

The
Indian Journal of
Surgery

1957.

February - 19-1



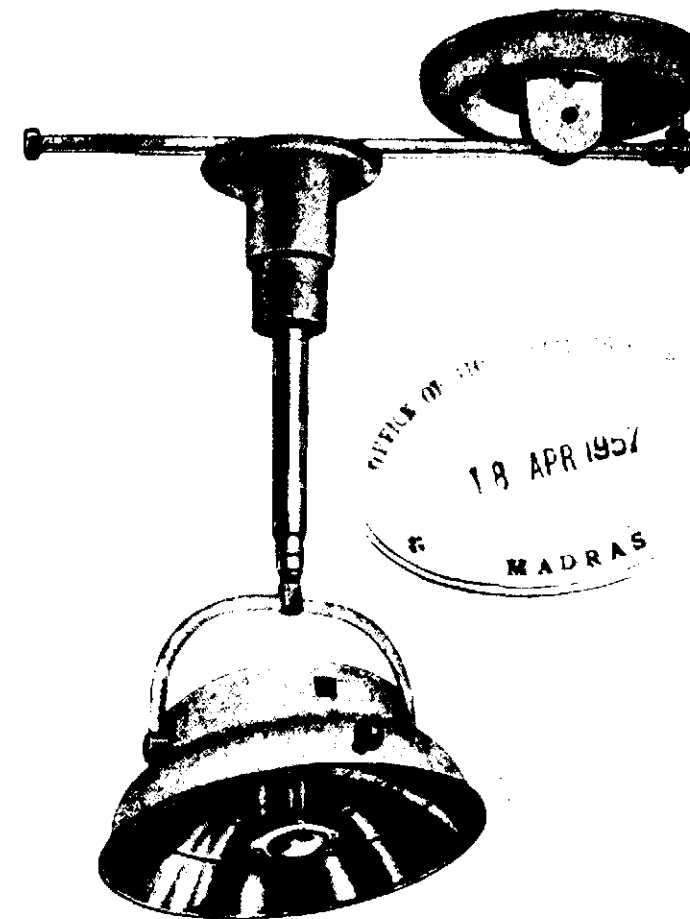
JL
L: 4:7m2, N40
N57.19.1
92726

The ³⁴¹/₂₋₅₇
Indian Journal of
Surgery



Vol. XIX] FEBRUARY 1957 [No. 1

B E L A 341-
SHADOWLESS OPERATING LAMP 51
(GERMAN MAKE) 818



Owing to its excellent shape and construction, the BELA Operation Lamp comply with the demands of experienced physicians and surgeons and are

- * free from dazzle,
- * do not cause undue shading
- * or heat
- * may be adjusted in any direction
- * and easily cleaned,
- * supply a powerful light
- * and, finally, assure a perfect lighting and relief of the operating field.

THE DIAMETER OF THE REFLECTOR IS 21½ INCHES

IT HAS ROTATABLE AND SLIDING MOVEMENT

SOLE DISTRIBUTORS :

H. MUKERJI & BANERJEE SURGICAL PRIVATE LTD.

39 1, COLLEGE ST., (Regd. Office)
CALCUTTA - 12.

and at

ASUTOSH BLDG., (Cal. University)
CALCUTTA - 12.

new improved **ANACAP** surgical silk
is *5 ways better* than ever before:

- greater tensile strength
- absolute non-capillarity
- easier handling
- withstands repeated sterilization
- more economical

New improved ANACAP Silk makes hemostasis more certain. Vessels are quickly ligated because ANACAP Silk handles easily and ties readily into firm non-slipping knots.

Available with swaged-on Atraumatic needles designed for every surgical use, or without needles, in tubes and reels.

AMERICAN CYANAMID COMPANY
SURGICAL PRODUCTS DIVISION
DANBURY, CONNECTICUT, U.S.A.

Distributors:
BOMBAY SURGICAL CO., New Charni Road, Bombay-4.

THE INDIAN JOURNAL OF SURGERY

EDITORIAL BOARD

CHAIRMAN

K. G. PANDALAI (Madras)

Jr. EDITORS

C. P. V. MENON (Madras)

S. R. JOGLEKAR (Bombay)

MEMBERS

K. S. NIGAM (Lucknow)
L. M. BANERJI (Calcutta)
V. R. MIRAJKAR (Bombay)
B. N. SINHA (Lucknow)
S. S. ANAND (Amritsar)
V. R. KHANOLKAR (Bombay)
B. N. BALAKRISHNA RAO (Gwalior)
R. NIGAM (Nagpur)
S. N. MATHUR (Lucknow)
S. K. SEN (Delhi)

R. H. BETTS (Vellore)
K. S. GREWAL (Amritsar)
M. V. RAMANAMURTHI (Mangalore)
A. K. BASU (Calcutta)
V. P. MEHTA (Bombay)
C. L. MODI (Hyderabad)
R. MAHADEVAN (Madras)
D. S. IYER (Madras)
A. E. DeSAI (Bombay)
S. P. SRIVASTAVA (Agra)

EDITOR (Orthopaedic Section)

N. S. NARASIMHAN (Madras)

EDITORIAL SECRETARY

C. S. SADASIVAN (Madras)

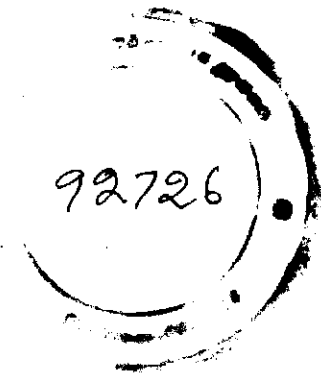
FEBRUARY, 1957

BI-MONTHLY

Annual Subscription Rs. 24

Balance

IN ANAESTHESIA...



