotic dilatation can be demonstrated on angiocardiography, this is quite straightforward and definite. However, a cardiac catheterization with careful pressure studies with an electromanometer is even more helpful. In those instances where the stenosis is valvular, there will be a very sudden change between the low pressure of the pulmonary artery and the markedly elevated pressure of the right ventricle. When the constricting area is in the infundibulum. then there is apt to be some increase in pressure when the catheter is withdrawn from the pulmonary artery into the pulmonary outflow tract, but there will be a second rise as the catheter is drawn farther down into the ventricle.

The surgical correction of this condition calls for direct attack upon the constricted area. For those with valvular stenosis it can be approached either thru the main pulmonary artery or thru the right ventricle, the latter seemingly being the preferable approach. The pulmonary valve is often extremely tough and rubbery and must be cut with a sharp valvulotome and then dilated well back to the annulus ; otherwise a poor result may be obtained. For those patients with infundibular stenosis or a combination of the two, resection of the infundibulum itself has been carried out in a number of centers with fair results. This is a more formidable procedure than the relief of valvular stenosis.

It is important that patients with pure pulmonic stenosis be differentiated from those with tetralogy of Fallot. A Blalock type of operation for patients with pure pulmonic stenosis will simply increase the workload on the right ventricle by shunting more blood into the pulmonary circuit and does not produce any benefit as the blood diverted into the pulmonary circuit from the subclavian artery is already fully oxygenated.

There has been some dissatisfaction with the results of operation for pure pulmonic stenosis by these so-called blind methods whether transarterial or transventricular. Open heart operations are now being done by a number of leading cardiovascular surgeons using either temporary inflow-stasis with hypothermia or a complete cardiac bypass with some type of heart-lung machine. The pulmonary artery is then opened and the valve actually trimmed back under direct vision. This, of course, is a more surgical procedure and if it can be shown that the operation can be done without greatly increasing the risk it should become the accepted treatment in the near future. Our experience has been limited to one case which had pure valvular stenosis which was relieved by a transventricular approach. In this instance the patient apparently has obtained a very marked improvement and is now able to lead a perfectly normal existence.

FOREIGN BODIES

It is not the intention of this paper to go into any detail regarding the removal of foreign bodies from the heart, but they are simply mentioned inasmuch as there is one case in this series that had such a lesion. Table I. This young man was carrying a large 4" needle in his hand and stumbled and fell while running, the needle going in thru the third intercostal space on the left side near the sternum and then broke off beneath the skin. An attempt was made at another hospital to remove this but when it was found to be intrathoracic he was referred to us. The patient had an unexplained high temperature of 104°F to 106°F which could not be controlled by antibiotics and we therefore had to go ahead in spite of the elevated temperature. The needle, which was found to be projecting into the main pulmonary artery, was removed without difficulty and the patient made an uneventful convalescence.

CONSTRICTIVE PERICARDITIS

Constrictive pericarditis is quite a separate entity from those that have been discussed above inasmuch as it deals with the sac surrounding the heart and great vessels but it seems appropriate to discuss briefly this condition. The surgical removal of the constricting membrane around the heart has been done for a quite number of years, some of the early attempts being made before the present century. There were no large series of cases reported, however, before the 1930s and it was only then with the advent of modern anesthetic technics that such operations could be carried out with a high degree of safety.

It is our belief that most of the cases, at least those seen on our service here, are tuberculous in origin. In some instances the patients have had an associated pulmonary tuberculosis but in others such an infection has not been demonstrated. The route of infection is open to question. It may be either a direct infection of the pericardium or perhaps a more likely explanation is the bacteria being transmitted from a caseous tuberculous lymph node in the neighboring mediastinum.

There is only one case in this series that we saw showing the more acute phase of tuberculous pericarditis with effusion. This case was operated on under a false diagnosis and the correct diagnosis was not suspected until operation. Although this young child had had no antituberculous

therapy before operation, a greatly thickened tuberculous pericardium was excised which was, of course, an easy surgical procedure inasmuch as the case was acute and there was still fluid in the pericardium. The patient made a good convalescence on chemotherapy. It is our belief that if one sees cases of tuberculous pericarditis with anything other than thin fluid present, it probably is a wise precaution to resect the pericardium, which can be done so easily at that stage, rather than to allow it to progress to the constrictive phase with all the difficulties attendant thereto.

Once the lesion has become established the diagnosis is usually not difficult. Patients complain of marked dyspnea and practically all have fluid both in the chest and in the abdomen. Peripheral edema may or may not be present. One of the more striking signs which helps to differentiate them from congestive failure is the absence of marked orthopnea. Patients with constrictive pericarditis usually are able to lie down flat without difficulty in spite of the presence of fluid in the chest and the abdomen and the evidence of congestive failure as shown by the increased venous pressure. The venous pressure may reach rather a high level, often being above 40 c.m. of water. A pulsus paradoxus can be demonstrated both by feeling the radial pulse or by use of the blood pressure apparatus. The blood pressure may be lowered somewhat and the pulse pressure is almost always of a narrow range.

Patients should be improved as much as possible before operation and this includes a good course of chemotherapy preferably of at least two to three months duration although this is not always possible. One of the more difficult abnormalities to correct preoperatively is the low blood-serum protein and reversal of the albumin-globulin ratio that is frequently found. Some of these patients lose so much protein in the ascitic and pleural fluid that it seems impossible to correct the abnormality preoperatively. Every attempt should be made to raise the protein and get the A-G ratio back to normal. In many of our cases, however, we have had to proceed without being able to achieve this desired result.

We strongly favor some type of sternum splitting or sternum dividing exposure. We believe that it is far preferable to the approach thru the left hemithorax although a fairly adequate decortication is sometimes possible thru that route. Earlier in our series we followed the technic of Holman [1] and split the sternum from the xiphoid up to the second interspace and then transected the sternum at this point. This gave a quite adequate approach to the entire heart and pericardium. For really adequate exposure, however, there is no doubt that the best exposure is obtained by a transsternal incision going thru the fourth intercostal space on either side. This has the disadvantage of opening both the pleural spaces, but this should pose no great difficulty for the modern day anesthetist. We have found in our later cases that it has been possible, by carefully placing the incision on the right side, to keep the dissection entirely extrapleural on that side, so as to obtain the advantage of a sternum dividing incision without the necessity of opening both hemithoraces. We believe that this is of some advantage in the postoperative period although if it is found necessary to open both chests one should not hesitate. It is important that the decortication of the heart be carried well down beyond the phrenic nerve on either side and also it must be carried down to the actual myocardium; otherwise it is easy to leave a thin, constricting layer over the heart. We believe that the inferior and superior vena cavae should also be freed up and all of this can be done with the best exposure thru the sternum dividing incision.

Improvement after operation often continues for a number of weeks or months following surgical removal of the pericardium. Theoretically the relief should be practically instantaneous, but this has not been found to be true. Formerly the slow recovery was said to be due to incomplete decortication but we have found that it may be prolonged even in those that have had a very complete decortication. It is perhaps due to the weakness of the myocardium after having been encased for such a long period of time.

One of the causes of constrictive pericarditis is hemopericardium. Unless the blood can be removed completely by aspiration and the pericardium washed out there is apt to be a thick membrane formed which will result in a constrictive pericarditis later on. It therefore seems advisable to us that when there is known to be blood in the pericardium which cannot be adequately removed by paracentesis one should have no hesitancy in operating on such cases. One of our patients in this series presented such a problem. She was admitted with a large pericardial shadow and on aspiration it was found to contain blood although the cause of the hemopericardium could not be determined. After a few aspirations it was not possible to obtain more blood and it was deemed safer to explore the pericardium surgically than to persist in aspirating. The major part of the pericardium was resected and all the blood removed and the patient had a good convalescence. There are nine other cases of pericardiectomy for constrictive pericarditis in this series and there have been no operative mortality. Table I. All of the patients have been quite markedly relieved and some of them strikingly so. It is a procedure of great importance and we feel should not be withheld from any patient because of poor general condition or low serum protein. After a strenuous attempt has been made to get the patient in the best possible condition operation should be carried out.

ACQUIRED HEART DISEASE

Although all the valves of the heart have now been treated surgically for varying conditions, that is, both stenosis and incompetence, and the coronary arteries have also been attacked surgically in an attempt to relieve coronary insufficiency, the one operation that has been accepted universally and which has become sufficiently standardized to be practised by a large number of surgeons is the relief of mitral stenosis. It is the only type of acquired heart disease with which we have had personal experience. The present discussion will be limited to the surgical treatment of that lesion. The extremely rapid and wide acceptance of the procedure for patients with mitral stenosis attests to its great need and sound basis. During the past eight years large series of cases have been operated on in many centers and the results have been most gratifying when there has been proper selection of cases.

Mitral stenosis appears to be a progressive disease and once the process has become established it rarely remains stationary but continues to become worse until the person is incapacitated and unless relief can be provided, a fatal issue practically always ensues. The concept that was prevalent in older text-books that rheumatic heart disease was not found in the tropics has been long since overthrown and it is now well recognized that rheumatic cardiac infaction is probably just about as frequent in the tropics as it is elsewhere. We have not found that patients frequently give the classical history of rheumatic fever, but there often is the story of a protracted fever of unknown etiology in the preceding years although the joint manifestations seem to be minor for the most part.

It is again fortunate that recognition of mitral stenosis is a straightforward clinical exercise without the necessity for elaborate investigative procedures. Patients with mitral stenosis almost always give a history of increasing dyspnea on exertion with a diminishing exercise tolerance. The more advanced cases will have had one or more bouts of congestive failure and quite frequently a history of hemoptysis is obtained. We have found it very helpful in attempting to determine whether the patient should be operated on or not to enquire in detail regarding the amount of exercise the patient has been able to do during the past two years and almost without exception one finds that progressively month by month less and less can be done without severe dyspnea.

Physical examination of the patient with mitral stenosis without congestive failure will reveal a heart moderately enlarged both to the left and the right and the apex beat is forceful and thumping. The classical crescendo-type diastolic and presystolic thrill and murmur are found in the mitral area. Quite frequently an opening "snap" can be made out usually about the level of the nipple and this supposedly indicates that the valve leaflets are pliable and thus the patient should obtain a good result from splitting of the valve. Oftentimes the murmur is made out best by having the patient lie partly on the left side.

Roentgenographic examination will confirm the enlarged heart with the so called "mitralization" which is due to the enlarged pulmonary artery shadow on the left cardiac border. When the patient is given a swallow of barium and turned in the right anterior oblique projection the dilated and enlarged left auricle displaces the esophagus posteriorly. This is a constant finding in patients with mitral stenosis.

When facilities are available, it is of interest to carry out cardiac catheterization studies on these patients both preoperatively and postoperatively. The pressure readings that can be obtained in the right auricle and the right ventricle are the only really scientific data on which one can assess the postoperative results. Such studies are not necessary for the actual selection of cases for operation, but they are extremely valuable in determining the effect of surgical treatment. Everyone recognizes there is a large psychic element in the appraisal of symptoms by the patient after operation and if this only is relied on a probably over-optimistic assessment will be made.

The case that presents a difficult problem from a surgical standpoint is the one that has either multivalvular disease or associated mitral stenosis and mitral incompetence. It has been quite well established that rheumatic infection of the tricuspid or aortic valve is almost always associated with the same infection of the mitral valve. inasmuch as the blood has to pass thru each of these valves in succession it is of very little benefit to the patient to relieve the obstruction at one point if it is allowed to continue in just as severe a degree at some other point in the cardiac cycle. As the aortic and tricuspid valves can be approached most satisfactorily thru the right thorax, this has led Bailey [12] and his associates to develop and advocate approaching all mitral valvular lesions also thru the right thorax in order to take care of all valvular lesions that may be present at the one operation. They now make it a routine to inspect by palpation the tricuspid valve in every instance and if a tricuspid stenosis is present they have found that mitral stenosis is always associated with it. It is their impression that it is important to relieve the obstruction in the proper order, doing first the aortic valve then the mitral and then the tricuspids otherwise an additional burden may be thrown on that part of the heart which is not accommodated to it. In this plan of attack the mitral valve is approached thru a dissection between the two auricles and then an opening is made in the wall of the left auricle thru which the finger can be inserted. Theoretically this is a sound approach to the problem of rheumatic heart disease, but as yet we have had no experience with it.

The problem of combined mitral stenosis and incompetence is a difficult one. When there is evidence of a predominantly incompetent valve one should be prepared to cope with the incompetence if operation is carried out. However, it often is difficult to assess the relative importance of incompetence verses stenosis as the two are frequently associated and relief of the stenosis will sometimes also improve the incompetence. When the stenosis can be relieved without making the incompetence worse, it produces marked benefit to the patient. We know of no sure way to make the proper selection of cases except by sound clinical judgment which comes mainly by the experience of the medical

cardiologist. Left heart catheterization procedures are being developed and show great promise in elucidating this point.

The other great difficulty in the proper selection of cases for mitral valvotomy is posed by patients with extensive calcification and fibrosis. One cannot tell by the preoperative appearance on fluoroscopy and roentgenographic examination just how badly the valve is calcified although the presence of calcium can usually be detected. Sometimes the extensively calcified valve can be split fairly satisfactorily, whereas in other instances, a not so intensely calcified valve may be impossible to open up. Along with the calcification there is often extreme fibrosis of the chordae tendinae and sometimes a mass of fibrous tissue only is found that cannot be safely opened either by a finger or by a knife without causing what is often a fatal amount of mitral insufficiency. Our fatal cases have for the most part been due to either an improper appraisal preoperatively of the amount of mitral insufficiency or to extensive calcification or fibrosis which prevented a proper opening of the valve. If one of these patients is put thru an operation without producing any benefit the postoperative course is apt to be extremely stormy.

When cases are properly selected for mitral valvotomy and not too many cases with extensively calcified valves are encountered, the operation can be carried out with a high degree of safety. It is incumbent, however, on any surgeon to try and give relief to some of the more advanced cases as it is their only hope of survival. A balance therefore has to be struck so as not to deprive bad cases of their one chance and also not to lose so many that the operation comes into disrepute. It has also been found advisable not to operate on patients until they have reached a degree of incapacity that prevents them from leading a fairly normal life. When they have reached this stage the relief afforded by operation is very real and a great deal of improvement can be expected. Operation done for the milder symptoms may be unappreciated because of the good condition of the patient beforehand as they do not understand the value of a prophylactic operation.

Summary

A brief review of the development of the field of cardiovascular surgery has been presented. Although there are a large number of acquired and congenital heart lesions that are now treated surgically, this discussion is limited to that group of lesions in which we have had some experience with surgical correction. No attempt has been made to detail the more elaborate cardiovascular investigative procedures that may be indicated in some of the complicated cases. Rather, stress has been made on the simple diagnostic procedures that are all that is necessary for the selection of most patients for cardiovascular operations.

Our experiences in the treatment of patent ductus arteriosus and the one case of coarctation of aorta are indicated. Among the cyanotic congenital heart lesions 29 cases of tetralogy of Fallot and one patient with tricuspid atresia have been operated on by either the Blalock or Potts-Smith procedures. There was only one instance of pure pulmonic stenosis which was treated by transventricular valvotomy.

The discussion of surgical treatment of acquired heart disease has been limited to the problem of mitral stenosis as it is the only lesion with which we have had experience. 48 cases have been operated on with 8 deaths, an operative mortality of 17%. Four of these deaths occurred in the early series and the deaths in the latter part of the series have been due either to marked preoperative mitral regurgitation or extreme calcification of the valves. There was one other case that died after exploratory thoracotomy, but without opening the pericardium, from auricular tachycardia which could not be controlled.

Ten cases have had resections of the pericardium. Nine were for constrictive

pericarditis and one for hemopericardium. There was also one patient with a foreign body in the pulmonary artery. An additional patient had a vascular ring associated with a tetralogy of Fallot and a right descending aorta.

We believe that the indications for surgical treatment of other cardiovascular lesions will be rapidly increased as these fields are actively explored in the larger cardiovascular centers.

BIBLIOGRAPHY

1. Gross, R. E. and Hubbard, J. P.: Surgical Ligation of Patent Ductus Arteriosus. J.A.M.A. 112: 1129, 1939.
2. Graybiel, A., Strieder, J. W. and Boyer, N. H.: Attempt to Obliterate Patent Ductus Arteriosus in Patient with Subacute Endarteritis. American Heart Journal. 15: 621, 1938.
3. Blalock, A. and Taussig, H. B.: Surgical Treatment of Malformations of the Heart in which there is Pulmonary Stenosis or Pulmonary Atresia. J.A.M.A. 128: 189, 1945.
4. Crafoord, C. and Nylin, G.: Congenital Coarctation of the Aorta and Surgical Treatment. Jour. Thor. Surg. 14: 347, 1945.
5. Gross, R. E. and Hufnagel, C. A.: Coarctation of the Aorta. N.E.J. Med. 233: 287, 1945.
6. Bailey, C. P.: Surgery of the Heart. Philadelphia, Lea and Febiger, 1955.
7. Harken, D. E., Allen, H. D., Weir, P. F. and Norman, L. R.: Surgical Treatment of Mitral Stenosis, I Valvuloplasty. N.E.J. Med. 239: 801, 1948.
8. Gross, R. E.: Patent Ductus Arteriosus. Am. J. Med. 12: 472, 1952.
9. Potts, W. J., McQuiston, W. O. and Baffes, E. G.: Causes of Death in One Thousand Operations for Congenital Heart Disease. Archives of Surgery. 73: 508, 1956.
10. Betts, R. H. and Thomas, T.: Patent Ductus Arteriosus with Endarteritis. Dis. of Chest. 23: 166, 1953.
11. Holman, E. and Willett, S.: The Surgical Correction of Constrictive Pericarditis. Surg., Gynec. & Obst. 89: 129, 1949.
12. Neptune, W. D. and Bailey, C. P.: Mitral Commissurotomy through the Right Thoracic Approach. Jour. Thor. Surg. 28: 15, 1954.

Received for publication on 8-2-'57.

CARCINOMA OF THE LUNG*

by A. K. BASU, Calcutta.

The increasing incidence of Carcinoma of the Lung has been the subject of serious concern in most countries of the world. In England for instance, there has been 18% increase in mortality from lung cancer in the last 20 years (Paxon 1949) and lung cancer is now acknowledged to be the commonest cancer in males. The alarm that it has created is reflected in the numerous questions that the Minister of Health has had to reply to in Parliament in the last year or so (Lancet 1956). In the United States of America, there has also been phenomenal increase in the incidence. For example, in one New York Hospital, the incidence of carcinoma of lung has increased by 462% in the last 20 years while total admissions have increased by only 87% (Moore & Cole 1955).

It would not be possible here to discuss the etiological factors relating to this high and increasing incidence, except to say that strong and positive statistical evidence exists incriminating smoking with lung cancer.

In our country, awareness of carcinoma of the lung as one of the important pathological lesions in the lung has been slow in developing and no well documented report exists regarding the frequency or morbidity of the disease. There is a general feeling that the incidence in this country is much less as compared to Western countries. This is probably true as evidenced in the series that we are presenting to-day as also in Dr. Betts series from Vellore (Betts 1956—Personal communication). In this latter series for example—there were 19 resections for carcinoma of the lung since 1948, whereas during the same time, the total number of lung resections exceeded 800.

There is however undeniable evidence that even in this country carcinoma of the lung is increasingly being detected and in the near future, this disease may become as important a problem as elsewhere.

Material

This report is based on a study of 37 consecutive cases of carcinoma of the lung together with 9 cases which closely simulated carcinoma—which came under our care between the years 1953 to 1956. During the same time, the total number of lung cases dealt with were 210 and the relative proportion of carcinoma of the lung as 17% of the whole series would be evidenced from the accompanying figure (Fig. 1).

All the cases were males. This is an indication of the relative rarity of this lesion amongst women in general and in our country in particular. It is also an indirect evidence of the incriminating factor of smoking as the causative agent for carcinoma of the lung—considering that smok-

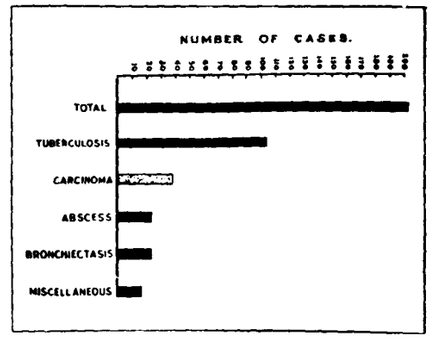


Fig. 1.

Figure showing the relative incidence of carcinoma of lung as contrasted with total number of lung cases studied and also with other pathological conditions in the lung.

* Paper read at 18th Annual Conference of the Association of Surgeons of India at Indore, Dec. 1956.

ing is still not a popular pastime amongst our women.

The ages of the patients in the series ranged generally between 51 and 60 years. 17 cases belonged to this age group. There were 8 cases between 41 and 50 years and 5 cases between 61 and 70 years. Our youngest patient was 35 years old. He had advanced carcinoma of the right lung involving and infiltrating the pericardium. The oldest was a man 82 years old who had a short history of only 2 months' duration. In spite of his age, he was in fair health. Diagnosis was confirmed both by positive Papanicolau smear from the sputum as well as by bronchoscopic biopsy. The patient however did not agree to the operation.

Of these 37 confirmed cases, exploration was performed in 14 cases (43%) and resection was completed in 9 cases (25%) only. 16 cases were considered inoperable from the beginning and 6 cases did not agree to the operative exploration.

This low rate of successful resection seems to be the general experience of most surgeons all over the world and the only way it can be improved is by early diagnosis and advocating thoracotomy in every obscure case of lung pathology in elderly patients.

Diagnosis

The clinical symptoms of carcinoma of the lung such as cough, haemoptysis, chest pain etc., are well known. Unfortunately they do not indicate or specify carcinoma as the offending lesion but are found also in most types of lung pathology, such as lung abscess, bronchiectasis or pulmonary tuberculosis. Further as exemplified in several of our patients, they may be quite late in appearance. It may even so happen that a lung tumour may develop and attain a very large size without any symptom being referable to the lung at all.

This is particularly true for the peripheral type of carcinoma of the lung and happened in one of our cases—where for at least over a year, a massive carcinoma of the lung completely masqueraded under the mask of osteoarthropathy and periodical attacks of fever.

Taken by and large however, these symptoms occurring singly or collectively in an elderly patient, particularly if persistent, should arouse suspicions of serious pulmonary pathology and should be followed up by other methods of diagnosis until completely explained. Herein lies the only hope of diagnosis at a relatively early stage and reasonable chance of curative resection in a larger percentage of cases.

A few unusual clinical symptoms amongst our patients may be mentioned. 3 of our patients presented themselves with sudden onset of hoarseness of voice as the primary feature.

One patient, as already mentioned, was being treated for joint pains and had typical pulmonary osteoarthropathy that was quickly relieved after resection.

One patient had pain in the chest for 2 years which was not taken seriously until he developed mental symptoms and on investigation was found to have a cerebral metastasis from a primary bronchial neoplasm.

2 patients came with symptoms and signs of superior vena caval obstruction. One case was admitted in the Cardiology Unit with evidences of cardiac failure. He had an expansile shadow from the right border of the heart indicating aneurysm of the ascending aorta. There was also a globular shadow at the left base. He died suddenly and at necropsy, in addition to a dissecting aneurysm of the ascending aorta, a long massive necrotising carcinoma at the base of the left lung was discovered.

Carefully performed skiagraphic study is the most valuable diagnostic aid. In this series, skiagraphy alone was diagnostic of the lesion in nearly 90% of cases. Skiagraphy was either not helpful or misguided the diagnosis in 4 cases. It should be remembered however that for the roentgenogram to be really helpful, it must be intelligently performed and interpreted and the newer advances in skiagraphic study such as tomography, bronchography and sometimes pulmonary angiography must be made use of.

Fig. 2.

Macroscopic specimen of the tumour removed—showing massive intrabronchial tumour infiltrating the parenchyma and causing lower lobe atelectasis.

A few striking examples of how skiagraphic study may be deceptive and how X-ray appearances may take peculiar form may be mentioned.

Case 1

Man aged 52. (1) Nov. 1951 — Normal appearances. (2) Dec. 1952 — Tenting of right diaphragm. (3) Sept. 1953 — Lower lobe atelectasis, Deviation of trachea, Enlarged hilar glands.

At this time, the patient coughed up necrotic material which on examination was found to be positive for malignant cells. Exploration revealed a massive carcinoma involving the Right lower bronchus, hilar gland infiltration and complete lower lobe atelectasis. Radical pneumonectomy was performed. The specimen showed a massive intra-bronchial tumour infiltrating the parenchyma and causing lower lobe atelectasis (Fig. 2). The patient is alive and active without any local or distant metastasis after 3½ years.

Case 2 & 36

Both these cases aged about 55 showed homogenous solidified lesion in the lower lobe. Both were explored and resection carried out. In one case an excavated carcinomatous mass was found and in the other, there was a solidified tuberculoma.

Case 31

Here ordinary skiagram was normal but on bronchography a space occupying lesion was found to occupy the stem bronchus. This was subsequently confirmed by operation.

Case 15

Here the skiagram showed areas of opacity at the right and left lung bases. The rest of the lung looked normal in ordinary X-ray but on bronchography there was a filling defect due to a space occupying neoplasm in the left upper bronchus and the other opacities were due to patches of pneumonitis.

Case 7

How a rapidly progressive anaplastic carcinoma may continue to be treated as Tuberculosis is illustrated in the following case.

A young patient of 32 years had cough and fever and was attending the Chest Department of a Medical College. Skiagraphy showed an area of opacity at the left base bordering on the Cardiac shadow. Sputum was consistently negative but even so, antitubercular drugs were being

Fig. 3.
Necrotic tumour in the same case.

administered. The shadow progressively increased in size and when he was referred to us, most of the left hemithorax was opacified. Aspiration revealed turbid effusion. He died suddenly and necropsy showed a huge necrotic tumour (Fig. 3). Histology showed highly undifferentiated anaplastic tumour (Figs. 4 & 5).

Case 4

One case showed complete obstruction of the right lower lobe on bronchography. He had positive malignant cells in the sputum and the scalene node biopsy was positive.

Case 22

One case illustrated periodic appearance and disappearance of pleural effusion during the course of the disease and at short intervals.

Pulmonary Angiography — is a newer field of investigation in the pathology of the lung and seems worth persuing in selected cases. We have performed this manoeuvre after introducing the cardiac catheter in the pulmonary artery of the affected side as opposed to Dolter & Steinberg (1950) who uses the same technique as in angiocardiography. We intend to make use of this method more often in future and will report on its value later on

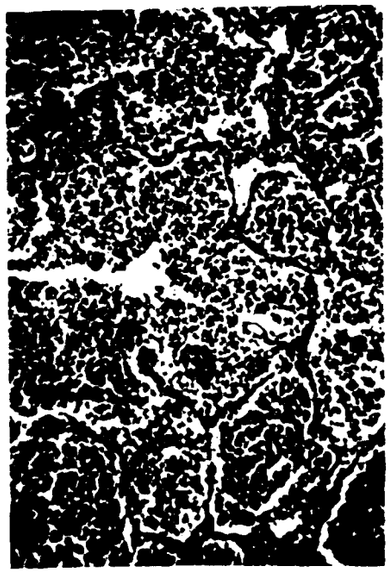


Fig. 4.
Shows anaplastic carcinoma of the round or oat cell type with area of lobar consolidation in the adjoining lung field.

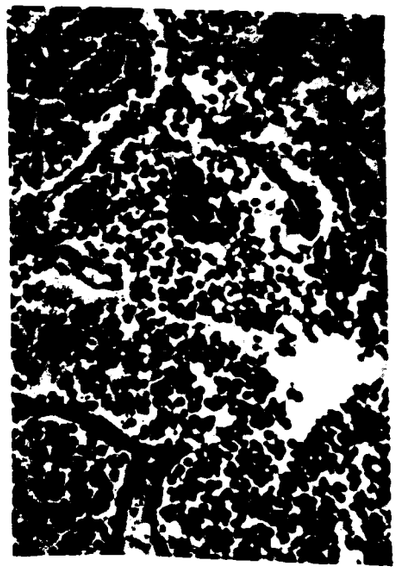


Fig. 5.
Same section under higher magnification showing an alveolus packed with tumour cells and neighbouring alveoli containing pneumonic exudate.

Fig. 6.
Bronchoscopic biopsy from a case of Carcinoma of Lung. The appearances from the bronchoscopic biopsy was suggestive of a mucous secreting adeno-carcinoma of the lung.

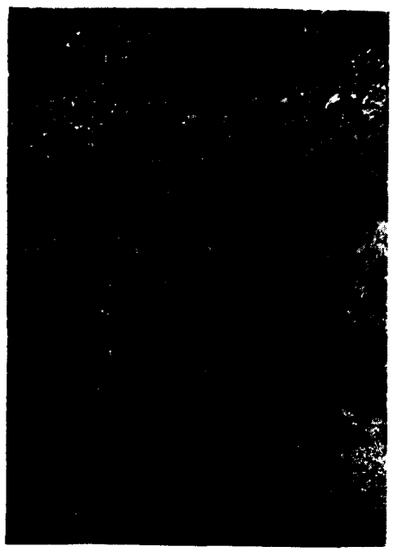


Fig. 7.
Another example of the similar type of mucous secreting carcinoma from a bronchoscopic biopsy without any attempt at gland formation.

Bronchoscopy — In 11 of these 36 cases bronchoscopic biopsy was positive, i.e., in about 30% of cases (Figs. 6 & 7). Apart from positive biopsy, other bronchoscopic findings such as distortion or narrowing of bronchial orifices, actual inspection of the neoplasm by bronchoscopic telescope, irregularity of surface epithelium or ulceration and haemorrhagic discharge etc., were found in another 5 cases — so that by bronchoscopy alone diagnosis was possible in about 45% of cases.

Scalene node biopsy — We had 2 patients with positive scalene node biopsy. One case was explored and showed a massive hilar tumour with a long chain of involved lymph gland running up to the supra clavicular region (Fig. 8).

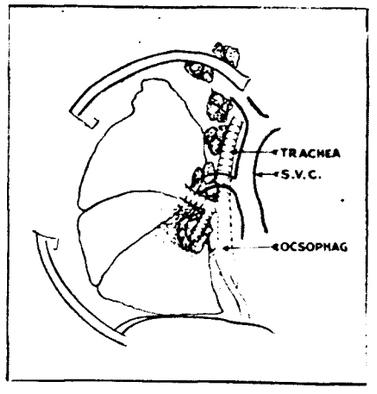


Fig. 8.
Shows a massive hilar tumour with chain of involved glands sunning up to the supraclavicular region—Case 4.

Cytology

We obtained positive evidence of malignant cells in the sputum in 6 of 20 cases where it was performed i.e., in about 30% of cases.

Thoracotomy

In many of the cases, confirmatory diagnosis is not possible by any other means except by exploratory thoracotomy. Considering that this manoeuvre has now been made as safe as abdominal exploration, its frequent use for otherwise doubtful cases should be stressed. In 3 of the operated cases in our series, diagnosis was only confirmed after thoracotomy.

Johnson, Clagett & Gord (1949) reported that in their series of 384 cases, a definite diagnosis was possible in 111 cases only after thoracotomy. Overholt (1954) gave some significant results of the value of early exploration. He operated on 30 patients for relatively early lesions. Of 8 cases who were operated on within 3 months of their first X-ray, 6 were alive after 3 years. In 22 cases, where exploration was delayed for some reasons only 5 are alive after 3 years.

Histopathology

The confused histological naming of the different types of Carcinoma of Lung result from the failure to recognise the great potentiality of the different epithelial cells in the bronchus and their variable capacity to abnormal differentiation. A single tumour may show 2 or more different types of cell differentiation with or without metaplastic changes. The confusion regarding the histological classification has been mainly due to failure of recognition of these basic factors. If therefore one recognises the multifarious potentiality of the epithelial cell in the bronchus to variable differentiation, histologically all primary carcinomas in the lung are bronchogenic and such terms as alveolar cell carcinoma should be abandoned.

The common histological types of bronchogenic carcinoma are

(1) Anaplastic or undifferentiated carcinomas (this includes the so-called Oat cells, large and small Pleomorphic cells and the large and small Spheroidal cell types).

(2) Squamous cell carcinoma.

(3) Adeno-carcinoma.

It should, however, be recognised that quite frequently one comes across 2 or more cell types in the same tumour in different areas and this classification should not be regarded as water-tight compartments. This pleomorphism does not indicate the different specific origin of the tumour. It is probable that all the epithelial elements, the surface and the glandular, participate in the origin of such tumours. The predominance of one or the other histological types depend on the particular element which is stimulated by the carcinogenic agent. The frequency of each of the above types that has been reported in the literature differs with different observers. Such discrepancies may well be due to the analysis from operation specimens alone by some workers or from post-mortem cases by others. It is likely that the larger incidence of squamous cell carcinoma recorded in operation specimens is due to the exclusion of the more inoperable anaplastic types. One would not be much out of the real incidence if one concludes that the squamous and anaplastic cell types are almost equal in frequency. The adeno-carcinomas are less frequent than of either type. Over 20% of all cases show hetrogenous characteristics. The incidence of the various cell types in this present series is as follows :

Squamous Cell Carcinoma	— 14	cases
Anaplastic Cell Carcinoma	— 10	,,
Adeno-carcinoma	— 4	,,
Undetermined	— 11	,,

By and large, the carcinomas occurring in the primary division of the bronchi are more frequently squamous cell in type,

grow slowly, produce manifest symptom early and are more amenable to surgical treatment. Both the squamous and the anaplastic cell types occur predominently in males at an earlier age group than the adeno-carcinomas. There is statistical evidence to indicate that these 2 types are the result of a recently established carcinogenic situation in certain parts of the world, where there has been an undoubted recent increase in the incidence of these 2 types of lung tumours. Whether a similar situation is existent in this country is yet to be established. Adenocarcinomas occur at a later age period. It does not indicate a strong sex bias and is presumably due to a weak type of carcinogenic influence.

In their size, rate of growth, local spread and production of metastases, pulmonary carcinomas show utmost diversity. There is no definite correlation between the duration of symptoms, the sizes of growth. the extent of local spread or the production of distant metastases. The biological behaviour of any particular tumour is a law by itself and defies any reasonable attempt at prediction of its ultimate course. This unpredictable course of events is evidenced in several of our cases. Small peripheral tumours produced early massive metastases — while large hilar types remained static for a long time.

Examples of the different types of carcinoma are illustrated in the accompanying figures.

Squamous Cell Carcinoma — Figs. 9, 10, 11 & 12.

Anaplastic Cell Carcinoma — Figs. 13 & 14.

Adeno-carcinoma — Figs. 15, 16 & 17.

Treatment & Results

Of the 14 cases in our series, where exploration was performed, resection was carried out in 9. In 2 cases, operation had

Fig. 9.
Shows low power view of a rather poorly differentiated squamous cell carcinoma.

Fig. 10.
The high power view of the same tumour showing absence of keratinisation but undoubted squamous cell carcinoma with prickle cells.

Fig. 11.

Is a high power view of a very well differentiated epidermoid carcinoma.

Fig. 12.

An example of infiltrative well differentiated epidermoid carcinoma infiltrating the surrounding lung tissue.

Fig. 13.

Another example of anaplastic bronchogenic carcinoma with appearances suggestive of the carcinoma cells arising from the alveolar epithelium.

Fig. 14.

A higher magnification of the same showing the details of the cell type.

Fig. 15.

A low power view of fairly well differentiated adeno-carcinoma.

Fig. 16.

A higher magnification of the same showing the glandular acini and occasional cell secreting mucin.

Fig. 17.

Another example of a poorly differentiated adeno-carcinoma but yet showing undoubted gland formation.

Fig. 18.

Macroscopic specimen of the massive tumour removed—Case 9.

to be terminated due to dense adhesions between the tumour mass and the arch of the aorta. In 3 other cases large densely adherent matted masses of glands in the hilum precluded any possibility of successful resection.

In 4 cases, we performed pneumonectomy with as much clearing of the hilar glands as was possible. In 5 cases, lobectomy was performed. There was no operative death in either of the two groups. whereas in one case, where resection was attempted but failed, the patient died due to subsequent development of post operative shock complicated by oedema of lungs.

The question of lobectomy versus pneumonectomy in the treatment of carcinoma of the lung has been debated considerably in recent years. Churchill et al from the Massachusetts General Hospital (1950) discussed this question in detail. They carefully followed up 87 pneumonectomies and 31 lobectomies over a period of 5 years and the average survival rate in both groups was about the same. However this result has not been substantiated by other observers. Our results of the lobectomy group have unfortunately been uniformly disappointing. Of the 5 cases, all are dead. One case of peripheral type of carcinoma without apparent hilar involvement developed metastasis 4 months after operation. Another case who was for sometime treated in the Medical wards as a case of intra-pulmonary cyst or abscess had a massive carcinoma involving the whole of the right upper lobe. Resection was extremely difficult technically because retraction of the lung was nearly impossible due to the tenseness of the tumour rendering visualisation of the hilar structures most imperfect. There were no visible or palpable glands in the hilum. However lobectomy was successfully accomplished. The specimen showed a huge tumour mass almost completely filling the upper lobe (Fig. 18). Histology showed anaplastic carcinoma. Unfortunately he developed cerebral metastasis 4 months after operation and died.

Of the 4 cases, where pneumonectomy was performed, 2 are alive, and also free from metastases. In one patient the post-operative interval has exceeded 3 years and 6 months and the other patient has passed 3 years. These two patients can therefore be considered as cured as it is well known that if a Carcinoma lung case passes the 2½ years to 3 years mark after operation, he is most likely to go on for 5 to 10 years. The other two patients are dead — one died 1 month after operation and the other 2 months after operation.

The question of a radical cancer type of operation in which pneumonectomy is a part of the en block removal of tissue with paratracheal, tracheo-bronchial and inter-bronchial glands, part of the pericardium and also with other adjacent tissues has recently been powerfully advocated by Brock (1955). In his hands, this type of radical pneumonectomy has produced convincing evidence of longer survival.

Although we have not actually performed this radical type of operation, we have had experience of intrapericardial ligation of the pulmonary vessels in one case. In this case, a massive hilar type carcinoma had involved and infiltrated the pericardium and the hilar vessels could be controlled after opening the pericardium and ligating the vessels inside the pericardial cavity where their walls were relatively unaffected (Fig. 19). The intrapericardial method of ligation was first strongly advocated by Allison (1946) and certainly allows some margin of safety in difficult cases.

As opposed to the use of the radical pneumonectomy procedure routinely in Carcinoma of the Lung, there has been some recent work on the anatomy of the Lymphatics and lymph glands in the lung (Nohl 1956), wherein it has been shown that a radical type of lobectomy with mass removal of the area of the lymphatic supply is also possible and may be justified on anatomical grounds. Boyd (1954) in his review of the Lahey Clinic cases has also

Fig. 19.
Showing intra-pericardial anatomy of the pulmonary vessels (Right side).

advocated this type of radical lobectomy in some selected cases. He advocates opening the pericardium and with provisional control of the main pulmonary trunk, the upper lobe artery may actually be cut away from the trunk artery and the defect in the artery can be carefully sutured. The upper lobe bronchus should be amputated at its take off from the trunk bronchus and the opening carefully repaired.

It appears to us however even from our limited experience that pneumonectomy — preferably of the radical variety is the operation of choice in Carcinoma of the Lung. It should be practised no matter whether the tumour is centrally or peripherally situated and the situation of the tumour or its histology should not influence this decision. Lobectomy should be reserved for those cases where pneumonectomy would be expected to lead to respiratory insufficiency or invalidism. It would also be indicated where on account of the age or the poor health of the patient, pneumonectomy could be considered unjustifiable from the immediate mortality point of view. This latter indication should not be stressed as the operative mortality figures has with improvement of technique been progressively reduced and now can be considered no more than 5% in both pneumonectomy and lobectomy. Considering everything, therefore, pneumonectomy of the radical type is the operation of choice in Carcinoma of the Lung and the Surgeon who follows this principle consistently, though occasionally in difficulties, will be regarded with better long term survical rate among his patients.

There seems to be general agreement that radiotherapy plays a less important part than surgery in the treatment of this disease and is specially indicated where for some reason operation is not agreed to or not possible either due to advanced state of the disease or the poor general condition of the patient or where operation leaves demonstrable residue of the tumour mass in the chest. X-ray is certainly not a substitute for surgery. X-rays can produce considerable ill effects. It destroys the lung and may lead to development of suppurative processes within the parenchyma.

None of the successfully resected cases in the series received radiotherapy in addition to their operation except one. This patient died 4 months after operation. 6 cases in whom resection could not be completed after thoracotomy due to technical difficulties were given radiotherapy in full doses. All of them died and the average time of their survival was 4½ months.

The question of super voltage X-ray therapy in combination with surgery is at present being tried out by the Lahey Clinic group. They have not been impressed with their preliminary experience with this method although in some cases, the initial supervoltage therapy did make certain advanced types of lesions ultimately resectable.

Discussion

It would be interesting to discuss a few cases which clinically and even at operation closely simulated Carcinoma of the Lung and whose diagnosis was only later confirmed at biopsy.

Case 38

A patient aged 65 had history of cough, fever and repeated haemoptysis of 6

Fig. 20.
Macroscopic view of the lobe removed—Case 38.

months' duration. He also had significant loss of weight.

Skiagraphy showed an area of opacity at the left upper zone which in the lateral X-ray was seen to be an area of atelectasis involving the anterior segment of the left upper lobe. At bronchoscopy, the anterior segmental orifice was found to be distorted. Biopsy from this area was negative. Sputum was negative for malignant cells. He also had symptoms of osteoarthropathy and had developed slight hoarseness of voice. At operation, a mass was found involving the anterior segment of the left upper lobe. The mass was densely adherent to the anterior chest wall and could be separated with difficulty by diathermy dissection. There were numerous glands at the hilum which felt firm. Considering his age and his general health, left upper lobectomy was performed. The cut surface of the specimen showed a smooth walled cavity filled with a greyish mass (Fig. 20). On histology, there was a classical picture of mycotic infection and presence of the ray fungus (Fig. 21). The patient was given a 3 weeks' course of

Fig. 21.
High power view showing the fungus colony and a reactive granulation tissue consisting of proliferating fibroblasts and polymorphonuclear leucocytes.

massive Penicillin treatment and is doing well after 1 year.

Case 40

Another similar type of case was also a man over 50 who came with a short history of cough and repeated haemoptysis of 4 months' duration. There was a large hilar mass suggestive of enlarged and matted glands with an opaque area spreading fanwise into the periphery. Carcinoma was suspected but as a therapeutic trial — high dose penicillin treatment was given for 2 weeks without clinical or skiagraphic improvement. At operation, an indurated mass was found to occupy mostly the superior segment of the lower spreading partly to the basal segments. There was a large mass of glands at the hilum. Frozen section biopsy revealed absence of malignant characteristics in the biopsy tissue removed. Lower lobectomy was performed. The involved area showed greyish atelectatic areas with multiple cavities. Histology was strongly suggestive of fungus infection.

Case 36

Another case — a man aged 55 years, complained of general weakness of 4 months' duration. On routine examination and skiagraphy of the chest, an oval area of opacity was detected at the periphery of the left base. Repeated examination of of sputum for A.F.B. or malignant cells was negative. Bronchoscopy was normal. On bronchography there was a suggestion of persistent non-filling and distortion of the middle basal bronchus and the Radiologist suspected carcinoma. At thoracotomy, a hard greyish indurated area was found occupying the mid zone of the base. The surface was umbilicated, hard and nodular. Malignancy was strongly suspected. There were a number of enlarged hilar glands. Radical pneumonectomy was performed. Subsequently the mass was found to consist of a solid greyish area with surrounding fibrosis. Giant cell systems were found on histology. After a stormy convalescent period, the patient is doing well after nearly 2 years.

Fig. 22.
Macroscopic specimen showing tumour mass filling the left upper bronchus with peripheral bronchiectatic changes—Case 11.

Fig. 23.
Histology of the same case showing typical picture of bronchial adenoma—Case 11.

We have had 2 cases of confirmed bronchial adenomas in our series i.e., about 5% as compared to 37 cases of confirmed carcinoma of lungs. This tallies with the experience of others (Overholt 1954). There has been considerable controversy and some confusion in the past as regards the classification and malignancy of this type of tumour. Formerly they were included in the carcinoma series of many authors (Overholt 1954) leading to unusually favourable cure rates. There seems to be general agreement at present that these tumours though benign are potentially malignant and in many ways behave like the mixed tumours of the salivary glands. Attempts at endoscopic removal are unwise. Bronchial adenomas are like icebergs — only a small part is within the bronchial lumen — the major part is in the pulmonary parenchyma. They should be excised with a good margin of healthy tissue around. Mostly they need lobar exci-

Fig. 24.
Macroscopic specimen of the removed Right lower lobe showing pedunculated tumour with broad base—Case 31.

sion; bronchotomy with local removal may suffice in a few cases. Some may be so situated as to need pneumonectomy. Both of our cases were treated by lobectomy. A man aged 54 had history of periodic cough and fever over 2 years. Repeated X-ray showed retraction of the mediastinum to the left with a small perihilar area of opacity. Bronchoscopy was negative but bronchography revealed filling defect of the left upper lobe bronchus. At operation, a tumour mass was found to fill most of the left upper bronchus. Left upper lobectomy was performed. The specimen showed the tumour mass nearly filling the left upper bronchus with bronchiectatic changes in the peripheral bronchi (Fig. 22). Histology showed the typical picture of bronchial adenoma (Fig. 23). The patient is doing well after 2½ years. Another case (Case 31)—a girl aged 14 years complained of repeated attacks of haemoptysis of many years duration. She had no other symptoms. Skiagraphy of lungs was normal. On bronchoscopy, a tumour mass could be seen arising from the left stem bronchus below the take off of the left upper bronchus. Biopsy from this area was negative. On bronchography, a filling defect was seen in this area. At operation, the tumour was found to fill the bronchus at this exact site. Lobectomy was performed. The specimen showed a beautiful broad based intra-bronchial growth (Fig. 24). Histology was typical and confirmatory (Figs. 25 & 26).

The question of the treatment of metastatic lung carcinoma may sometimes pose considerable difficulty. It is known that a secondary tumour may masquerade as a primary one. It may grow in the bronchial lumen closely simulating both macroscopically and microscopically a primary lung carcinoma. We had one such case in the series. Clinically the case was thought to be a primary tumour. The patient died suddenly and at autopsy the secondary nature of the tumour was revealed (Fig. 27). Excision of a solitary secondary tumour may sometimes be justified. We did lobectomy for carcinoma of solitary peripheral metastasis from a primary epidermoid carcinoma of the penis (Fig. 28). Histology revealed well differentiated epidermoid carcinoma (Fig. 29). At one place there was extension of the growth in the bronchiolar lumen (Fig. 30). The patient unfortunately developed further metastasis after 5 months and died.

It would perhaps be worthwhile to discuss for a few minutes the means whereby under present conditions, the survival rate of carcinoma of the lung could be improved. We in India are rather in a fortunate position in this respect. Together with increasingly frequent diagnosis of carcinoma of the lung, and instead of a fatalistic outlook towards this disease as heretofore, more and more cases are being submitted to surgery in different centres in India. In trying to improve our results we certainly can learn from the experience of other workers and if this experience has any meaning at all, it is this — Carcinoma of the lung is usually a silent disease at its onset and sometimes for a long time. There is no specific symptom. Routine X-ray of chest is the best diagnostic measure. Any shadow in the lung in a patient about 40 years unless otherwise explained should be followed up by bronchoscopy and biopsy, bronchography and sputum study and if

Fig. 25.
Low power view of a bronchial adenoma showing the uniform cell pattern, absence of any pleomorphism and attempt at formation of glandular acini.

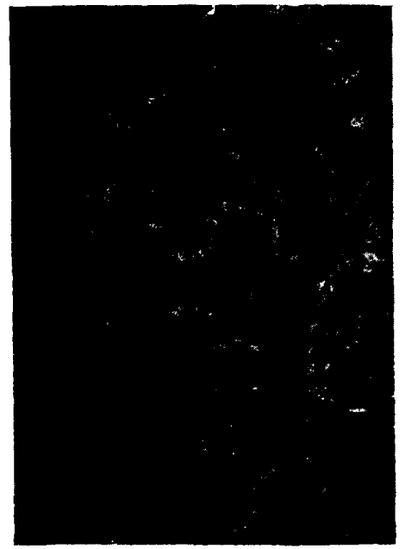


Fig. 26.
High power view of the same section showing the details of the classical book picture of a bronchial adenoma.

Fig. 27.
Picture showing a metastatic carcinoma in lung with involvement of hilar tissue.

Fig. 28.
Picture of the right upper lobe removed showing the tumour.

Fig. 29.

Metastatic carcinoma: This is a section showing metastatic well differentiated epidermoid carcinoma from a primary carcinoma of the penis.

Fig. 30.

Same case showing extension of the metastatic growth inside the bronchiolar lumen. Such types of growth may at time masquerade as primary carcinoma.

persistent, thoracotomy should be insisted upon. The tendency at present in this country is to look upon every shadow in the lungs with a tuberculosis bias. Antitubercular drugs are often prescribed and even persisted on without bacteriological proof. This attitude is to be deplored. It betokens an attitude of laissez fare which is the negation of all progress. There is one significant example of such a case in our series. This has already been mentioned.

At operation, if the diagnosis of carcinoma lung is reasonably certain, either by visual and palpatory evidence or by rapid frozen section biopsy, the surgeon should play safe and if necessary err on the side of radicalism. Radical pneumonectomy is the operation of choice and the more radical it is, the better it would be for the long term survival of the patient. In the present state of our knowledge of cancer surgery, conservatism should have only a small place in our operative philosophy. Lobectomy perhaps of the radical type should be indicated only in suspected or actual respiratory cripples — or where temporary palliation is what is aimed at. Only by this bold and forthright attitude can surgery hope ultimately to lead to improved results in this most malignant disease.

ACKNOWLEDGEMENT

I owe a deep debt of gratitude to Prof. B. K. Aikat, who took the greatest possible interest in the histological study of all the resected and the biopsy specimens included in the present series. Opinions expressed in this paper as regards the histology of lung tumour are held jointly by him and me. Thanks are also due to Lt.-Col. N. C. Chatterjee, Surgeon Superintendent, S. S. K. M. Hospital, Calcutta, for allowing me to make use of the case records in the series included here. One of the cases included in this series was originally referred to me by Col. Chatterjee.

REFERENCES

1. Paxox, T.: Non-tuberculous conditions revealed by mass Radiography. Proc. Roy. Soc. Med. 42: 1043, 1949.
2. Moore, S. W. and Cole, D. R.: Primary malignant neoplasm of the lung. S.G.O 141: 457, 1955.
3. Betts, R. H.: Personal communication. 1956
4. Steinberg, I, Dolter, C. T. and Andrews, W. Pew: Angiography in Thoracic Surgery. S.G.O. 90: 45, 1950.
5. Johnson, C. R., Clagett, O. T. and Gord, C. A.: The importance of exploratory thoracotomy in diagnosis of certain pulmonary lesions. Surgery. 25: 218, 1949.
6. Overholt, R. H.: Discussion in paper by D. P. Boyd. Jour. Thor. Surg. 28: 409 1954.
7. Churchill, E. D., Sweet, R. H., Soulter, L. and Seannell, J. G.: The surgical management of Carcinoma of the Lung. J. Thor. Surg. 20: 349, 1950.
8. Brock, R. C. and Whythead, L. L.: Radicai pneumonectomy. Brit. Jour. Surg. 43: 3, 1955.
9. Allison, P. R.: Intrapericardial approach to lung root in treatment of bronchial carcinoma. Jour. Thor. Surg. 15: 99, 1946.
10. Nohl, H. C.: An investigation into the lymphatic and vascular spread of carcinoma of the bronchus. "Thorax". 2: 172, 1956.
11. Boyd, D. P.: Carcinoma of Lung. Jour. Thor. Surg. 28: 392, 1954.
12. Hare, H. F.: Newer modalities of irradiation in the treatment of Cancer of the lung. Amer. Cancer Society. Annual Meeting. November 1953.
13. Overholt, R. H.: Discussion in paper by D. P. Boyd. Jour. Thor. Surg. 28: 409, 1954.

Received for publication on 29-4-'57.

ROLE OF CYTOLOGY IN DIAGNOSIS OF SUSPECTED LUNG CANCER *

by REBATI DUTTA-CHOUDHURI, Calcutta.

It is an universally accepted fact that for the diagnosis of cancer, biopsy is the method of choice. But this method is not always convenient for growths of the deep seated organs. Even among the deep seated organs due to the peculiarity of its position, structure and function, the lung is a special problem, though a biopsy can be done by endoscopy. The lesion, however, may be situated in a position which may be beyond the reach of the bronchoscopy. The cytologic method helps very much in such cases as it makes the more peripheral tumours available for microscopic study. This method has been invaluable in the recognition of cancer of the lung when this has been masked by such disease as concurrent tuberculosis. In many cases even the cell type of the neoplasm can be determined by this method. Papanicolaou's method of staining is the method of choice for the purpose. The diagnosis depends on the individual cell character. The nuclear cytoplasmic ratio diminishes, there are anisocytosis, anisonucleosis and hyperchromatosis with prominent nucleoli. Thus though a single cell is pathognomonic for cancer the diagnosis should always be based on a group of cells. The cytologic study can be done from sputum, bronchial washing, smear from broncheal swab during bronchoscopy and pleural fluid when there is effusion. It depends largely on the site of the growth; the more superficial it is, the more cells will it exfoliate in the bronchus. Thus if the tumour is in the extreme periphery the sputum and bronchoscopy material fails to give the proper finding. In such cases, the author has got good results by aspirating the growth by a wide bore lumbar puncture needle attached to a 50 c.c. record syringe; the smear being made on the albuminised slide by the aspirated fluid and fixed in the ether-alcohol mixture; not infrequently a small bit of tissue also comes out along the aspirated material; the section of the tissue gives the architecture of the tumour.

Collecting and preparing the smear of sputum is always the first step in a cytologic examination. Special care should be taken in collecting the specimen of sputum. The patient should cough deeply before expectorating the specimen. So far as the taking of bronchial aspirates and washings is concerned there should be a close collaboration with the bronchoscopist and the cytologist. The washings in the trap of the apparatus should be centrifuged and smeared on the albuminised slide and fixed in the ether alcohol mixture without loss of any time.

Fig. 1

This shows the malignant cells obtained from sputum of a case. This was diagnosed as epidermoid carcinoma.

Bronchial washings are a valuable means of verifying findings in the sputum. In experienced hands, in addition to the diagnosis of the presence of cancer cells, the type of carcinoma can also be accurately established.

Fig. 2

This shows the cells obtained in a bronchial washing. This was diagnosed and corroborated by operation as small cell anaplastic or oat cell carcinoma.

Massive pleural effusions are found some times in lung cancer cases. Much difficulty arises in diagnosing the causative factor of such effusion as the lung conditions are not manifested by radiographic examination; bronchoscopy may not also help in the matter. In one such case aspiration of pleural fluid was done fifteen times as a method of treatment under the diagnosis of tuberculous pleural effusion; on the sixteenth occasion under the direction of another consultant the fluid was sent to the author and the diagnosis was established.

Fig. 3

This shows the malignant cells in the smear from the deposit of centrifugalised pleural fluid.

Fig. 4

This shows the section done on a small bit of tissue brought out along with the aspiration biopsy. In addition to the malignant character of the cells it shows the architecture of the tumour also.

Now the question arises is this cytologic method infallible? The answer in one word is 'No'. The epitheloid cells in active tuberculosis and the metaplastic epithelial cells in bronchiectasis and virus pneumonia resemble malignant cells and thus these conditions can easily give false positive results. These are the cases in which the age and the clinical history of the patient are of distinct help. The bronchoscopic finding if present is invaluable in coming to a conclusion.

Another question is pertinent — 'Do all positive cytologic reports indicate pulmonary cancer? The answer again is in the negative. The cell in the sputum may come from the oesophagus by regurgitation or erosion into the trachea, or from the larynx or from pharyngeal or oral cavities. They may also be from secondary deposits in the lung.

In conclusion it may be stressed that the cytologic method is no doubt a valuable

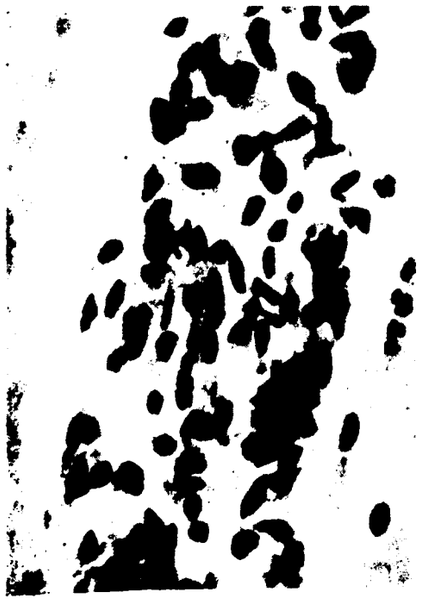


Fig. 1.

Shows the malignant cells obtained from sputum of a case This was diagnosed as epidermoid carcinoma.

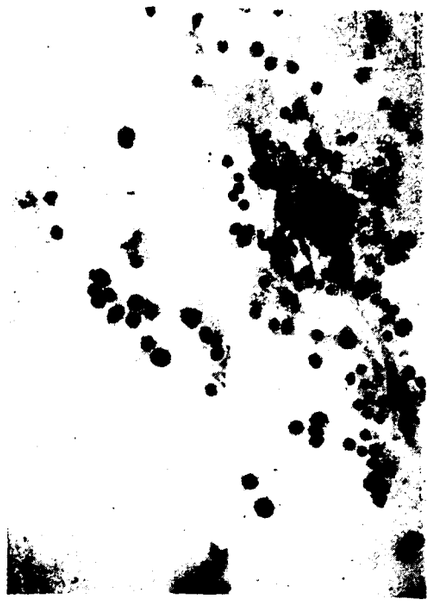


Fig. 2.

Shows the cells obtained in a broncheal washing. This was diagnosed and corroborated by operation as small cell anaplastic or oat cell carcinoma.

* Paper read at the 18th Annual Conference of the Association of Surgeons of India held at Indore, Dec. 1956.

Fig. 3.

Shows the malignant cells in the smear from the deposit of centrifugalised pleural fluid.

Fig. 4.

Shows the section done on a small bit of tissue brought out along with the aspiration biopsy.

procedure in the diagnosis of cancer lung but before depending solely on this diagnosis, the case should be judged along with the clinical, radiological and/or bronchoscopic findings. One should also remember the fact that the patient may have harboured small cancerous growths that are not otherwise detected as does happen with small intra-epithelial carcinomas when he receives a positive report. If necessary the procedure should be repeated before the surgeon is satisfied regarding the diagnosis.

Received for publication on 29-4-'57.

CANCER OF THE LUNG *

(A preliminary report of the Radiotherapeutic aspects)

by N. B. ROY, Calcutta.

This preliminary report of the Radiotherapeutic aspects of Carcinoma of the Lung, though based on a very small number of cases, is intended to stimulate interest in the subject, and it is hoped that in the course of time with more extended work and contributions from others interested in the field, some definite conclusions with regard to the place of radiotherapy in the treatment, will be arrived at. This work has been carried out in collaboration with Dr. A. K. Basu who has dealt with the surgical aspects. A definite plan has been evolved in the recording of cases giving full details of the patient's personal, previous and family histories and the various investigations, which are carried out as a routine.

The total number of cases treated in this series was 47 and were distributed as below :—

A. Bronchogenic Carcinoma .. 38
   - Diagnosis confirmed by bronchoscopy and histology .. 25
   - Diagnosis based on clinical and radiological evidence .. 13

B. Metastases from Seminoma Testis 7

C. Metastases from Teratoma Testis 1

D. Lymphosarcoma .. 1

Of these only the 38 Bronchogenic carcinoma cases are dealt with. Age incidence showed a maximum in the age group 40 to 60. 2 patients in a younger age group 20—30 years were both females. The sex incidence was 8.5 : 1. A history of smoking was present in 30 of whom 18 were heavy smokers. The incidence in urban and rural populations was 3.7 : 1. Occupational incidence shows a preponderence among indoor workers. The series is perhaps too small to draw any conclusions. The duration of symptoms varied from one month to 2 years with the majority (87%) giving histories of under 8 months, and 50% under 3 months. Cough or pain in the chest were present as the main symptoms. Superior vena caval obstruction with puffiness and engorged veins were the presenting picture in a few cases. Some patients had haemoptysis and dyspnoea as the original symptom. As most of the cases were seen late, they came with pleural effusion or metastases.

Clinical staging.

Stage I. Localised lesion with no evidence of collapse of lung. General condition good.

„ II. As (I), but with visible evidence of tumour, or with early evidence of collapse, e.g. one lobe. General condition good.

„ III. Collapse involving whole lung on one side.

„ IV. Extensive lesion with :
   - (a) Pleural effusion.
   - (b) Supra-clavicular glands.
   - (c) Mediastinal glands.
   - (d) Distant metastases.

Clinical staging of the present material.

Stage I. —Nil.
„ II. —Nil.
„ III. — 2.
„ IV. —36.

Methods of Radiotherapy.

A. Deep X-ray therapy.
   - (1) Multiple field treatment.
   - (2) Moving beam therapy.

* Paper read at the 18th Annual Conference of the Association of Surgeons of India held at Indore, Dec. 1956.

B. Supervoltage therapy.
   (1) Multiple field treatment.
   (2) Moving beam therapy.

C. Radioactive gold grains implant.

D. Installation of Radioactive gold or Chromic phosphate in malignant effusion.

Methods of Radiotherapy used in the present series.

A. Deep X-ray therapy — of primary and glands.
   Two field or multiple field treatment.

B. Deep X-ray therapy — of bony metastases.

Dosage — Tumour dosage of 4000r to 5000r in 4 to 5 weeks.

In more extensive lesions — 4000r tumour dose over wide volumes.

In less extensive lesions — 5000r tumour dose over less volumes.

Assessment of results.

1. Possibility of cure.
2. Prolongation of life.
3. Relief of symptoms.
   (a) cough.
   (b) pain.
   (c) haemoptysis.
   (d) dyspnoea.
   (e) vena caval obstruction.

The assessment of results can be discussed under three headings as shown here.

1. Possibility of cure: This is remote—indeed very few cases can pass the five-year mark. Judged from this angle, radiotherapy has little to offer.

2. Prolongation of life: If we compare the span of life in an untreated case with that of a treated case, we find on an average the survival period is 7 months and 15 months respectively from the onset of symptoms.

3. Relief of symptoms: (a) Cough, (b) Pain, (c) Haemoptysis, (d) Dyspnoea, (e) Vena caval obstruction.

It is here that radiotherapy has really something to offer. Although radiotherapy cannot cure most of these advanced cases, it can perhaps prolong the life a little, but much more marked is the relief of symptoms. In many cases, the quality of life is remarkably good for a short while until the inevitable end comes. In two cases the relief of superior vena caval obstruction was so marked that if these two cases had not been histologically proved cases, one would not have hesitated to revise one's diagnosis to mediastinal reticuloses—either Hodgkin's disease or lymphosarcoma.

Results.

Lost in follow up	—	18
Alive with disease	—	6
Alive without disease	—	Nil.
Dead from cancer	—	14
Dead from causes other than cancer	—	Nil.

Of the 6 cases alive, all are alive with disease and the maximum period of treatment has been only 11 months. The results are thus very disappointing and one may conclude with the words of Dr. Fulton in his Presidential Address before the Royal Society of Medicine, "I regret a subject is presented in which the picture is so gloomy, my hope is that the sombre nature of this picture will constitute a challenge to you to peer into the shadows to see what lies behind to strive constantly to solve the riddle of why this disease should be a man-killer, and why indeed, it should occur at all. I hope that you will meet the challenge of end result by further sustained endeavour. Our methods, both surgical and radio-therapeutic, are improving and I would urge you not to accept this disease as incurable, but to continue your efforts with unabated energy."

Received for publication on 27-4-'57.

PERIPHERAL ARTERIAL DISEASE *

by B. B. OHRI and KRISHNAMOORTHY, Indore.

It was known in the nineteenth Century that the function of the limbs is diminished in men and animals as the result of lessened blood supply in their arteries. What reduces this blood flow in the arteries was not understood and even today it is not well understood inspite of the fact that a lot of work has been done since the time Buerger published his work on Thrombo-angeitis-Obliterans in 1908. Lewis (1936) has helped in distinguishing between two main forms of diminished circulation namely the organic and the spasmodic or the functional form. Purely Spasmodic types are rarely found in our country. We are not aware of any large series of these cases. The Organic or the obliterative type is fairly common.

Buerger's classical description includes cases of this obliterative type which he called Thrombo-Angeitis-Obliterans. It is commonly called Buerger's disease after his name though the disease was first described by Von Winiwater in 1879. Buerger's description of the 'Study of blood vessels and adjacent structures' in 1908 was accepted by most of the workers in the field of histo-pathology until several papers were published by Boyd and his associates from the Neuro-vascular Clinic at Manchester, Boyd (1948); Boyd, Ratcliff, Jepson and James (1949) and Boyd (1950). Their Publications regarding Obliterative Vascular Disease stimulated further interest. They claim that very few patients can be classified under the classical description of Thrombo-Angeitis-Obliterans. In an analysis of 472 cases of obliterative arteritis of the lower limb Boyd and his associates have described only 8 cases which correspond to Buerger's description and 6 cases of Primary Thrombosis of the Popliteal Artery which are also included under the heading of 'Thrombo-Angeitis-Obliterans'. The large majority of these cases (453) were considered to be 'Senile Obliterative Arteritis'. In their opinion cases below the age of 35 are either Primary Arterial Thrombosis or Juvenile Obliterative Arteritis, the two groups corresponding to the Thrombo-Angeitis-Obliterans of Buerger. Those above the age of 35 are, in their opinion, cases of Senile Obliterative Arteritis. These papers have served to stimulate further research because before this Buerger's views were accepted as final and there was practically no progress in this direction.

A large percentage of cases coming under our care at the former King Edward and Maharaja Tukojirao Hospitals in Indore were showing a clinical picture indistinguishable from Buerger's disease (Table I). They had a slow and steady but relentless progress of the disease and in almost all of them leading to the same ultimate result, amputation of limbs one after another. In other cases with senile or diabetic gangrene the progress was not so steady and uniform.

TABLE I

Showing classification of all cases with peripheral vascular insuffiency

Thrombo-angitis Obliterans (Buerger's)	62
Arteriosclerosis	10
Cases which could not be definitely classified as either Buerger or Arteriosclerosis	4
Diabetic	3
Embolism	1
Traumatic (Fracture & other injuries)	4
Cervical Rib syndrome	1
Raynaud's Disease	1
Total	86

Thrombo-Angeitis-Obliterans is characterised by involvement of large arteries and veins. Though all limbs may be involved the condition is more common in the lower limbs. It was seen exclusively in males and comparatively young persons. The disease is progressive, starting from the toes resulting in ulcers and then in

* Paper read at the 18th Annual Conference of the Association of Surgeons of India held at Indore, Dec. 1956.

gangrene. This short description closely corresponds to the definition of the disease by Kramer (1948). Most of our cases appear to fit in with the above description and not a small percentage as shown by Boyd. This led us to investigate the condition in more detail and our enquiry began in December 1949.

From the point of view of treatment differentiation of one type of occlusive disease from the other may not be important but its importance lies in the fact that whereas arteriosclerosis is probably a senile change and inevitable, thrombo-angeitis-obliterans may be due to some cause as yet unknown and may be preventable when the cause is known. It is all the more important to us because most of our cases appear to belong to this group.

The object of the study was to investigate

(i) whether the number of cases of thrombo-angeitis-obliterans was really as large as it appeared to be ;

(ii) what may be the cause of the preponderance of this disease in our cases and lastly ;

(iii) to assess the value of the various treatments so far available.

Plan of Study :

Almost all cases seen by us reported themselves when the diagnosis as regards deficient circulation was no longer in doubt because there was either a typical ulcer on one of the toes or gangrene of one or several toes already. The aim of investigation in our cases was to record :—

1. The degree of interference before and after the treatment to assess benefit if any.

2. Whether there was a factor of spasm associated.

3. The level of the lesion.

4. The presence or absence of disease in the coronary or retinal vessels.

5. Any possible factor in the mode of life or environments of the patients which may be peculiar to these patients. With these points in view the following investigations were carried out :—

1. Oscillometery.

2. Skin temperature record.

3. Arteriography.

4. Electrocardiography.

5. Fundoscopy.

6. Histological examination of vessels when limb was amputated.

7. Complete history regarding smoking, diet, nature of work, evidence of venereal disease or metobolic disturbances and clothing and whether wearing shoes or not.

Material :

The total number of cases of peripheral vascular disease studied by us is 86. Their classification is shown in Table I. Except for three cases, one each of embolism, cervical rib and Raynaud's disease, all the cases were males. We have classified 62 as Buerger's disease. Our diagnosis has depended on a process of exclusion of arteriosclerosis by clinical, and when possible, histological evidence. There were 10 cases of arteriosclerosis and 4 cases could not be classified. This is no doubt open to criticism but we have as yet no definite criteria for classifying these conditions. Histological examination is only possible in the amputated limb. Vein biopsy is not to be taken lightly in a limb with poor blood supply just for establishing the diagnosis. Then again unless the portion of the vessel studied shows thrombosis and obstruction the diagnosis is not possible. Recently even this histological diagnosis has been challenged since the inflammatory changes are not specific and are inevitable in a limb already the seat of chronic ulceration and gangrene.

Table II shows the limbs involved in all these cases (Buerger's, arteriosclerosis and diabetic). All the five cases showing involvement of all the four limbs were Buerger's. They first came with the disease in the lower extremity and during further follow up showed the disease in the upper extremities. It is possible that a longer follow up will reveal more cases with involvement of the superior extremities.

TABLE II

Showing involvement of extremities in all cases (Buerger's, Arteriosclerotic & Diabetic)

Cases with only one lower limb involved	31
Cases with both the lower limbs involved	41
Cases with all the four limbs involved	5
Cases with upper limbs alone involved	2
Total	79

Oscillometery :

Oscillometery was done in almost all cases. Modified Pachon Oscillometer was used. We have relied on the reading of the oscillometer because in most of the cases it has given a fairly correct indication of the level of obstruction as confirmed later by arteriography. Table III shows the level of obstruction detected by oscillometric reading and arteriography.

Skin temperature reading :

For recording skin temperature we have been using a skin thermometer having a thermocouple and an oscillation galvanometer. It was necessary to keep the patient in the air-conditioned room for which we have been using our air-conditioned operation theatre, the temperature of which could be controlled. The patient could not be kept in this room for sufficiently long time as the operation theatre could not be spared for long periods. The temperature of the thigh, the leg and the foot was recorded on each side and repeated after 10 minutes of spinal block.

The temperature readings were not consistent with the other findings in the patients and therefore we consider that this test is not reliable, at least in our cases, due to high atmospheric temperature during most of the time of the year.

Arteriography :

Arteriography was done by a technique described by Wilkie (1952) and by Learmonth (1944). Instead of taking series of X-rays quickly, which were found difficult with the equipment that was at our disposal at the time, we started taking a large sized 15″ x 12″ X-ray with knee flexed at 90′ so that it included the thigh as well as the leg. This gave us the level of the block in the main arteries and the condition of the collateral circulation.

The arteriograms were assessed according to the standards described by Messent et al (1953). In all cases the arteriography has confirmed the level of the block to be almost the same as guessed from clinical examination and oscillometery. We consider oscillography essential to find out the state of the collateral circulation. There are some fallacies in this method (Stammers 1954). Arteriograms may not be reliable by themselves but in combination with the clinical examination, they are very reliable. Arteriography has been done in 69 cases with results shown in Table III.

TABLE III

Showing level of obstruction and the condition of collateral circulation

Level of obstruction	Total No.	Good Collateral circulation	Poor Collateral circulation
1. Iliac	8	7	1
2. High Femoral	22	12	10
3. Low Femoral	18	12	6
4. Popliteal	16	9	7
5. Peripheral	13	9	4

1. The level of obstruction was decided by clinical exam, oscillometry, arteriography etc.

2. The condition of the collateral circulation was determined by the nutritional state of the limb, skin condition, presence or absence of gangrene etc.

Electrocardiography and fundus examination in these cases has not shown any abnormality in any of the cases except those of arterio-sclerosis where the usual fundus picture was seen.

Histological examination was done in 7 cases and all showed features of Buerger's Disease.

History and Clinical Features :

Most of our cases are drawn from a small area on the southern border of the former Madhya Bharat State. Most of the cases were workers in the fields either cultivating their own lands or labourers working on daily wages in the fields, Table IV.

TABLE IV

Showing occupation in patients suffering from Buerger's Disease

Agricultural labourer earning daily wages	24
Agriculturist cultivating own land	6
Ordinary labourer	10
Mill labourer	3
Barber	2
Tailor	1
Mason	1
Domestic servant	2
Mechanic	1
Motor driver	1
Painter	1
Labour supervisor	1
Butcher	1
Watchman	1
Priest	1
Cook	1
Traffic inspector	1
Clerk	2
Total	62

Smoking :

All these patients were smokers without exception. Some of them smoked 'bidis' (Indian cigarette made of tobacco wrapped in Temru (Botanical name Diofdyrof Melanoxylon) leaf. Most of them smoked Chillam (Indian Clay Pipe).

Malnutrition :

All except a few of these patients belonged to the poorer classes. They lived under semi-starvation conditions. During two or three months after the two main crops in November and March they have just sufficient to live on but during the two winter months they cannot afford enough food to fulfil, even their basic requirements. Fruits and meat are luxuries which are denied to them and therefore they must suffer from malnutrition. This factor of malnutrition has been mentioned by Ostrove (1955) to be present in the majority of such people.

They cannot afford sufficient clothing to cover themselves during the winter and work barefooted in the fields during the rainy months. The only pleasure they can indulge in is smoking and rarely, on festive occasions, drinking of some crude country liquor.

TABLE V

Showing Symptamatology

Symptom & signs	Total No complaining of this symptom	Total No. complaining of this symptom alone
Intermittent claudication	44	4
Rest pain	48	Nil
Nail bed infection, ulcer small gangrenous p tches of skin	25	1
Established gangrene		
Confined to toes	36	
Confined to foot	8	
Confined to leg	1	
Coldness of feet	2	
Superficical phlebitis	4	

Disease	Mode of onset Gradual onset	Sudden onset
Buerger's (62)	52	10
Arteriselerosis (10)	3	7

Table V shows the presenting symptoms. It will be seen that most of the cases arrived when there was marked Intermittent Claudication and also 'rest pains.'

Most of them also had ulcers or gangrene. We had three cases who used to lie in bed in a peculiar depressed phychological state showing no interest in the surroundings. They appeared to be half asleep or in semicoma and in stupor. Stimulants, proteins, vitamins, blood transfusions or sedatives did not improve their general condition. Possibly after suffering for a long time, they had given up all effort to get well. One of them inspite of bilateral sympathectomy went gradually downhill and died. One was taken away by his relatives after sympathectomy and improved later. The third was in a critical state to begin with but the house surgeons and ward nurses kept him occupied in talking and induced him to walk round the wards several times a day. After a few days he 'came back' to himself and made a rapid recovery.

We have noticed that a patient who has been suffering for a long time and the solace that he derives from smoking is denied to him is likely to get in this state. We do not now forbid smoking entirely until the pain is relieved and they become cheerful.

Age :

The ages varied from 22 to 63. The average age in each group was Buerger's, 33, and Arterio-sclerosis 51 (Table VI).

TABLE VI

Showing age incident in Buerger's & Arteriosclerosis

Disease	Total No.	Minimum age	Maximum age	Average age
Buerger's Disease	62	22	60	32
Arteriosclerosis	10	40	63	51

Aetiology :

The aetiology in chronic occlusive disease is not definitely known. It has been shown by Shepherd (1951) that smoking reduces the flow of blood in the hand and by Theis and Freeland (1941) that tobacco smoking was accompanied by a great reduction in the oxygenation of arterial blood. Smoking nowever cannot be the only cause. We found almost all males in these villages were smokers and a few women as well. Though the disease was found in the males only we saw many in these villages who were very heavy smokers and yet they did not have the slightest sign of any vascular inefficiency.

Arterio-sclerosis is believed to be due to age, diet and endocrine disturbances and focal infections. Reichert (1956) believes that the cause is impaired hormonal functions of the Anterior Pituitary, Hypothalamus as well as the Adrenal Cortex. Pratt (1949) has offered a theory that since the changes in the arteriosclerosis vessels and in diabetics are the same both may be due to failure of fat metabolism. This, however, cannot be the cause in our cases as almost all our cases were living on a diet almost free from fat. None of them appeared the type of person likely to get diabetes.

It appears therefore that there is no single cause of Vascular Occlusive Disease. Malnutrition, repeated trauma inflicted on bare feet while working in the fields particularly in wet weather, insufficient clothing and perhaps smoking all combine to produce or aggravate the occlusive process.

From the arteriographic studies it is apparent that the occlusion occurs in the terminal part of the large vessels and the thrombosis extends proximally until the whole of the femoral artery is blocked. The collateral vessels are closed by reflex spasm. Opening up of these vessels by abolishing spasm brings about some relief to the patient. Contrary to the definition of Thrombo-Angetis-Obliterans by Allen Buerker and Hines quoted by Richards (1953), we have rarely found the disease starting as 'segmental inflammatory obliterative disease' or 'exclusively in young men.' Most of our cases correspon to the 'Slowly Progressive Group' of Richard's

classification. The disease once started progressed relentlessly until both the femoral arteries were completely blocked and in some cases the disease involved both the brachial arteries as well. It is very difficult clinically to make any sharp distinction between the degenerative changes of arterio-sclerosis and the inflammatory changes of thrombo-angetis-obliterans. Typical degenerative changes have been found in young people and typical thrombo-angeitis-obliterans has been found in older people.

Treatment :

A large number of the cases who came to us with chronic peripheral disease had either threatened, or fully developed, gangrene and severe pain with sleeplessness. All were in an extremely poor general state of bodily health. It was therefore very necessary that such patients should be relieved of their suffering as speedily as possible before they got into a defeatist state of mind.

The routine followed was to put the patient in bed and wash his feet with soap and water without scrubbing. The feet of most of these people were dirty and the skin was in a very unhealthy state. It needed a dose of morphia for some to be relieved of their pain and provide sleep. For others suitable doses of barbiturates were enough to provide sleep provided the pain was not severe. Smoking was not forbidden until the pain was relieved as it is a great hardship to deny the only pleasure with which one could bear the suffering. Good hospital balanced diet and vitamins were provided and when the severity of the suffering becomes less and bearable they are gradually taken off the smoking habit.

As all the patients were weak and emaciated and appeared to be suffering from malnutrition we put them on a generous diet. Low calorie diet advised by Kinmonth (1953) for obese patients was not indicated in our patients as none of them were obese.

During the period the patient was having this general treatment his clinical investigation as already mentioned was completed and recorded. His lesions—small gangrenous patches, ulcers or cracks—were attended to and wet lesions were turned dry as advised by Goetz (1949). He was also put on conservative medical treatment.

Conservative treatment :

This consists of drugs and exercises. Many of the patients were not in a condition fit for exercises as they had rest pains and already some necrotic skin lesion. A few early cases were given passive vascular exercises and periodic compression. A few got some relief but most of them could not carry out the treatment for any length of time.

Of the numerous vasodilator drugs, we have used only Papaverene, Depropanex and 'Priscol'. These drugs had a limited value. For three or four days the patient reported relief which might have also been due to bed rest and the comforts of the hospital. Later on there was disappointment. Most of our cases were those of thrombo-angeitis-obliterans with skin lesions and therefore much benefit was not expected of these vasodilators. Following the advice of Douthwaite and Finnegar (1950) we gave a fair trial to 'Priscol' and feel that like other vaso-dilators it has limited use in such cases. It was of value as an 'interim treatment' until sympathectomy was done. We agree with Goodwin and Kaplan (1951) that it is unlikely to replace sympathectomy.

Vit. E and intra-arterial novocaine have been found to have practically no value. Almost all cases needed some sedatives for relief of pain and for sleep. Codein, aspirin, barbiturates, bromides, morphia, pethidine and several others have been used but, with the exception of morphia there was no drug which could relieve the patient enough to give a few hours' sleep. This was necessary for a few days as after three or four days' rest the patient got relief from vaso-dilators. During the last few years some favourable reports have been published regarding the use of Hydrogenated Ergot Alkaloids, [Kalpert and Hadorn (1950), Robert et al (1952), Luck and Marion (1953) and Funk (1953)] in Peripheral Vascular Disease. Influenced by these reports we used Hydergine (very kindly supplied by Messrs. Sandoz Ltd.) in some of our cases. The number of cases on which we tried is not large enough to give a dogmatic opinion but we found that it relieved pain only for a short time. We have found it of more use in relieving patients who had recurrence of pain and other symptoms after sympathectomy had already been done. In most of the cases however we had disappointing results. Hydergine may have some use in early cases but not in the type of advanced cases we get.

Sympathectomy :

In all except those who refused operation we have done sympathectomy. We have done 4 for the upper limb and 58 for the lower limb. Of these two had bilateral operation for the upper limb and 26 had bilateral operation in the lower limb. The results of 58 lower limb operations are shown in Table V.

TABLE VII

Results of Sympathectomy in 58 cases

	Improved without amputation	Local	Amputation necessary Below Knee	Above Knee	Died	Total
Cases considered suitable for operation	11	7	6	1	3	33
Cases considered unsuitable for operation according to the usual oriteria of suitability	1	6	7	16	0	30

The sympathectomy for the upper limb was done through the anterior supra-clavicular approach (Telford 1935) and lately we have started the posterior approach of Smithwick (1940). There is nothing much to choose as the results shown by Kinmonth and Hadfield (1952) are identical. We find the posterior approach easier. For the lower limb we have used the extra-peritoneal lumbar approach one at a time with an interval of 8-10 days. Recently we have started operating on both sides at the same operation. The sympathetic chain with the 2rd, 3rd and 4th ganglia was removed.

Most of our cases were unsuitable for the operation of sympathectomy from the usual criteria described in publications. Pratt (1955) considers that among other factors, the presence of gangrene in a case makes it unsuitable for this operation. Goetz (1949) counsels against indiscriminate sympathectomy and depends on plethysmographic reading to decide whether a case is fit for sympathectomy or not. We were unfortunate in being unable to procure the apparatus described by him. We have done sympathectomy in cases who had gangrene, ulcers, absence of the pulse, before and after attempts at remov-

TABLE VIII

Showing results of treatment in relation to level of Obstruction with or without sympathectomy 68 cases

Level of obstruction	Improved with sympathectomy	Local	Amputation with or without sympathectomy below knee	Above knee	Died	Total
Iliac	1	2	—	—	2	5
High Femoral	1	1	8	10	1	21
Low Femoral	2	3	6	3	1	15
Popliteal	7	4	—	1	—	12
Total	12	14	19	18	5	68

ing the spasm and have also done it in cases who had no such lesions and the results are shown in Tables VII and VIII.

On paper the operation of sympathectomy did not appear justifiable in 30 of our 58 cases but sympathectomy in these cases was helpful, as Palumbo et al (1953) state, in relieving pain and whatever little vasospastic element there is and helps in the healing of local lesions and prevents or delays the need for major amputation. Although in the opinion of Ostrove (1955) lumbar sympathectomy may not limit the extension of gangrene in advanced cases of occlusive disease; he has the impression, and it is our impression as well, that the amputation stump heals better on account of better circulation of the flaps.

We concur with Pratt (1955) that amputation will follow most of the cases with gangrene, inspite of sympathectomy, but it is never the cause of increasing the progress of gangrene.

Edwards and Crane (1956) have shown that Lumbar sympathectomy is beneficial in a five year follow up of 100 cases of arterio-sclcerosis. McPherson and Kessel (1956) have recently shown in a small series of 14 patients with paralysed limbs that sympathectomy produces a lasting vaso-dilatation. Hoffert (1956) also recommends lumbar sympathectomy in all cases of occlusive vascular disease below the age of 55 and selected cases above that age.

Conclusion :

We have come to the conclusion that all cases of vascular occlusive disease except those with advanced gangrene should be given the benefit of sympathectomy. Quite a large percentage of them will derive benefit in the sense that although their disease may not be cured the blood supply of the limbs will improve, the symptoms will be lessened, sacrifice of the limb may be postponed or only a small part of the limb may require amputation. It is true that some cases may not be benefitted at all and require amputation at the level at which it would have been done had no sympathectomy been done. It is true that there will be some waste of hospital bed space. Such cases would certainly take away the time of the busy surgeon. As long as we can save some limbs even for a period of two or three years, limbs which are the very hope of these poor working men, there is every justification for giving the benefit of this operation to the unfortunate ones.

REFERENCES

1. Boyd, A. M.: Obliterative Vascular Disease of the Lower Extremities. Manchester University Medical School Gazette. January, 1948.
2. Boyd, A. M., Ratcliff, A. H., Jepson, R. P. and James, G. W. H.: Intermittent Claudication. Jour. Bone and Jt. Surg. **31-B**: 325, 1949.
3. Boyd, A. M.: Symposium on Peripheral Vascular Disease. Practitioner. **164**: 488-496. 1950.
4. Douthwaite, A. H. and Finnegan, T. R. L.: B.M.J. i: 869, 1950.
5. Edward, E. A. and Crane, C. C.: Arch. Surg. **72**: 32, 1956.
6. Funk, R. E.: Angiology. **4**: 480, 1953.
7. Goetz, R. H.: B.J.S. **37**: 146, 1949.
8. Goodwin, J. F. and Kaplan, S.: B.M.J. i: 1102, 1951.
9. Hoffert, P. W.: Arch. Surg. **72**: 431, 1956.
10. Kappart, A. and Hadoro, W.: Angiology. **1**: 520, 1950.
11. Kinmonth, J. B.: B.M.J. i: 1325, 1953.
12. Kinmonth, J. B. and Hadfield, G. J.: B.M.J. i: 1377, 1952.
13. Kramer, D. W.: Peripheral Vascular Disease. F. A. Davis and Co., Philadelphia. P. 179. 1948.
14. Learmonth.: Lancet. ii: 750, 1944.
15. Luke, J. C. and Martien, B. N.: Canad. Med. Asso. Jour. **68**: 221, 1953.
16. Lewis (Sir), T.: Vascular Disorders of the Limbs. MacMillan and Co., 1936.
17. Messent, D., Steiner, R. E. and Goodwan, J. P.: Lancet. ii: 1324, 1953.
18. McPherson, A. and Kessel, A. W. L.: Lancet. i: 713, 1956.
19. Ostrove, L. L.: Am. Jr. Surg. **89**: 600, 1955.

20. Palumbo, L. T., Quirin, L. F. and Conkling, R. W.: S.G.O. **96**: 162, 1953.
21. Pratt, G. H.: Surgical Management of Vascular Diseases. Lea and Fibiger. Philadelphia, p. 44, 1949.
22. Pratt, G. H.: S.G.O. **100**: 43, 1955.
23. Richards, R. L.: B.M.J. i: 478, 1953.
24. Reichert, F. L.: Am. Jr. Surg. **91**: 41, 1956.
25. Robert, J. E., Anderson, L. L. and Perry, T. M.: Am. Jr. Med. Sci. **224**: 431, 1952.
26. Shepherd, J. T.: B.M.J. ii: 1007, 1951.
27. Smithwick, R. H.: New England Jr. Med. **222**: 699, 1940.
23. Stammers, F. A. R.: Jour. Bone and Jt. Surg. **36**: 209, 1954.
29. Telford, E. D.: B.J.S. **23**: 448, 1935.
30. Telford, E. D.: Lancet. i: 70, 1938.
31. Theis and Freeland.: Ann. Surg. **113**: 411, 1941.
32. Wilkie, J.: Pro. Roy. Soc. Med. **45**: 143, 1952.

Received for publication on 21-1-'57.

ERYTHROMELALGIA

by B. RAMAMURTHI, Madras.

Erythromelalgia is a condition in which there is pain and stiffness of the limbs associated with redness coming on with changes in position or temperature. Weir Mitchell in 1878 described this condition as a rare Vasomotor Neuroses.

The condition is more common in the feet than in the hands and more common in women than in men. The attack starts with tingling and numbness in the limb. During the attack, the condition of the skin is similar to the one seen after long immersion in hot water. The surface temperature of the limb is raised and the skin looks red. This is associated with hyperaesthesia and the patient resents touching the limb. There is also a feeling of fullness and stiffness and pain associated with this and the patient may find it difficult to move his fingers.

The condition comes on in bouts and may be caused by dependent position of the limb or increase in temperature. Increase of environmental temperature or increase of blood temperature by immersing another limb in hot water will precipitate an attack. There may be a critical level of temperature above which the attack may come on. Occasionally cold also may cause an attack.

The aetiology of the condition is not clear. Telford believes it to be a condition of instability between vasoconstrictor and vasodilator mechanisms. Lewis considers this essentially an abnormality in the skin which is unusually sensitive to stimuli that do not affect normal skin. The response is caused by stimuli that are borne by a normal person without any distress. Normal skin if suitably traumatised will show a similar reaction. There are two phenomena to be noticed in this condition. One is the defect in the vasomotor system itself leading to excessive vasodilation and redness. The other is pain induced by these changes.

Lewis believes that this disorder is due to a hypersensitivity of the pain fibres to heat or tension due probably to a release into the skin of an unknown substance, not histamine, which lowers the threshold of the pain nerve endings. Mufson (1937) doing capillarographic studies found that the pain was due to hypertension in small vessels due to absence of normal antagonistic vasoconstriction. The consensus of all these opinions is that the lesion is more due to neural causes than direct vascular causes.

Erythromelalgia may be considered as primary and secondary (Allen and Norman). It is primary when it is not associated with any other disease. It may secondarily be associated with diseases like arteriosclerosis, thromboangeitis obliterans, polycythaemia etc. In these conditions the disturbance is patchy and usually not associated with warmth and evidence of vascular insufficiency may also be apparent.

Collier in 1898, in reporting 10 cases found that a majority of them had a lesion in the nervous systems and presumed erythromelalgia to be a precursor of serious neurological disease. But this has not been borne out by further experience. Occasionally erythromelalgia may be associated with thyrotoxicosis.

CASE REPORT

Mr. P. (N.S.) male aged 24 was admitted into the Neurosurgical Unit, General Hospital, Madras for a complaint of pain and stiffness of his left hand since one year. For sometime before he had been having pricking pain in the tips of fingers and the palm, which has become worse now, preventing him from working. During the attack of pain, the fingers and palm become red and there was also sweating of the hand.

On Examination: The lesion was confined to the left hand which was redder in colour than the right. Being a dark individual, the difference in colour was more obvious, in the palms and the nails. The hand felt warm and it was covered with sweat. The patient could not move his fingers freely. Being a labourer, he found this difficulty very disabling. When he began to work hard the attack used to come on and last for some hours.

There was no neurological abnormality. The limb vessels were quite normal. There was no evidence of vascular occlusion. All the other limbs were free. The cardiovascular system was normal.

RBC count 4.9 mill. 95% Hb. Blood. No evidence of polycythaemia. VDRL negative. X-ray chest normal. No evidence of cervical rib.

A diagnosis of erythromelalgia was made. It was difficult to explain the concomitant sweating. During an attack, a sympathetic block with novocaine was found to give immediate relief. Hence a sympathectomy of the left upper limb was done by the posterior route, excising the medial end of the III rib.

Following operation the patient had complete relief from pain, stiffness and sweating. The hand continued to be redder than the opposite side. The patient reported three years later and is found to be in good health with no recurrence of the trouble.

DISCUSSION

The above patient had all the typical sign of erythromelalgia. There was no evidence of any associated vascular disease. But the redness and warmth was associated with sweating. Everytime the patient got an attack of pain and redness, there was sweating. This is not usually reported. It is difficult to associate sweating with vasodilation if a lesion in the autonomic nervous system is postulated. It is more likely that a local agent—cholinergic in action—is the cause of the association of sweating and vasodilation. Leslie Roberts (1934) states that the responsibility for the sweating and vasomotor changes lay not in the central nervous system but in the mesenchymal cells that surround the capillaries of the derma. These cells control the behaviour of the capillaries, causing their expansion or contraction. This control is chemical, rather than nervous and the nerve impulse is the trigger that starts the dermal reactions.

Sympathectomy has definitely relieved this patient and three years later he reports he is in good health able to carry out strenuous manual work. Telford and Symmon's (1940) reported 3 cases of erythromelalgia relieved by sympathectomy. Sympathectomy probably acts by interfering with sympathetic pain conduction mechanisms. Telford and Symmons have also argued that the vessels of a sympathectinised limb are incapable of excessive dilatation as well as contraction. Thus intravascular hypertension is relieved and pain is abolished. In the above case incidentally the patient was free from excessive sweating also.

SUMMARY

The condition of Erythromelalgia is presented and the aetiology is discussed.

A case of erythromelalgia is presented. The patient had associated excessive sweating. Sympathectomy gave him lasting relief.

The association of sweating with erythromelalgia and the rationale of sympathectomy are discussed.

ACKNOWLEDGEMENT

My thanks are due to the Dean, Madras General Hospital for permission to publish this case.

REFERENCES

1. Allen and Norman.: U.S. Naval Medical Bulletin. **35**: 309, 1937.
2. Collier.: Lancet **2**: 40, 1898.
3. Mufson.: American Heart Journal. **13**: 483, 1937.
4. Leslie Roberts, H.: Removal of Interior Cervical Ganglia and its effect on hyperidrosis and cyanosis of the hands and feet. Brit. Jour. Derm. and Syph. **46**: 124-134, 1934.
5. Telford and Symmons.: Brit. Med. Jour. **2**: 782-783, 1940.
6. Telford.: British Surgical Practice. P. 485. Vol. I.
7. Weir Mitchell.

Received for publication on 10-2-'57.

UNCOMMON BREAST LESIONS *

by K. D. KOSHAL, B. P. SAXENA and J. N. MONGA, Gwalior.

A clinico-pathological study of breast tumours diagnosed clinically and subjected to surgical excision was carried out in the Departments of Surgery and Pathology, G. R. Medical College, Gwalior, from August, 1951-1956.

83 consecutive specimens of breast lesions were histologically examined and a follow-up of all the cases carried out. This study revealed the following uncommon lesions.

TABLE I

CLASSIFICATION OF UNCOMMON BREAST LESIONS

1. *Inflammatory*:		
Plasma cell mastitis	...	2
2. *Neoplastic Associated with Inflammatory*:		
Anaplastic spheroidal cell carcinoma with		
(a) Tuberculosis	..	1
(b) Actinomycosis	...	1
3. *Neoplastic*:		
Benign (a) Fibroadenoma		
i. With cartilaginous metaplasia	...	1
ii. With muscle cell metaplasia	...	1
(b) Cellular Fibroma	...	1
Malignant (a) Cystosarcoma Phyllodes	...	1
(b) Sarcoma	...	1
(c) Carcino-sarcoma	..	1
4. *Miscellaneous*:		
(a) Unilateral infantile hypertrophy of the breast in a male child	..	1
(b) Lymphatic cyst	...	1

PLASMA CELL MASTITIS

CASE 1.

A 42 year old woman was admitted on 26-3-'53 for a painful lump in the left breast of 2½ months' duration. She had seven children, each was breast fed for an average period of 1½ years. The youngest was 2½ years old. The patient had irregular menstruation and polymenorrhoea for the last 2½ months and vague pain in the left breast. On casual examination she noticed a small nodule in the breast. This gradually increased in size, and the pain became throbbing in character. Fomentations and a course of penicillin injections brought no relief, hence she sought admission to the hospital.

On examination: The left breast revealed that the nipple was retracted and there was a lump just above the areola in the upper and inner quadrant, 2 inches in diameter, rounded, hard, smooth and tender. The overlying skin was adherent to the lump and showed reddish discolouration (Fig. 1). Firm, discrete lymph glands were palpable in the left exilla. Aspiration of the swelling yielded a small amount of dirty red material.

A diagnosis of chronic abscess or carcinoma of the breast was made. Simple mastectomy was performed on 31-3-1953.

Morbid Anatomy: Cut surface showed a pinkish white growth measuring 7 cm. x 6 cm. x 5 cm., extending into the breast tissue. There was a small abscess under the nipple which on incision exuded a thick greyish purple material.

Microscopic: Section showed evidence of proliferation of the duct epithelium and the acini, with marked periductal infiltration by plasma cells, eosinophils and polymorphs (Figs. 2 & 3). At places follicles of epitheloid cell proliferation and foreign body giant cells were seen (Fig. 4). There was associated fibroblastic proliferation and the vessels showed endarteritis and periarteritis. There was no evidence of malignant infiltration.

Progress: The wound healed by primary intention and the patient was discharged. Three weeks later she again reported with a painful nodule in the scar about 2 cm. x 1½ cm. The whole scar appeared to be reddened and inflamed. A course of deep X-ray therapy, total dose 1000 r units was given. The condition completely resolved.

Follow up: The patient is free from recurrence 3½ years after the operation.

PLASMA CELL MASTITIS

CASE 2.

A 30 year old woman was admitted with an abscess of the right breast of six months' duration, on 31-8-1956. She had six children, each was breast fed for a period of 2 to 2½ years. Her youngest child was 4 years old. She had developed abscesses in the right breast four years ago which were incised and drained. A year ago she reported with a discharging sinus in the right axilla, which was excised along with the lymph

* Presented at the XVIII Annual Conference of the Association of Surgeons of India, held at Indore, on 31-12-1956.

Fig. 1.

Clinical photograph of case I showing lump and retraction of the nipple.

Fig. 2.

Plasma cell mastitis showing marked periductal infiltration with inflammatory cells and disruption of ducts. (H & E x 75)

Fig. 3.

The section from plasma cell mastitis shows inflammatory exudate consisting of plasma cells, lymphocytes, and histocytes. (H & E x 150)

Fig. 4

Plasma cell mastitis — the section shows foreign body giant cell reaction. (H & E x 300)

glands lying beneath. The wound healed well. Histological examination of the glands showed evidence of chronic lymphadenitis. Six months back a swelling appeared in the lower inner quadrant of the breast, which was painful and firm. It gradually increased in size and since the last month became soft and more painful. The overlying skin too, became red.

On examination: The breast was hypomastic. An abscess was detected in the lower inner quadrant, about an inch in diameter with an area of induration round it. The overlying skin was inflamed and red. No lymph glands were palpable in the right axilla. Due to the insidious onset of this abscess in a non-lactating breast, a diagnosis of tuberculous cold abscess was made. X-ray chest revealed prominent hilar shadows, but the lungs were clear. Aspiration was done twice and the pus examined. Plenty of pus cells were detected but no organisms were seen on smear or routine culture. The patient was so fed up with recurrent trouble in the breast that she requested for its ablation. Simple mactectomy was performed on 18-9-1956.

Morbid Anatomy: Specimen of breast measuring 3½" x 2½" x 1". The cut surface showed a honeycombed appearance (? dilated ducts), in the greyish white tissue underneath the nipple and the areola. The rest of the surface was homogenous. In the lower segment there was a small cystic cavity ½" in diameter full of blood stained necrotic material (Fig. 5).

Fig. 5.
The specimen of plasma cell mastitis showing many abscess like cystic spaces in the breast.

Microscopic: Section showed a diffuse inflammatory reaction. Most of the inflammatory cells were characteristic plasma cells having a periductal distribution. At other places there was a granulomatous type of inflammatory reaction around disrupted ducts, characterised by formation of epitheloid cells and foreign body giant cells.

Pathological diagnosis: Plasma Cell Mastitis.

Discussion

Plasma cell mastitis is a rare disease.
Incidence: Table II.

TABLE II

Author	Total cases	Plasma Cell mastitis	Percentage
Cromar & Dockerty	12000	24	0.2
Parsons, Henthorne & Clark	1500	5	0.33
Talwalkar	2061	12	0.58
Patellani	300	3	1%

In the present series two cases were encountered in 83 specimens. It is an inflammatory disease occurring most often in parous women in the non-lactating phase. It has often been mistaken for carcinoma, as in case 1.

Etiology:

Both these cases were multipara with a history of prolonged lactation for a period of 1½ to 2½ years. It is reasonable to suggest that the ducts of the breast had been subjected to excessive functional strain. This might have produced weakening of the basement membrane which gave way due to increased intraductal pressure. Seepage of the contents into periductal tissues then excited the typical reaction. Patellani found hypertrophic changes in the basement membrane and hence called it 'neoplastiform'. He and Adair consider it to be a malignant lesion or at least precancerous.

Recurrence after excision occurred in case 1. Similar recurrence has been observed by Talwalkar in one case and by Parsons et al in two cases. Cutler has reported a case in which the other breast was involved seven years after the first. Shrivastav and Sharma have reported a case of bilateral plasma cell mastitis in the lactating phase.

Diagnosis:

Pre-operative clinical diagnosis is difficult as the condition very closely simulates carcinoma. If however the condition is kept in mind it would be seen that the lesion more closely resembles a chronic abscess. A frozen section examination at the time of operation offers the best solution of the diagnostic problem.

Treatment:

Cassie recommends 'masterly inactivity' in the acute phase. The residual lump usually gets absorbed in time; if it does not. irradiation brings about a cure. In case 1, the recurrence responded well to irradiation.

Patellani and Adair recommend radical mastectomy; while most authors consider it to be necessary as local excision brings about a cure more often than not.

SPHEROIDAL CELL CARCINOMA WITH TUBERCULOSIS

CASE 3.

A 40 year old woman, widow, was admitted on 29-6-1954 with a lump in the right breast of six months' duration. She had two children, one alive. Both were breast fed. The patient noticed a nodular lump in the right breast which gradually increased in size. It was incised by a quack. It became infected and started discharging pus.

On examination: The right breast showed three foul smelling ulcers in the upper and outer quadrant, covered with pus. The nipple was ulcerated. A lump was present in the upper and outer quadrant 3" x 2½", irregular, nodular and hard. fixed to the skin and pectoral fascia. Right axillary and supraclavicular lymph glands were enlarged, hard, and mobile.

There were no distant metastases.

A simple mastectomy was performed on 14-7-1954.

Morbid Anatomy: Anaplastic spheroidal cell carinoma undergoing marked necrosis. The cell type at places, especially under the skin is squamous cell (Adenacanthoma). Areas of necrosis associated with follicle formation and Langhans type of giant cells are seen suggesting an associated tuberculous lesion (Fig. 6).

Progress: A course of deep X-ray therapy, total dose 3750 r units was given to the breast and its area of lymphatic drainage. While the patient was still in the ward local recurrence in the scar took place. Later the patient developed brawny oedema of the arm. The nodules in the scar ulcerated. Palliative treatment was carried out. Patient expired on 1-1-1955 in the ward.

Comment

Carcinoma with tuberculosis is an uncommon finding in the breast.

SPHEROIDAL CELL CARCINOMA WITH ACTINOMYCOSIS

CASE 4.

Already published.

Koshal, K. D.: Primary Actinomycosis of the Breast. Ind. Jour. Surg. 17: 87-89, 1955.

INTRACANALICULAR FIBROADENOMA WITH CARTILAGINOUS METAPLASIA

CASE 5.

A 32 year old woman, married, but issueless, reported a lump in the left breast of 1½ years' duration on 12-7-1954. The lump was of the size of a walnut to begin with and was painless. It rapidly grew to the present size.

On examination: The left breast was of the size of a football. A smooth, rounded firm lump was palpable which was movable on the deeper structures. The skin over the lump was stretched No lymph glands were palpable in the left axilla

Local excision of the lump was performed. After removal of the main tumour, two small nodules were detected in the breast, which were excised.

Morbid Anatomy: The main tumour was 12" x 7" x 5", in size, and weighed 2½ pounds It was well encapsulated. Consistency varied. being soft at places and firm or hard at others.

Cut surface showed a fibrous structure with translucent bluish areas (Fig. 7).

Microscopic: (Fig. 8). Section showed an admixture of fibrous tissue, adipose tissue and islands of hyaline cartilage. The transitional phases from metaplasia of fibrous tissue into cartilaginous tissue could be traced. There was evidence of myxomatous degeneration. Epithelial elements were so strangled by the growth of fibrous tissue that they were conspicuous by their absence in several sections.

The smaller tumours were 2" x 1", each, and on histological examination were found to be typical pericanalicular fibroadenomata.

Fig. 6.

The section from the tuberculous portion showing classical tuberculous follicles. (H & E x 45)

Fig. 7.

The photograph of huge specimen of intracanalicular fibroadenoma with cartilaginous metaplasia.

Fig. 8.

The section shows one of the areas of cartilage formation (case 5). (H & E x 75)

Fig. 9

The section shows one of the bundles of plain muscle cells in a case of fibroadenoma with muscle cell metaplasia. (H & E x 75)

Comment

Willis has reported one case and Cheatle and Cutler have reported two cases of cartilaginous metaplasia in fibroadenomata. There is no other recorded case as far as we could search. Cartilaginous metaplasia is not an uncommon feature in fibroadenomata in the dog.

INTRACANALICULAR FIBROADENOMA WITH PLAIN MUSCLE CELL METAPLASIA

CASE 6.

A male aged 36 presented on 4-3-1954 with a firm swelling in the right breast of six months' duration. On examination the swelling was 2" x 1", oval, firm freely moveable beneath the skin and over the deeper tissues. Local excision was performed.

Morbid Anatomy: An oval tumour, 2" x 1", well encapsulated. Cut surface revealed a whitish fibrous appearance.

Microscopic: Section showed an intracanalicular fibroadenoma associated with plain muscle cell metaplasia in focal areas (Fig. 9). In addition, there was a diffuse and focal collection of inflammatory cells most of which were lymphocytes and plasma cells.

Comment

This case is being presented, because fibro-adenomas are very rare in the male breast. Scarff and Smith record four examples in a series of 65 mammary lesions in the male. Plain muscle cell metaplasia in the male has not yet been reported.

CELLULAR FIBROMA. NEUROFIBROMA

CASE 7.

A 46 year old woman was admitted on 18-7-'55 for multiple nodules in her left breast of six months' duration. She had eight children all breast fed. At first there was a small nodule in the lower outer quadrant. It was painless and gradually increased in size. Two months later two more nodules appeared in the upper inner quadrant. These too increased in size gradually. Meanwhile the lower ones started becoming painful and one of those ulcerated.

On examination: The breast was pendulous and contained multiple nodules which were visible on the surface. There was patchy pigmentation of the whole breast. An ulcerated nodule was present in the lower inner quadrant. On palpation these nodules varied in size from, 1" diameter to 2½" in diameter, rounded, firm, smooth, freely mobile. A few lymph glands were palpable in the left axilla. No such nodules were present on any other part of the body, nor was there any evidence of pigmentation elsewhere. A diagnosis of multiple neurofibromata was made and a simple mastectomy performed on the left side.

Morbid Anatomy: The breast showed multiple well encapsulated tumours mainly in the upper inner and lower outer quadrants. Cut surface of the tumours showed a whorled appearance with whitish strands of fibrous tissue interspersed (Fig. 10).

Microscopic: The structure was that of a cellular fibroma with spindle shaped cells and elongated nuclei (Fig. 11). There were no mitotic figures. By Massons stain, formation of collagen fibres and fibrils was clearly seen indicating the fibroblastic nature of the cells. There was no evidence of a sarcomatous change. Regimentation of nuclei at places suggested a neurogenic origin.

Pathological diagnosis: Cellular fibroma.

Follow up: No recurrence to date.

Comment

Multiplicity of tumours and pigmentation of the skin and a fibroblastic histological picture, leaves no doubt that clinically this case appears to be that of multiple neurofibromata of the breast. This has been rarely described as localised to the breast.

CYSTO-SARCOMA PHYLLODES

CASE 8.

A 35 year old woman was admitted on 4-4-1955 with a painful lump in the right breast of six months' duration. She had four children, all breast fed. The youngest was 3 years old. The lump had gradually increased in size for the last five months, but during the last month the growth had been rapid.

On examination: The lump occupied the entire breast, 5" x 4", was round, nodular, freely movable over the deeper tissues and not adherent to the skin. A diagnosis of giant fibroadenoma was made and a simple mastectomy performed.

Morbid Anatomy: The breast was almost completely replaced by the tumour that measured 5" x 4" x 3½" (Fig. 12). Cut surface showed a homogenous gelatinous appearance.

Microscopic: Section showed the structure of an intracanalicular fibroadenoma. The connective tissue was very cellular, the cells presented sarcoma like appearances (Fig. 13). In addition there were areas of myxomatous degeneration of the

Fig. 10.

The specimen of cellular fibroma of the breast showing whorled appearance of the growth.

Fig. 11.

The section shows cellular tumour consisting of spindle shaped cells. (The central round spot is an artefact). (H & E x 75)

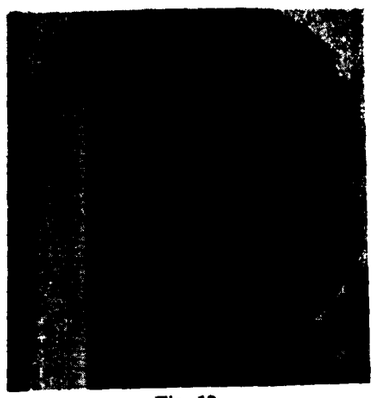


Fig. 12.

Shows gelatinous cut surface of the specimen of cystosarcoma phyllodes.

Fig. 13.

The section shows intracanalicular fibroadenoma and cellular sarcoma like stroma. (H & E x 75)

stroma. The epithelial component of the fibroadenoma showed evidence of compression atrophy.

Pathological diagnosis: Cystosarcoma Phyllodes.

Follow up: No recurrence more than a year after the operation.

Discussion

Attention to this condition was first drawn by Johannes Muller in 1838. According to Lee and Pack this tumour develops from a pre-existent fibroadenoma probably of the intracanalicular variety. Repeated births and lactation may be a factor in initiating this change. These tumours are of low grade malignancy and recurrence after excision is uncommon. Stewart has described 43 synonyms of this tumour. The term Cystosarcoma phyllodes does not denote a malignant tumour unless so qualified. It is a rare tumour, though well known. Lee and Pack collected 109 cases from the literature upto 1931. Owens and Adams in 1941, added another 12 cases. Goddalland Curran have reviewed another 27 upto 1953, including one of their own but excluding 77 published by Treves and Sunderland in 1951 and 9 published by Mclaran in 1952.

These tumours occur in women past middle age and generally are of a huge size. However, such tumours do occur that are small in size, but present coarser than usual, intracanalicular protrusions with connective tissue portions, more cellular and with the overlying epithelium more proliferative, than that seen in intracanalicular fibroadenoma. Such tumours have been named 'miniature cystosarcoma phyllodes' (Stewart). Surely intermediate types must occur.

Fig. 14.

Shows cut surface of the specimen of sarcoma of the breast.

SARCOMA

CASE 9.

A young married woman, 20, no issue, was admitted on 7-6-1954 with a swelling of the left breast of one years' duration. To begin with the lump was of the size of a lemon. It rapidly increased to three times its size in three months. During the last month it had doubled its size as compared to the previous month, and had become tender and painful.

On examination: The whole breast was swollen. Overlying skin was red, hot, shining and oedematous. It was tender and pulsations were present. The tumour was 8" x 7" in size, rounded, smooth and soft. Areas of fluctuation were present. No lymph glands were palpable in the left axilla.

Fig. 15.

The section shows thin walled sinuses lined by the tumour tissue in the above case. (H & E x 75)

A simple mastectomy was performed on 11-6-1954. The tumour was highly vascular, though well encapsulated.

Morbid Anatomy: Well encapsulated tumour measuring 9" x 8" x 7". It was solid at places and cystic at other places (Fig. 14). Cut surface showed a fleshy homogenous appearance with cystic areas.

Microscopic: Section showed undifferentiated mesenchymal tissue with active and aberrent proliferation. Marked vascularity was evident and at places there were sinuses lined by tumour cells (Fig. 15). In addition there was proliferative activity of duct epithelium showing eosinophilic change, but no distinct infiltrative properties. 'This tumour is a malignant mesenchymal tumour — sarcoma, but not of the variety which is associated with a giant intracanalicular fibroadenoma."

Progress: A course of deep X-ray therapy, total dose 1650 r units was given to the region of the breast.

Follow-up: The patient is alive and well without recurrence more than two years after the operation.

Discussion

Sarcoma of the breast is an uncommon lesion. In the present case it occurred in a young patient and rapidly grew in size. Histology too was that of a very malignant tumour. So far however there is no local or distant recurrence. Discussing the prognosis of breast sarcoma and its relation to age Gross in 1887 wrote "Sarcoma occurring in a functionally active breast evinced a morbid disposition to recur after operation with less disposition to metastasise whereas a sarcoma of the declining breast recurs less frequently but it generalises in a greater number of instances." Adair and Herrmann found evidence of involvement of lymph nodes in about 4% of cases of breast sarcoma. They also found that conservative methods of treatment were as effective as radical measures. The role of X-ray therapy cannot be evaluated in cases of breast sarcoma due to the rarity of the lesion. It would however appear from our case that it is of definite value. According to Gross's finding this case might have shown local recurrence. Perhaps, the post-operative X-ray therapy has eliminated the possibility, at least for some time.

CARCINO-SARCOMA

CASE 10.

A 40 year old married woman, was admitted on 23-2-1955 with a lump in the right breast of 1½ months' duration. It rapidly increased in size and ulcerated, 15 days from its onset. She had three children, alive, all breast fed.

On examination: There was an ulcerated tumour in the right breast. The ulcer had almost completely destroyed the nipple. The tumour was 6½" x 5", in size, hard and irregular. It had infiltrated into the pectoral fascia and the pectoralis major muscle. The right axillary lymph glands were enlarged, hard and matted, though mobile. There was no evidence of distant metastases.

A simple mastectomy was performed on 24-2-1955. The pectoralis major was found to be infiltrated and a part of it was excised.

Morbid Anatomy: "Spheroidal cell carcinoma with evidence of sarcomatous change in the strome" (Figs. 16 & 17). "Carcino-Sarcoma."

Progress: A course of deep X-ray therapy, total dose 3000 r units was given to the breast and its areas of lymphatic drainage. Though the axillary glands shrank to some extent, two nodules appeared in the scar inspite of X-ray therapy. The patient at this stage left against medical advice. She reported for re-admission three months later, with massive local recurrence and metastases in the lungs. On 15-7-1955 the patient expired.

Discussion

Several theories have been advanced to explain the presence of carcinoma and sarcoma in the same neoplasm:

(1) That it is a mixed tumour.

(2) That a carcinoma stimulates the adjacent connective tissue to undergo sarcomatous transformation or conversely that an antecedent sarcoma causes a carcinomatous change in the neighbouring elements.

(3) That there are two distinct and separate tumours which grow towards each other and coalesce.

(4) That the lesion is a primary carcinoma, some portions of which become so altered in histologic appearance that they are interpreted as sarcoma (Saphir and Vass).

Fig. 16.

The section shows spheroidal cell carcinoma and sarcomatous stroma in a case of carcino-sarcoma. (H & E x 75)

Fig. 17.

The above section under high power to show sarcomatous stroma. (H & E x 300)

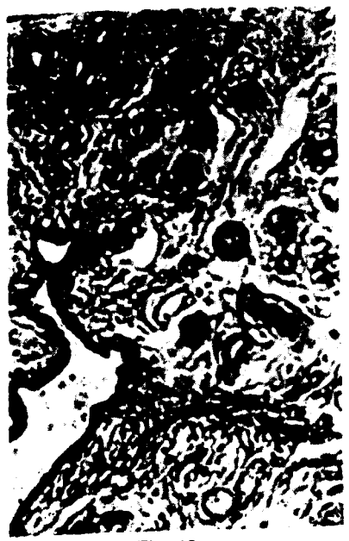


Fig. 18.

Unilateral infantile hypertrophy in a male child —the section shows dilated ducts and proliferated acini. (H & E x 75)

Fig. 19.

Lymphatic cyst — the section from the wall shows fibrous tissue and a dilated lymphatic. The lumen contained lymph like material. (H & E x 75)

INFANTILE MAMMARY HYPERTROPHY IN A MALE CHILD

CASE 11.

A two year old male child was brought by his mother for a swelling of the left breast. It was painful. The right breast was normal. The mother was so worried about this feminine attribute in her child that she requested early excision. The swelling was excised on 19-7-1954 through a submammary incision, preserving the nipple.

Morbid Anatomy: The tissue measured 3" x 3" x 2". Cut surface showed a whitish fibrous appearance.

Microscopic: (Fig. 18). Section showed increase of fibro-fatty tissue in the breast, adenosis and dilatation of ducts, some of which showed evidence of a small homogenous secretion. The changes resembled those of adolescent mammaplasia.

COMMENT

Infantile mammary hypertrophy practically never occurs in the male child. Gynecomastia does occur and may be unilateral or bilateral but it appears round about puberty. This child had no precocious development or abnormality of the genitalia. This unilateral mammary hypertrophy therefore is of considerable interest.

LYMPHATIC CYST

CASE 12.

A 30 year old male presented with a cystic swelling in the right breast of one years' duration on 7-7-1954. The cyst was oval in shape, 1½" x 1" in size, freely mobile. It was excised.

Morbid Anatomy: (Fig. 19). The cyst wall consisted of non-descript collagenous tissue containing dilated lymphatics. There was no lining. It contained fluid akin to lymph. The cyst appeared to be due to dilatation of the lymphatics which had broken through.

Diagnosis: Lymphatic Cyst.

SUMMARY

In a clinico-pathological investigation of 83 breast lesions, 12 uncommon lesions were detected. The salient clinical and pathological features of those lesions have been discussed. This study illustrates the value of a careful histopathological examination of all breast lesions submitted to surgery along with a follow up of all such cases.

ACKNOWLEDGEMENTS

Our thanks are due to Prof. B. N. B. Rao, F.R.C.S. (Eng.), Principal and Professor of Surgery, G. R. Medical College, Gwalior for generous help in the preparation of this paper. To Prof. B. K. Aikat, Director of Pathology, Seth Karnani Memorial Hospital, Calcutta, our special thanks are due for initiating this study and some of the histological reports.

REFERENCES

PLASMA CELL MASTITIS:

1. Adair, F. E. Plasma Cell Mastitis. A lesion simulating Mammary Carcinoma. Arch. Surg. **26**: 735-749, 1933.
2. Cassie, G. F.: Plasma Cell Mastitis. Brit. Jour. Surg. **40**: 505-508, 1953.
3. Cheatle, G. L. and Cutler, M.: Tumours of the Breast. P. 298, London, Arnold, 1931.
4. Cromar, G. D. L. and Dockerty, M. B.: Plasma Cell Mastitis. Proceed. Staff. Meetings Mayo Clinic. **16**: 775-783, 1941.
5. Cutler, M.: Plasma Cell Mastitis — Report of a case with Bilateral Involvement. B.M.J. 1: 94-96, 1949.
6. Ewing, J.: Neoplastic Diseases. P. 547, Philadelphia, W. B. Saunder & Co., 1942.
7. Mangalik, V. S. and Mathur, S. N.: Plasma Cell Mastitis. Ind. Med. Gaz. **87**: 249-251, 1952.
8. Parsons, W. M., Henthrone, J. C. and Clark, R. L.: Plasma Cell Mastitis. Arch. Surg. **49**: 86-90, 1944.
9. Shrivastav, J. B. and Sharma, K. D.: Plasma Cell Mastitis. Ind. Jour. Surg. **16**: 87-89, 1954.
10. Sirsat, M. V.: Frozen Sections for the Diagnosis of the Tumours of the Breast. Ind. Jour. Surg. **7**: 40-44, 1945.
11. Talwalkar, G. V.: Plasma Cell Mastitis. A Clinico-Pathological Study. Ind. Jour. Med. Sci. **10**: 375-382, 1956.

FIBROADENOMA:

1. Cheatle, G. L. and Cutler, M.: (Quoted by Willis).
2. Willis, R. A.: Pathology of Tumours. Pp. 215-216, London, Butterworth, 1948.
3. Scarff, R. W. and Smith, C. P.: Proliferative and other lesions of the male breast. Brit. Jour. Surg. **29**: 393, 1942.

CYTOSARCOMA PHYLLODES:

1. Goodall, A. L. and Curran, R. C.: A case of Cystosarcoma Phyllodes. Brit. Jour. Surg. **40**: 479-481, 1953.

2. Lee, B. J. and Pack, G. T.: Giant Intracanalicular Fibroadenomyxoma of the Breast. Am. J. Cancer. **15**: 2583, 1931.
3. Miller, J.: Wher den feiner Ban und die Formen der Krank lafter Geshwaltse. P. 56, Berlin, G. Reimer, 1938.
4. Owens, F. M. and Adams, W. E.: Arch. Surg. Chicago. **43**: 588, 1941.
5. Stewart, F. W.: Tumours of the Breast. P. 68, Washington, D.C., Armed Forces Institute of Pathology, 1950.
6. Treves, N. and Sunderland, D. A.: Cancer. **4**: 1286, 1951.

SARCOMA:

1. Adair, F. E. and Herrmann, M.D.: Sarcoma of the Breast. Surgery. **19**: 55-73, 1946.
2. Gross, S.: Sarcoma of the Female Breast. Am. J. M. Sc. **94**: 2, 1887.

CARCINO-SARCOMA:

Saphir, O. and Vass, A.: Carcino-Sarcoma. Am. J. Cancer. **31**: 331, 1938.

ADDENDUM:

Patellani, E.: A Proposito di 3 casi di mastite plasmacellulare neoplastiforme, Tumori, Milano. **41**: 505, 1955.

Received for publication on 1-2-'57.

ENTEROLITHS ASSOCIATED WITH TUBERCULOUS INTESTINE

by M. CHAUDHURI, New Delhi.

Enteroliths are on the whole relatively uncommon, and those of bile acid and other constituents of bile are even more rare. Only a few cases are recorded in the literature, and except in the case reported by Kelly (1932) there was no tuberculous lesion of intestine in the other cases. Majority occurred in diverticulae, chiefly in the duodenum and jejunum, as reported by Watson (1924), Shaw (1940), Armitage, Fowweather, and Johnstone (1950), Robinson (1953), and Slater (1953). Recently a case of enterolith has been described by Duncan (1956) in a Meckel's diverticulum. Enteroliths are rarely associated with strictures in the intestine.

In view of its infrequent occurrence, it may be considered worth while recording the following case of multiple enteroliths associated with multiple strictures of the ileum due to tuberculosis.

CASE REPORT

Mrs. R.M., aged 35 years, admitted to the hospital on October 28, 1955, as an emergency case with severe abdominal pain and vomiting for 15 days. History of similar repeated attacks of pain for 6 years at intervals of 2-3 months, often with constipation and vomiting, lasting for 2-3 days at a time. No history of fever, but lately had lost some weight.

On Examination :

The patient looked pale, ill-nourished and somewhat dehydrated. Temp. 98°F, pulse 100 per min., sent. The tongue was clean but dry, no jaundice present. The abdomen was distended more in the lower half, visible peristalsis present in this region ; the abdomen moved well with respiration. At the time no mass or any viscera were palpable, but while under observation subsequent examinations revealed a visible mass in the left lumbar region which was smooth firm and tense ; it disappeared under the examining hand suggestive of distended bowel. The liver and other organs were not palpable. On vaginal examination a similar tense cystic tense cystic mass was palpable through the anterior and left fornices not connected with the pelvic organs, diagnosed as distended coils of intestine. After admission pain and vomiting subsided and bowels moved regularly. Operation was postponed and the following investigations were carried out.

Blood Examination :

Hb.—11 gms., RBC—4,500,000 per ccm., WBC—6,400 ccm., Erythrocyte sedimentation rate—21

Fig. 1.
Excretory pyelography showing concentric radio-opaque shadows below the right kidney.

Fig. 2.
Grossly distended and engorged coils of ileum as found at operation.

Fig. 3.
The specimen showing strictures with enteroliths within the lumen of the intestine.

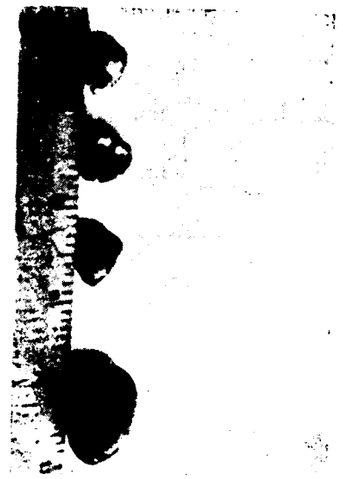


Fig. 4.
Four Enteroliths removed from the distal segments of the ileum showing faceted appearance.

mm./hr., Icteric index—6, Blood urea—32 mgm%. Straight X-ray of the abdomen showed multiple concentric shadows with clear central areas ; closely packed, suggestive of calculi, opposite 3rd lumbar vertebra. On excretory pyelography similar shadows were seen just below the lower pole of the right kidney ; except for a slightly dilated right lower calyx both the kidneys were normal (Fig. 1). Subsequent skiagrams showed that these opaque areas were changing in position indicating that they were in the bowel. Cholecystography revealed a normal gall bladder and biliary tract. Barium enema findings were also normal showing absence of stones in the large bowel.

At operation on December 5, 1955, the findings were as follows :— On opening the abdomen grossly distended coils of ileum bulged through the wound (Fig. 2). The liver, gall bladder and other viscera were normal. Three strictures were defined in the ileum at distances of about 45 cms. ($1\frac{1}{2}$ ft.), ,90 cms. (3 ft.), and 150 cms. (5 ft.) proximal to the ileo-caecal junction. Several hard masses were felt within the segments of the obstructed loops of ileum. In addition a solitary bigger mass was palpable through the thickened wall of the intestine proximal to all the strictures ; this could be moved freely in the lumen. About 2 meters of the ileum was involved. There were no tubercles on the surface of the bowel or on the peritoneum, and no mesenteric glands were detected. At the time it was presumed that the strictures were traumatic in nature as a result of stones in the lumen of the intestine. Origin of the stones remained obscure since the gall bladder and the bile ducts were found to be normal. Resection of the entire affected part of the ileum measuring about 2 meters was done, and the continuity of the bowel restored by anastomosis. The specimen consisted of 198 cms. of ileum grossly distended and hypertrophied, particularly in the proximal part showing marked congestion with dilated veins on the surface. There were three strictures present in the resected part of the ileum at 45, 90 and 150 cms. from the distal to the proximal end. Six greenish brown enteroliths were found in the lumen, 3 smaller ones in the distal and 2 in the proximal segment were faceted, in addition one large stone proximal to the strictures was nonfaceted and pyramidal in shape (Fig. 3). The mucosa was ulcerated at the site of the distal stricture, other strictures showed no evidence of recent inflammation. The lumen of the ileum was very constricted at the sites of these strictures being only 1 cm. in diameter. The enteroliths were in sizes of 4 x 4.5 cms., 2.5 x 4 cms., 1.25 x 1.25 cms., 2 x 1.5 cms., 1 x 1.5 cms., and weighed 5 gms., 3.5 gms., 2.2 gms., 2.5 gms., and 1.5 gms. respectively (Fig. 4). Histologically the section of the intestine showed a tuberculous lesion with epitheloid and giant cells, and lymphocytic infiltration, also some fibrous tissue reaction. Bacteriological examination, however, was negative for tubercle bacilli, only B. Coli were cultured from the swab taken from the surface of the ulcer.

Biochemical analysis of two of the stones showed mineral matter mainly calcium from the outer crust, but the inner zones of the stones consisted of bile acid salts with a small proportion of bile pigment, cholesterol, and fatty acids.

Postoperative recovery was uneventful. In view of the pathological findings the patient was treated for tuberculosis with Streptomycin, P-aminosalicylic (PAS), and Iso-niazid. She had 93 gms. of Streptomycin and PAS 12 gms. daily for 3 months, and Iso-niazid 200 mgms. for a month. The patient was last seen in March, 1956, about 4 months after the operation at the Follow-up clinic. She had gained 2 kilos in weight, and had no complaints. Her general condition was good.

Discussion

The etiological factors in the formation of these enteroliths are not well known, but some form of mechanical obstruction in the intestine, such as due to strictures or diverticulae, is usually present. Probably intestinal stasis aids in the formation of concretions, as a result of binding of crystalloids and colloids which are concentrated within the lumen. Besides, certain substances, chiefly the constituents of bile, may precipitate with changes in the Ph reaction in the intestinal contents. Fowweather (1949) described in detail the biochemical changes responsible for precipitation of bile acids and other constituents of bile, and showed that the bile acids are precipitated between Ph of 6 and 7. According to Mcghee and Hasting's (1942) work on Ph of different parts of intestine the range of Ph varies from 6.2 to 6.8 in the proximal part of the ileum; this may explain the precipitation of these acids. It is possible that in certain pathological conditions Ph may still further vary so that other substances are also precipitated. The entire process of formation of enteroliths may take a long period before the stones are large enough to give rise to intestinal obstruction, the condition is usually diagnosed at operation.

In the present case under review the condition was suspected pre-operatively on account of the radio-opaque nature of the enteroliths. Although these resembled gall stones both the cholecystography and the operative findings confirmed that the gall bladder and the bile ducts were normal. In this case the multiplicity of enteroliths, and the fact that these varied in size and were faceted, suggest that the stones were formed at different periods within the obstructed segments of the ileum, almost completely occluded at both the ends, preventing any entry or exit to the stones. This is the only case so far reported, as far as I am aware, with 6 enteroliths associated with multiple tuberculous strictures of ileum. Treatment is mainly surgical, especially as the condition is mostly diagnosed at operation. In those cases with no obvious pathological lesion of the bowel simple removal of the enteroliths by enterotomy is sufficient to relieve obstruction as in Shaw's case (1942), where an enterolith had extruded from a duodenal diverticulum into the ileum. Richards (1951) described a case of multiple enteroliths 3 in number which were removed from the ileum, and the case was followed for 4 years with no recurrence. But in all the cases associated with some pathological changes in the intestine, particularly with strictures, it is necessary to resect the entire affected part of the intestine, especially if a tuberculous lesion is present. Kelly (1932) reported a case with 3 enteroliths in a patient on whom he had operated for tuberculosis of jejunum 20 years previously. In such cases, therefore, the possibility of recurrence of strictures with recurrence of enteroliths must be kept in mind. At the present time, on account of modern anti-tuberculous drugs recurrence is unlikely and may possibly be prevented.

Summary

A case of multiple enteroliths with multiple tuberculous strictures of the ileum in a woman aged 25 years is described.

The literature is reviewed briefly and the problems of etiology and diagnosis are discussed. The treatment is described in the light of modern anti-tuberculous therapy.

References

1. Armitage, G. F., Fowweather, F. S. and Johnstone, A. S.: Brit. J. Surg. 38: 21, 1950.
2. Duncan, D.: Brit. J. Surg. 43: 64, 1956.
3. Fowweather, F. S.: Biochem. J. 44: 607 1949.
4 Kelly, R. E.: Brit. J. Surg. 20: 168, 1932.
5. McGhee, I. C. and Hastings, A. B.: J. Biol. Chem. 142: 893, 1942.
6. Richards, H. J.: Brit. Med. Jour. 2: 1384. 1951.
7. Robinson, A. F.: Brit. Med. Jour. 1: 548, 1953.
8. Shaw, J. J. M.: Brit. J. Surg. 28: 328, 1940.
9. Slater, N. S.: Brit. J. Surg. 41: 60, 1953.
10. Watson, C. M.: Surg., Gynec. & Obst. 38: 67, 1924.

Received for publication on 10-1-'57.

POST-IRRADIATION FIBRO-SARCOMA DEVELOPING IN A CASE OF OSTEOCLASTOMA

by D. J. REDDY, K. GOPALAKRISHNIAH GUPTA, T. SURYAPRAKASA RAO and C. ETHIRAJULU, Guntur.

Surgeons and radiologists are painfully aware of the sarcoma inducing potential of ionising radiations. Beck and Marsch in 1922 simultaneously published reports on patients in whom sarcoma of bone followed at the site of roentgen therapy for tuberculous arthritis. Fourteen of their cases followed roentgen therapy of benign lesions of bones and all but five have expired. Giant-cell tumours enjoy an exceptionally controversial position with regard to origin, identification, behaviour, and response to treatment. Some of the more critical articles on giant-cell tumours of bone indicate a recurrence rate of nearly 50 percent and a rate of clinical malignancy of approximately 10 percent. Increasing evidence has accumulated recently that irradiation in large doses, or even in doses that generally are considered acceptable, is able to induce sarcomatous change in giant-cell tumours. Coley, Lichtenstein, Jaffe, and several others have reported a number of cases in which giant-cell tumours of bones became malignant after radio-therapy.

Sabcinas in 1956 reviewing 9 secondary sarcomas arising from giant-cell tumours reported by Williams and co-workers, added 8 more cases of post-irradiation sarcoma encountered in Mayo Clinic. Three of the seventeen secondary sarcomata reported by them arose in normal bone within the field of irradiation after radiotherapy of adjacent lesions, while the remaining fourteen occurred at the site of pre-existing benign lesions of bone. Sabcinas further recorded that in the series of ten giant-cell tumours of bone reported from Mayo Clinic, two became malignant without any treatment, where as in eight, malignant lesions were observed at varying intervals after radiation. Govinda Reddy in a survey of bone tumours studied at the Pathology department of Madras Medical College pertinently warns the surgeon the hazards of irradiation as applied to giant-cell tumours. Case reports of malignant transformation of giant-cell tumour or sarcoma developing at the site irradiation of giant-cell tumours from our country are infrequent. This has prompted us to record the clinico-pathological findings of a case of giant-cell tumour under our observation.

CASE REPORT

Smt. S. S., female, aged 22, was in the obstetric ward, Govt. General Hospital, Guntur, in January 1956 for confinement. Dr. Ethirajulu, was consulted for a swelling in the left fore arm at that time. X-ray of the area revealed complete destruction and irregular calcification of the bones in the region (Fig. 1). He suggested excision and deep X-ray therapy and advised the patient to seek re-admission to the hospital some time later. Accordingly she was admitted under the orthopaedic surgeon in May 1956.

Local Examination :

Ulcerated growth left fore arm, skin in some places was wanting. It was painful and tender. The swelling was fluctuant in places (Fig. 2). The patient expressed that she noticed the swelling was rapidly increasing in size.

Previous History :

The patient noticed a small nodule in the left fore arm in 1952. This swelling gradually increased in size and was painful. A year later she sustained fracture at the spot and was treated at the Govt. General Hospital, Guntur. Four months later she was admitted under Dr. Thayumanaswamy, Govt. General Hospital, Madras. Skiagrams of the lesion was typical of osteoclastoma (Fig. 3).

Biopsy report from the Pathology department of Madras Medical College is given below : (No. 2212 54 of 20-5-1954).

"Shows blood and tissue comprising a few osteoclasts, spindle cells and capillaries. Appearances suggest osteoclastoma. No evidence of malignancy is seen in the tissue received."

It appears from the correspondence that she was tranferred for treatment to Dr. K. M. Rai. Report received from Dr. Rai is given below :

Fig. 1.

Reduction skiagram illustrating destruction and spotty calcification in osteoclastoma. The X-ray was taken in January 1956.

Fig. 2.

Photograph illustrates multi-nodular tumour of the fore-arm. The skin over the tumour is ulcerated.

Fig. 3.

Reduction skiagram illustrating typical soap bubble appearance of osteoclastoma left radius. The X-ray was taken on 15-11-'54.

Fig. 4.

Photograph illustrates sectioned surface of the tumour. The homogeneous and fleshy appearance are apparent.

Fig. 5.

Photomicrograph illustrates the fibro-sarcomatous nature of the neoplasm. Tumour cells are seen scattered all over. (H & E x 324)

Fig. 6.

Photomicrograph illustrates appearances typifying giant-cell tumour. This represents the lesion in the cystic area. (H & E x 324)

"The patient was admitted under me from 31-5-1954 to 15-6-1954 for osteoclastoma of the left radius and during the period a total tumour dose of 2000 r was given."

Later the patient was treated by Dr. Sundaravadanam. Excision and bone grafting appears to have been done by him. The wound healed and the patient had the benefit of deep X-ray exposures. A repeat X-ray exposure is said to have been given five months later and the swelling by then considerably decreased in size and pain subsided. Further course of the patient is inferred from the letter received from Dr. Rai and the same is given below:

"She reported again on 3-10-1955 with a history of further course of X-ray therapy in February 1955 at some private clinic in Mylapore. Madras. X-ray and clinical examination of the patient showed that the condition was worse and further radiation therapy was not advsied."

Based on the previous history and the condition at the time of last admission to Govt. General Hospital, Guntur, the Orthopaedic surgeon excised the entire tumour by amputating the fore arm. Pre-operative and post-operative X-ray of the chest showed no secondaries in the lung. Two months after discharge from the hospital the patient is reported to have expired and the exact cause of death is not known.

Morbid Anatomy and Histology of the Excised specimen (768-69/1956).

The amputated forearm and hand shows a large irregular nodular neoplasm. The growth is ulcerated (Fig. 2). The skin is stretched and appears unhealthy. Cut surface of the tumour presents greyish white fleshy appearance. Deep in the substance of the growth and close to the radius, cystic spaces, haemorrhage and myxomatous changes are seen. The growth is seen extending to the region of metacarpal bones (Fig. 4). Sections of the surface growth presented appearances typical of fibrosarcoma (Fig. 5). In view of the past clinical history sections taken from the cystic and haemorrhagic areas were studied and picture resembling osteoclastoma was noticed (Fig. 6).

Comment

The clinical history and the biopsy reports are conclusive proof of the development of fibro-sarcoma at the site of pre-existing osteoclatoma, consequent to radiation. Excessive doses of radiation appear to be the most significant factor in the production of sarcoma, although individual variations of irradiation sensitivity obviously exist. Sarcoma of bone or neighbouring tissues may follow single or multiple exposures to ionising radiations. Sabcinas has noticed malignant change following irradiation after an interval of 32 months to 30 years in his series. In his series the tumour dose ranged from 1,400 to 10,000 r. We feel that our patient probably received slightly excessive dosage, since Lichtenstein is of opinion that 1,000 r will suffice to irradiate giant-cell tumours and he further cautions that bone lesions cannot be irradiated with large doses of X-ray with impunity. Sabcinas found in his series, 8 osteogenic sarcomas and 9 were pure fibroblastic variety of sarcoma. We feel that our case is exclusively a fibrosarcoma.

Although the relationship of radiotherapy in the development of malignant change in osteoclastoma is debatable, we feel wherever surgery could be applied, it is best employed. In the light of our case report and other similar published reports we are to re-affirm Eyre Brook's recent statement. "Excision is the treatment of choice wherever it can be applied without loss of function. Excision with arthrodesis has a scope. Radiotherapy holds undisputed field in the region of sacrum. Prognostic forecasts indicate the sinister potentialities of these tumours, following curettage and radiotherapy. Recurrence and metastases are not infrequent."

Summary

1. Literature regarding post-irradiation sarcoma of bones is briefly reviewed.

2. Clinico-pathological findings in a case of post-irradiation fibrosarcoma developing at the site of osteoclastoma are recorded. The exact place of radiation and the attended hazards of radiation in the treatment of osteoclastoma are discussed.

Acknowledgements

We thank Drs. K. M. Rai, F.R.C.S., etc., Hony. Professor of Radiology, Madras Medical College, G. S. Viswanathan, M.D., Professor of Pathology, Madras Medical College, and Ram Seshgiri Rao. M.B.B.S., D.M.R., etc., Lecturer in Radiology, Guntur Medical College for the information furnished. We acknowledge with pleasure the help rendered by the photo-artists Messrs. Venkateswara Rao and Narasimha Rao.

References

1. Beck, A.: Zur Frage des Rontgensarkoms. Zug. leich. ein. Beitrag Zur Pathogenese des Sarkoms. Munchen med. Wchnschn. **69**: 623-625, 1922.
2. Coley Bradley, L.: Neoplasms of Bone and related conditions. Paul B. Hoeber, Inc. New York. 1949.
3. Eyre Brook L. Arthur.: Giant-cell tumours of bone and related conditions. Proceedings of the Royal Society of Medicine. **49**: 7, 409, 1956.
4. Govinda Reddy, D.: Giant-cell tumour with a brief survey of bone tumours examined in the Dept. of Pathology, Madras Medical College. Ind. Jour. Surg. **15**: 1, 36-42, 1953.
5. Jaffe, H. L.: Giant-cell tumour of bone. Bull. Hosp. Joint Diseases. **5**: 84-91, 1944.
6. Lichtenstein. L.: Giant-cell tumour of bone. Current status of problems in diagnosis and treatment. Jour. Bone & Jt. Surg. **33-A**: 143-150, 1951.
7. Marsch, E.: Tuberkulose und Sarkom. (Rontgen Sarkom) Zentralbl. f. Chir. **49**: 1057-1060, 1922.
8. Sabcinas Alvina, O. et al: Post-radiation sarcoma of bone. Cancer. May-June 1956. 9.3.528.
9. Williams, R. R., Dahlin, D. C. and Ghormley, R. K.: Giant-cell tumour of bone. Cancer. **7**: 764-773, 1954.

Received for publication on 10-1-'57.

OSTEOGENIC SARCOMA FEMUR EXTENDING INTO TIBIA AND PATELLA

by PRITAM DAS, Lucknow.

It is unusual for an osteogenic sarcoma of a long bone to spread beyond the epiphyseal cartilage, and it is considered rare for it to infiltrate the articular surface. So far as I am aware no clear cut case of an osteogenic sarcoma spreading to another bone after infiltrating the articular surfaces and the joint has been reported. The case reported here should therefore be of interest. In this case the sarcoma originated in the lower end of the right femur and infiltrated into the knee joint, patella and the upper end of the tibia by direct continuity.

CASE REPORT

Patient K., aged 14 years, female was admitted to the Gandhi Memorial Hospital on 14-5-1954. She came in with the complaint of a swelling in the region of the right knee joint since five months. Her history of the present illness was that she felt pain on the medial side of the right knee joint about six months back. The pain was quite severe and remained for about a month before a swelling was noticed in the same region. Since then the swelling has been gradually increasing in size, the pain has also persisted though it is less in severity now.

General examination of the patient showed her to be a young girl, thin, anaemic and much run down in health, and groaning with pain most of the time. Her blood pressure was 120/80 m.m., a soft systolic haemic murmur was heard in the mitral area, and the lungs were clear. The skiagram of the chest showed no metastases.

The right knee joint was kept flexed to about a right angle (Fig. 1) and its active movement or passive stretching caused pain. The thigh and the leg were very much thinned, and a number of prominent veins were visible on the surface of the swelling. A few superficial scars were present on the medial surface of the swelling, these had been caused by the application of counter irritants in the early stages of the disease. There appeared to be a generalised swelling of the lower end of the femur, and the knee joint. Palpation revealed the surface temperature to be raised, and well marked tenderness was present. The surface was irregular at places and smooth at others. Consistency was bony hard all over except for small areas here and there. The patella could not be made out separately. The size of the swelling vertically was 7" and the maximum circumference was 17". Clinically the tibia appeared to be free from disease. The movements at the knee joint were very much limited. She was very apprehensive and did not allow the joint to be moved because of pain. The pulsation in the arteries of the leg distal to the tumour was present and was equal to those in the opposite limb. The movements of the toes were free and there were no signs of nerve involvement.

Laboratory investigations: The urine was acidic in reaction and there was no Bence Jones protein in it. The total white count was 11,000 cmm., with Polys. 48%, Lymphos. 44% and Eosinophils 8%. The total R.B.C. was 2.7 million per cmm. and haemoglobin was 75%.

The skiagram of the tumour region showed an osteogenic sarcoma involving the lower end of the femur, the patella and the upper end of the tibia. The involvement of the tibia came as a surprise. It will also be seen from the skiagram (Fig. 2) that there is intense new bone formation, there is no sun ray appearance, the Codman's triangle is well marked on the Femur, and the articular cartilage of the femur and the upper end of the tibia are infiltrated, and the patella appears to be completely replaced by tumour tissue.

Preoperative preparation: A preliminary anti-anaemic treatment and a blood transfusion was given before an amputation was performed. Some delay occurred due to the unwillingness of the patient to have the leg amputated. Permission for a disarticulation at the hip was not given.

Fig. 1.
Clinical photograph of the tumour as seen from the medial side.

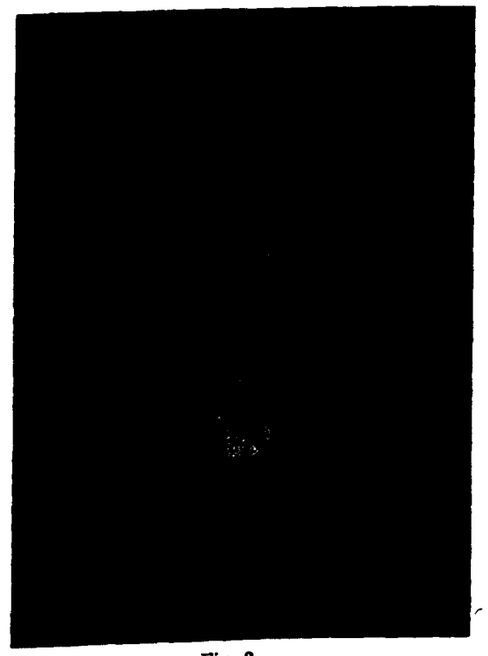


Fig. 2.
Skiagram of the specimen.

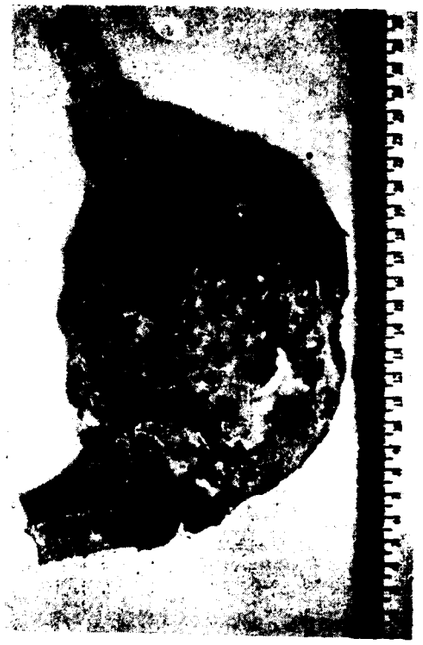


Fig. 3.
Photograph of the sagitally cut surface of the specimen. The crack in the tibia occurred during sawing of the bone.

Operation: Amputation was performed on 12-6-1954 under general gas oxygen anaesthesia. The tourniquet was applied on the thigh as high as possible, without a preliminary elevation of the limb. A long anterior flap was made, the femoral vessels were ligatured as the first step, and the bone was divided about six inches above the palpable margin of the growth.

The specimen: The amputated limb was dissected immediately after the operation. It was a hard mass, roughly globular in shape with irregular surface. The deep muscles were closely adherent to its surface although there was no evidence of their infiltration. Areas of the muscle near the tumour appeared white and edematous and pieces were taken from them for histological examination. Two lymph glands were found in the popliteal region, they were not grossly enlarged and were saved for microscopic examination. The veins were opened throughout the length of the limb but no tumour emboli were found in the femoral, popliteal or the two tibial veins. The nerves in the region of the growth appeared edematous and flattened but no actual infiltration was visible. The specimen was sawn through sagitally (Fig. 3) and it was found that the whole of lower end of the femur including its epiphysis, and the epiphyseal cartilage were almost completely destroyed and the articular cartilage had disappeared at most places. The patella was found to be completely replaced by tumour tissue.

The knee joint was found invaded particularly anteriorly, and the continuity of the process extending into the upper end of the tibia was visible. The articular cartilage of the upper end of the tibia was eroded at places and the epiphysis and the upper part of tibial shaft were also found infiltrated. The cut surface of the tumour mass was whitish in colour and granular in appearance and felt hard and gritty. There were small haemorrhagic areas here and there, and few soft patches of dirty grey colour were also present at places.

Fig. 4.

Microphotograph of a section of the tumour showing the intense new bone formation.

Histological Examination: Sections taken from the tumour mass in the region of the femur, from inside the knee joint, and from the patella and tibia all showed similar appearances (Fig. 4). The tumour consisted of a highly vascular stroma containing tumour cells, a number of blood vessels and bone trabeculae. The tumour cells were oval or spindle shaped in outline and were present in close proximity with vascular spaces. They showed a fair degree of anisocytosis and anisonucleosis, though the mitotic figures were few. Small numbers of giant cells containing two to three nuclei were sparsely distributed in the tumour mass. The stroma of the tumour showed marked laying down of irregular bone trabeculae. Blood vessels were numerous and their walls were thin.

Section from the region of the articular cartilage from the posterior portion of the condyles of the femur showed groups of cartilage cells. At one end there was evidence of infiltration by tumour cells.

Section from the muscle piece showed bundles of striated muscle fibres separated by edematous fibrous tissue containing a few inflammatory cells. In one section there was evidence of calcification of muscle fibres.

Section from the lymph gland showed lightly thickened fibrous capsule of the gland. The lymph sinuses were dilated and contained chronic inflammatory cells. There was no evidence of metastases in them.

Histological diagnosis of sclerosing osteogenic sarcoma was made.

Post-operative course was uneventful. The patient was completely relieved of the constant pain which she had before the operation, and had restful nights without sedatives. The wound healed by primary intention and the general condition of the patient improved considerably in a short time.

Follow up: The patient reported three months after discharge from the hospital. The amputated stump was in good condition and there were no signs of recurrence locally or of metastases in the lungs.

Comment

The main point of interest in this case is the extension of the sarcoma from the femur to the tibia and patella. The history was short (six months) and it cannot be considered to be an advanced case. The process of new bone formation was quite intense and such a tumour is expected to be less invasive than is observed in this particular case. The possibility of a multicentric origin of the tumour in the three bones is rather remote since the continuity of the disease process through the knee joint was clearly present. The radiological picture and naked eye appearances of the cut surface of the tibia are such as to indicate that the growth infiltrated from above rather than originated in it. Moreover, multicentric foci are expected when the sarcomatous change supervenes as Paget's disease of various bones.

The lesion in tibia cannot be regarded as a blood borne metastasis either. Metastases of bone sarcoma to other bones have been reported. They are more common with Ewing's sarcoma and the cases of metastases from osteogenic sarcoma to other bones have been rare. Willis (1952) had a case in which osteogenic sarcoma of

the femur produced a metastasis in the ileum. He has also referred to some more cases reported by others. The earliest of these reports and the one having some similarity with the case reported here, was of Durham who described an ossifying sarcoma of femur with metastases into the tibia and the skull. From the short reference available it is not clear whether the metastasis in the tibia was by direct continuity or by the same route by which the ileum was affected. Other cases were, a case each by Nunokawa (1908) and von Roznowski (1915) of periosteal fibrosarcoma of femur metastasising to a number of bones. In Joll's case of sarcoma of femur, there were metastases in the skull, pelvis and ribs. Dresser and Dumas (1930) had a case of osteogenic sarcoma of a metatarsal bone with metastases in the vertebral body: and Roedelius (1915) described a sarcoma of the maxilla with metastases in the femur. All these cases were in all probability of blood borne metastases.

Summary

A case of a girl of fourteen years suffering from sclerosing osteogenic sarcoma of the lower end of femur extending into patella and tibia by direct continuity, is reported. The case is probably the first of its kind to be reported in India.

ACKNOWLEDGEMENT

I am indebted to Dr. R. M. L. Mehrotra, M.D., Ph.D. (Lond.) for histological study of the tumour.

REFERENCES

1. Willis, R. A.: The Spread of Tumours in the Human Body. Butterworth & Co. London, 1952.

Received for publication on 11-1-'57.

MULTIPLE PROSTATIC CALCULI

(A Case Report)

by R. B. KARKHANIS, Sholapur.

Prostatic Calculi are such a rare entity. The case quoted below is the only one seen in the last fifteen years, in the Sholapur Hospital.

CASE REPORT

Subbanna Krishnappa, age 55 years, admitted on 22-7-1956 with a complaint of obstruction to the passage of urine in the beginning of the act.

Case History :

Duration : 2 years.

Pain : Nil.

Difficulty : In starting the urine.

Frequency : Every two hours.

Stream : Small.

Straining : Required to start the urine and with better result.

Two years before admission, the patient was quite normal. He then had fever with rigors and pain in the perineum with dysuria, frequency and burning of urine. This lasted for ten days and then he was relieved after passing plenty of pus and blood per urethra for three days. For two months more he continued to have incontinence of urine. This was followed by the present urinary obstructive symptoms.

Clinical Findings :

Thinly built elderly person, well nourished.

Tongue coated.

Bladder not distended.

Rectal examination showed prostate not enlarged but there was gritty feeling suggestive of multiple calculi inside prostate.

Urethral sound could not be passed.

Plain Skiagram Fig. No. 1 showed multiple calculi in the prostate area.

Urine : full of pus cells ; staphylococcal and B. Coli infection present.

Blood urea : within normal limits.

Fig. 1.

Plain skiagram taken on 23-7-56 to detect the calculi in the prostate gland and showing multiple calculi in the gland.

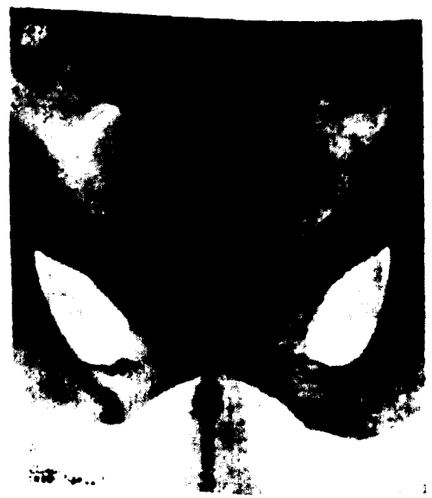


Fig. 2

Plain skiagram taken on 11-9-56 after the operation, showing remnants of some calculi in the prostate capsule.

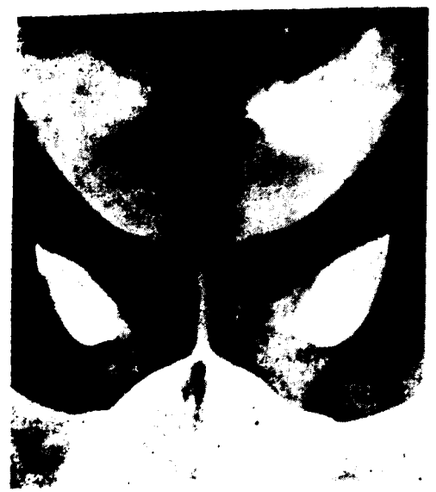


Fig. 3.

Plain skiagram taken six months later (on 7-2-57) to demonstrate that some of the remnant calculi have been excreted naturally.

Fig. 4.

Photograph of the removed prostate gland showing the two lobes and a few calculi in their crevices.

Operation Notes :

Suprapubic cystotomy was done on 24-7-1956 to relieve the patient of the frequency and distress and also to combat cystitis and seven days later, trans-vesical enucleation of prostate was done suprapubically. This was achieved with some difficulty and the prostate was taken out in two lobes ; it was not very big but was fibrosed and with honey-combed appearance accommodating many calculi in the crevices. There were many of them inside the bed of the fossa after enucleation and about 50-60 of them were irrigated out. Skiagram taken ten days later (Fig. 2) showed a few calculi still present inside the prostatic capsule at its urethral end and transperineal opening of the bladder was done but the stones could not be scooped out. Skiagram taken once again after this showed remnants of the calculi, but fewer in number. Patient on discharge was completely relieved except for lack of control on sphincter i.e. passing few drops of urine while passing flatus.

Remarks :

Prostatic calculi to such a large extent as found in this case are a rarity. Obviously enough the patient had an acute attack of prostatitis due to B. Coli infection as suggested by the pain, fever and discharge of pus per urethra two years before. This widespread infection of the prostate gland resulted later in multiple calculi within the crevices of the prostate gland. Infection, therefore, plays a major role in the formation of prostatic calculi.

Skiagram No. 1 presents a picture of the calculi spread all over the prostatic tissue and No. 2 presents incomplete removal of the gland mainly because some of the peripheral prostate gland that forms the false capsule does lodge some small calculi and are always likely to be left in under the circumstances in which the operation was done. The patient anyhow is symptom free as far as the obstruction is concerned and very likely will pass the calculi out as has been proved by a subsequent picture (No. 3) where fewer stones are seen. No alternative method like removal of prostate by retropubic method or perineal route could be resorted to in this case as suprapubic cystostomy had to be done first and secondly the prostatic urethra was impassable by any instrument which is required for prostatectomy by perineal route.

The picture is $\frac{7}{8}$" actual size of the prostate removed with some calculi still inside the prostate (No. 4).

SUMMARY

1. An unusual case of multiple calculi in prostate is presented with cause, clinical signs and symptoms.

2. Infection plays a major role.

3. Difficulty in total removal of all the calculi along with the entire prostate is stressed.

4. Result of operation was very good.

5. Biopsy report shows all the changes of chronic inflammation in the prostatic tissue.

Received for publication on 28-2-'57.

STRANGULATED DIAPHRAGMATIC HERNIA

*by M. P. PAI, Dibrugarh.**

(A Case Report)

Strangulation in diaphragmatic hernia is uncommon and when it occurs it is more common in the acquired variety of hernia than in the congenital type. The case presented here had an oesophageal hiatus hernia with organo-axial volvulus of the stomach and strangulation. A similar case was presented recently by Sellors and Papp —where the patient was successfully operated on by the authors. Our patient was admitted in a moribund state and died within an hour after admission. A clinical diagnosis of strangulated diaphragmatic hernia was made which was proved at autopsy.

CASE No. 404 56.

M.M., Muslim, male, aged 21, was admitted on 23-4-56 at 10-30 P.M. for the treatment of severe pain in the abdomen and vomiting of four days' duration.

Onset was acute, pain and vomiting started on 19-4-56. To start with the vomitus was sour and contained undigested food material, and then he was unable to retain anything he swallowed. Since the complaint started he had no motion but passed flatus.

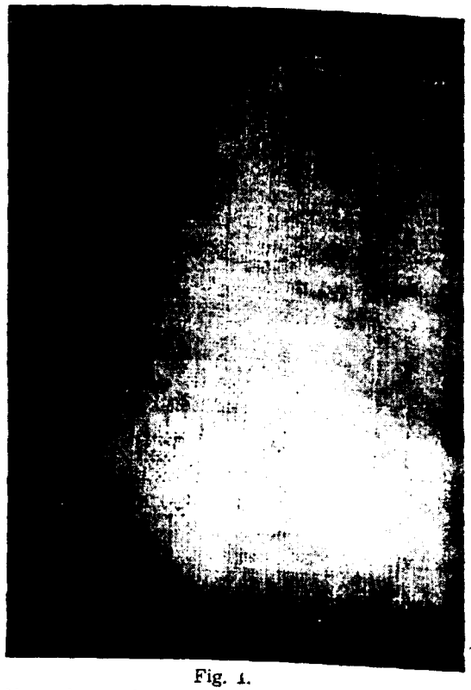


Fig. 1.

Note the mediastinal shift due to the stomach occupying the left chest and absence of the fundal gas bubble in the usual place

Fig. 2.

Shows the specimen removed along with the diaphragm. (A) Supradiaphragmatic oesophagus. (B) Spleen attached to the left half of the diaphragm. (C) Abdominal part of the oesophagus disappearing as it passes upwards into the thorax through the hiatus

* From the Dept. of Surgery, Assam Medical College.

Fig. 3.

Finger pointing to the oesophageal hiatus.

Fig. 4.

Photograph taken from the thoracic aspect. Note the grossly distended stomach with greater curvature looking upwards, and proximity of oesophagus (A) to the Pyloric part of the stomach (B).

Fig. 5.

Appearance of the stomach after the hernia was "reduced". Stomach grossly distended and congested.

General condition poor, dehydrated, eyes sunken, pulse 160 per minute, thready, temperature 97°F.

Abdomen moved freely with respiration, a rounded swelling seen in epigastric region, moved with respiration, tense and tender, tympanitic to percussion.

Trachea deviated to the right, heart pushed to the right, heart sounds are of a poor quality, left side of the chest movement restricted, hyperresonant note on percussion, breath sounds absent.

Diagnostic puncture of the left chest done by the House Physician had revealed dark brown fluid freely coming into the syringe. Nothing could be aspirated through the Ryles tube passed down the oesophagus.

Intravenous replacement of fluids and electrolytes started and an emergency chest X-ray was done. Before the X-ray plate could be developed patient's condition suddenly became bad and he died.

Post-mortem findings: Post-mortem, conducted the next day, showed that the stomach was not

in the abdomen, left dome of the diaphragm was everted with its convexity downwards due to the over distended fundus of the stomach pushing it from the thoracic aspect. Whole of the stomach was found in the left chest compressing the left lung and pushing the mediastinum to the right. Hernia had occurred through the oesophageal hiatus, abdominal part of oesophagus was acutely kinked and doubled upon itself. Greater curvature of the stomach was pointing upwards and lesser curvature downwards resulting in an organo-axial torsion. Whole stomach was grossly distended and congested and was full of fluid and gas.

ACKNOWLEDGEMENT

I am grateful to Dr. B. H. P. Pai, M.D., Professor of Medicine under whom the case was admitted and to Dr. B. N. Banerjee, F.R.C.S. (Eng.), Principal and Superintendent, Assam Medical College Hospital for permitting me to publish this case.

REFERENCE

Holmes Sellors, T. and Cornelio Papp.: Strangulated Diaphragmatic Hernia with Torsion of the Stomach. B.J.S. 53: 289–292, 1956.

Received for publication on 16-1-'57.

BENIGN METASTASISING ADENOMA OF THE THYROID GLAND

by D. J. REDDY, K. GOPALAKRISHNIAH GUPTA, K. R. VENKIAH and Y. RAMACHANDRA REDDY, Guntur.

Incidence of carcinoma of thyroid gland is high in India as is inferred from the reports of Devadatta [3] and Gault, Reddy [8] et al, Reddy [9], and Mangalik [5] and Wahal. Biopsy material from the neoplasms of the thyroid forms an interesting study to the pathologist. He is very often reluctant to offer an unchallengeable diagnosis based on his findings observed under the microscope in a clinically suspect case of thyroid neoplasm. This he does because of his past experience, in that the biological behaviour of thyroid neoplasms is unpredictable. In the interest of the patient he desires full clinical history, radiological findings, and biochemical data and liaison with the surgeon, when his histological observations are of an equivocal nature. The pathologist is rightly not assertive to declare benign metastasising adenoma of thyroid as not malignant, since the follow up reports of these cases by the clinicians indicate fatal termination. Cohnheim [1] in 1876 called this condition "Benign Metastasing Goitre" and Simpson [7] in 1926 reported three cases, all of which died in three years of the original diagnosis, of frank carcinoma of thyroid. On the contrary Joll [4] in 1923 reported 44 cases of metastases in bone, where either no abnormality or a benign form of tumour was found in the thyroid. Clinically, roentgenologically, and at operation the case reported by Cruickshank [2] in 1938 was suspected to be a meningioma, gumma, or sarcoma and only histological examination disclosed benign metastasising struma Nothing was found in the thyroid for four months after the operation. But later a hazel nut size adenoma was found and since the patient declined exploration of the thyroid, the nature of the lesion could not be studied.

These patients often seek medical aid for a pathological fracture, or paraplegia, or tumour of the bone. Rarely do these patients complain of symptoms pointing to disease of thyroid. During the last two years four cases of malignant thyroid came under our observation. Clinico-pathological findings of one of these cases characteristic of benign metastasising adenoma of the thyroid are recorded below.

CASE REPORT

Hindu female aged 60 was admitted under Dr. Y. Ramachandra Reddy for girdle pains and inability to walk since a month. She noticed a swelling on the right side of her neck 18 years ago, which since then has been encroaching on the middle line of the neck. Three months prior to admission she noticed a swelling over the left frontal region, very close to the lateral portion of the left upper orbital margin (Fig. 1). This swell-

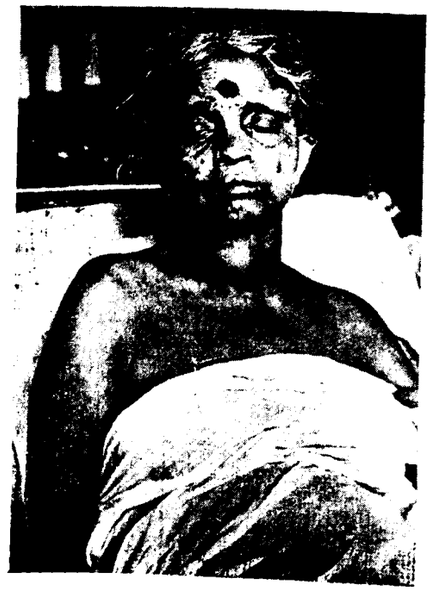


Fig. 1.

Photograph illustrates a swelling over the left supra orbital region — thyroid metastatic deposit and diffuse swelling over the neck.

Fig. 2.

X-ray reduction photograph of the skull showing a circumscribed area of rarefaction and destruction of bone just above the left supra-orbital region, result of metastatic thyroid deposit.

Fig. 3.

X-ray reduction photograph of the cervical spine showing compression and illdefined outlines of the lower cervical vertebrae, result of secondary thyroid deposits.

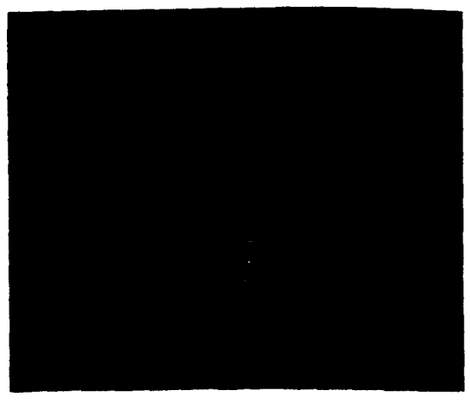


Fig. 4.

X-ray reduction photograph of the chest showing spontaneous fracture of the rt. humerus, result of secondary thyroid deposit.

Fig. 5

Photomicrograph illustrates normal thyroid acini containing colloid amidst bone trabeculae-significant of "Benign metastasising thyroid adenoma."
(H & E x 270)

ing was cystic and not tender. She further experienced since a month pain over the right arm and over the spine. The right arm was tender on palpation.

Physical and Roentgenological findings :

The swelling over the neck moved with deglutition, and it was partly firm and partly cystic (Fig. 1). No change in voice was observed. The lower limbs were spastic and plantar reflex was extensor. Deep reflexes in the lower limbs were exaggerated. X-ray findings of the following bones are given below.

Skull :

A circumscribed area of rarefaction and bone destruction is seen in the supra orbital region (Fig. 2).

Spine :

Shows compression and ill defined outlines of the lower cervical vertebrae (Fig. 3).

Rt. Humerus :

Shows fracture of the rt. humerus (Fig. 4).

The roentgenological findings are consistent with metastatic carcinoma of the thyroid. On 5-11-1956 biopsy bits from the tumour over the left frontal region were examined.

Biopsy Report : (1803/56)

Four small greyish white bits with brown spots were received. Sections of the bits revealed well differentiated normal thyroid tissue amidst bone trabeculae (Fig. 5). The findings are consistent with benign metastasising adenoma of the thyroid. A biopsy from the thyroid swelling was suggested but the patient desired to be discharged and the opportunity to know the nature of thyroid lesion was lost.

Comment

The case report exemplifies benign metastasising thyroid adenoma. Several writers have claimed the demonstration of malignant lesion in the thyroid either synchronous with the appearance of the metastases in the bone or some time following the occurrence of bony deposits. But we were not fortunate to explore the thyroid since the patient desired to be discharged, before this could be undertaken. Outerbridge [6] observed paraplegia in one of his five cases of benign metastasising adenoma, owing to the deposits settling in the cervical spine. Devadatta [3] and Gault encountered a similar clinical picture and biopsy from the affected spine disclosed histological picture indistinguishable from normal thyroid tissue.

Clinicians are frequently least assertive to forecast prognosis in these cases, for the tumour cannot be classed under high grade of malignancy, yet it is likely to cripple the patient in seedling secondary deposits in the long bones or in the spine. Excision of the offending nodule in the thyroid and deep X-ray therapy applied over the deposits may prolong the life of the patient.

Summary

Review of literature pertaining to benign metastasising adenoma of thyroid is briefly recorded. Clinico-pathological findings of such a case are recorded.

ACKNOWLEDGEMENTS

We are grateful to Dr. N. Balakrishna Reddy, F.R.C.S., Hony. Surgeon, Govt. General Hospital, Guntur, for the help rendered. We acknowledge with pleasure the help rendered by our artists Messrs. Venkateswara Rao and Narasimha Rao.

REFERENCES

1. Cohnheim Julius.: Arch. of Path. Anant. 68 : 547, 1876.
2. Cruickshank, M. M.: Thyroid Metastases in Bone. Ind. Med. Gaz. P. 656, 1938.
3. Devadatta, S. and Gault, E. W.: Carcinoma of the Thyroid Gland. Jour. Ind. Med. Assn. 27 : 2 : 1956, 41.
4. Joll, C. A.: British Journal of Surgery, 1923. (Quoted by Cruickshank, M. M.).
5. Mangalik, V. S. and Wahal, K. M.: Lateral "aberrant" thyroid tumours. Ind. Jour. Surg. 14 : 295, 1952.
6. Outerbridge Ralph, E.: Malignant Adenoma of the Thyroid with Secondary Metastases to Bone. Annals of Surgery. 125 : 3 : 1947, 282.
7. Simpson, W. M.: Three cases of Thyroid Metastases to Bones. S.G.O. 42 : 489, 1926.
8. Reddy, D. J., Muniswamy, M., Bhaskara Reddy, D. and Appa Rao, D. N.: Hurthle-Cell Tumours of the Thyroid. Jour. Ind. Med. Assn. 25 : 12 : 1955, 465.
9. Reddy, D. J.: Neoplasms of the Thyroid. Editorial, Jour. Ind. Med. Assn. 26 : 7 : 1956, 277.

Received for publication on 28-2-'57.

ASSOCIATION NOTES

GOVERNING BODY

President
G. M. PHADKE (Bombay)

Vice-President
S. S. ANAND (Amritsar)

Founder President (Ex-officio Member)
K. G. PANDALAI (Madras)

Three Immediate Past Presidents (Ex-officio Members)
S. N. MATHUR (Lucknow)
C. P. V. MENON (Madras)
S. J. MEHTA (Bombay)

Hony. Secretary
A. VENUGOPAL (Madras)

Immediate Past Hony. Secretary (Ex-officio Member)
U. MOHAN RAU (Madras)

Hony. Treasurer
C. P. V. MENON (Madras)

MEMBERS
A. E. de SA', Bombay.
B. RAMAMURTHI, Madras.
R. NIGAM, Nagpur.
P. K. SEN, Bombay.
B. N. SINHA, Lucknow.
V. R. THAYUMANASWAMI, Madras.
A. K. SAHA, Calcutta.
V. P. MEHTA, Bombay.
M. KRISHNAMURTHI, Visakhapatnam.

THE XIX ANNUAL CONFERENCE

The XIX Annual Conference of the Association of Surgeons of India will be held at Nagpur during the last week of December 1957. The following papers will be discussed:—

1. *Non-malignant Stricture of Oesophagus*
   by Dr. Subrata Banerjee, Calcutta.
2. *Surgery of Intracranial Vascular Lesion*
   by Dr. B. Ramamurthi, Madras.
3. *Tumours of the Testis*
   by Dr. E. J. Borges, Bombay.

Besides this, a few short papers will also be read at the Conference. Further details about the Conference will be announced later.

* * *

Subjects for discussion at future meetings

20th Meeting:

1. *Acquired Facial Defects*
   by Dr. M. Mukherji, Calcutta.
2. *Hydronephrosis—Experimental and Clinical Studies*
   by Dr. B. N. Balakrishna Rao, Gwalior
   and Dr. A. E. deSa', Bombay.
3. *Cysts of the Lung*
   (i) Hydatid Cyst of the Lung—
   by Dr. S. K. Sen, New Delhi.
   (ii) Cystic disease of the Lung—
   by Dr. P. K. Sen, Bombay.

21st Meeting:

1. *Place of Vascular grafts in Obliterative vascular disease*
   by Dr. R. Nigam,
   & Dr. V. V. DaSilva.
2. *Uses of Radio-active Isotopes in Surgery*
   by Dr. Miss P. Parvathi,
   & Dr. S. R. Mukherjee.

INSTITUTE OF POST GRADUATE MEDICAL EDUCATION & RESEARCH

244, Lower Circular Road, Calcutta 20

June 15, 1957.

THORACIC SURGERY SECTION

The Hony. Secretary, Thoracic Surgery Section of the Association of Surgeons of India writes:

A sectional meeting of the Thoracic Surgery Section of the Association of Surgeons of India would be held in New Delhi about the middle of November 1957.

Dr. S. K. Sen is making the local arrangements for this meeting and information about accommodation and other details can be obtained from Dr. Sen at the following address:

Dr. S. K. Sen, F.R.C.S.E.,
Dr. Sen's Nursing Home,
Hardinge Bridge,
NEW DELHI.

All Surgeons interested in Thoracic Surgery are cordially invited to attend this inaugural meeting and to take part in its deliberations.

It is intended that this meeting would last 2 days and that it would be intensively devoted to scientific discussions.

It is also notified for general information that any member of the Association of Surgeons of India who is interested in Thoracic Surgery and who is doing appreciable amount of Thoracic surgical work can enrol himself as a member of the Section and should apply to the Honorary Secretary for enrolment.

A. K. BASU,
Honorary Secretary,
Thoracic Surgery Section,
Association of Surgeons of India.

CONTRIBUTORS—June, 1957

1. Dr. R. H. Betts, M.D., F.A.C.S.,
   Dr. T. Thomas, M.B.B.S., &
   Dr. N. Gopinath, M.B.B.S., T.D.D.,
   Dept. of Thoracic Surgery, Christian Medical College Hospital, Vellore (S. India).

2. Dr. A. K. Basu, M.S., F.R.C.S. (Eng.), F.A.C.S., Director, Dept. of Surgery, Institute of Post-Graduate Medical Education and Research, 244, Lower Circular Road, Calcutta-20.

3. Dr. Rebati Dutta-Choudhuri, Pathologist, Chittaranjan Cancer Hospital, Calcutta.

4. Dr. N. B. Roy, M.B., D.M.R.T., R.C.P.&S., Professor of Radio-therapy Medical College, Calcutta.

5. Dr. B. B. Ohri, M.S., F.R.C.S., Professor of Surgery, Medical College Indore, &
   Dr. Krishnamoorthy, M. Y. Hospital, Indore.

6. Dr. B. Ramamurthi, M.S., F.R.C.S.E., F.I.C.S., Neuro-surgeon, Govt General Hospital, Madras (2nd Main Road, C.I.T. Colony, Mowbrays Road, Madras-4).

7. Dr. K. D. Koshal, M.B.B.S. (Pb.), F.R.C.S. (Eng.), Reader in Surgery,
   Dr. B. P. Saxena, M.D., Ph.D. (Lond), Professor of Pathology, &
   Dr. J. N. Monga, M.D., Lecturer in Pathology,
   G. R. Medical College, Gwalior (M.B.).

8. Dr. (Miss) M. Chaudhuri, F.R.C.S. (Eng.), Professor of Surgery, Lady Hardinge Medical College Hospital, New Delhi.

9. Dr. D. J. Reddy, M.D., Principal & Professor of Pathology,
   Dr. K. Gopalakrishniah Gupta, M.B.B.S., Tutor in Pathology,
   Dr. T. Suryaprakasa Rao, M.B.B.S., Tutor in Pathology, &
   Dr. C. Ethirajulu, M.S. (Orth.), Lecturer in Orthopaedics,
   Guntur Medical College, Guntur.

10 Dr. Pritam Das, M.S., F.R.C.S. (Eng.), F.A.C.S., Surgeon, Medical College, Lucknow (now Professor of Clinical Surgery, G.S.V.M. Medical College Kanpur-U.P.).

11. Dr. R. B. Karkhanis, M.S., Chief Medical Officer, N. M. Wadia Charitable Hospital, Sholapur.

12. Dr. M. P. Pai, M.S., F.R.C.S. (Eng.), Dept. of Surgery, Assam Medical College, Dibrugarh (Assam).

13. Dr. D. J. Reddy, M.D., Professor of Pathology & Principal,
   Dr. K. Gopalakrishniah Gupta, M.B.B.S., Tutor in Pathology,
   Dr. K. R. Venkiah B.Sc., M.B.B.S., Tutor in Pathology, &
   Dr. Y. Ramachandra Reddy, M.D., Lecturer in Paediatrics,
   Guntur Medical College, Guntur.