... WITH
'INTRAVAL' SODIUM
trade mark brand
THIOPENTONE SODIUM

... the most convenient, effective and rapid agent for induction of anaesthesia

Also
'FLAXEDIL'
trade mark brand
GALLAMINE TRIETHODOLE

... the medium-acting synthetic muscle relaxant

M&B Brand Medical Products
Detailed literature available on request



MANUFACTURED BY
MAY & BAKER LTD

MA1475-19

Supplies

'INTRAVAL' SODIUM Boxes of 6 x 0.5 Gm. and 6 x 1 Gm. ampoules (with ampoules of water for Injection).

'FLAXEDIL' Boxes of 10 x 2 c.c. ampoules.

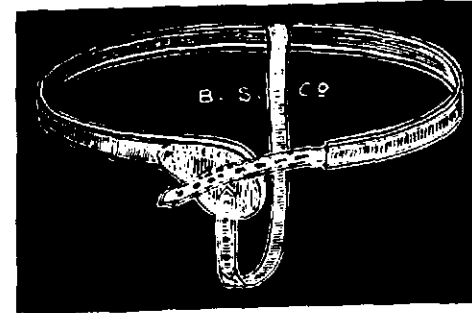
Photograph by courtesy of Berram Mills Circuit Ltd.

Distributors:

MAY & BAKER (INDIA) PRIVATE LTD
BOMBAY - CALCUTTA - GAUHATI - MADRAS - NEW DELHI

"Surgico" HERNIA TRUSSES

Trusses made by "Surgico" are perfectly designed, efficient, combined with lightness and strength. They can safely be relied upon to hold securely and comfortably and to give satisfactory results as they are made to order to the particular requirements of the patients. State the approximate size of the hernia, also the type, as inguinal, scrotal, femoral etc., "Surgico" trusses are approved patterns made of flexible steel spring frames as follows:—



"Surgico" Truss made of soft durable brown leather with inguinal pad.

- A - Covered with strong durable leather, or
- B - Soft chamois leather, or
- C - Waterproof material for bath (impervious to perspiration) or
- D - Velvet for the orthodox patients, or those who object to leather.

Made to order according to prescription, the specific type of appliance. Be sure to state the size in inches, and if the truss is to be used for right or left or double hernia. Some cases require only light support, others all the pressure that a spring truss can afford.

"Surgico" ABDOMINAL SELF-REDUCING BELT

All Abdominal Belts are made to order by skilled workmen out of best materials.

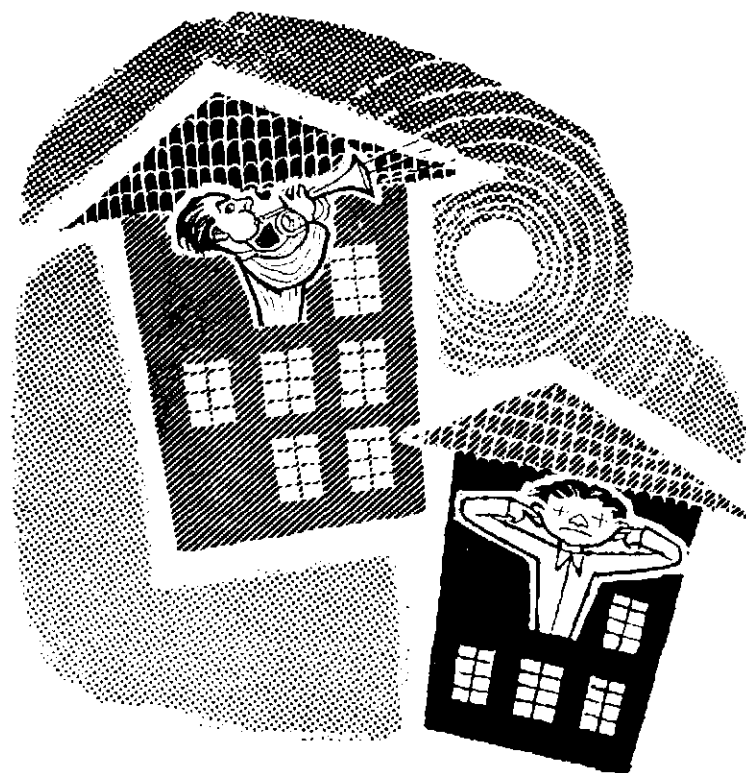


Telegrams: "SURGICO".

Phone: 71726.

For full Particulars write to:

BOMBAY SURGICAL CO.
NEW CHARNI ROAD :: BOMBAY-4.



even music . . . has unexpected side-effects . . .

but PREDNISOLONE Dumex has NONE!

PREDNISOLONE Dumex is a synthetic analogue of hydrocortisone. It marks the onset of a NEW ERA in corticosteroid therapy.

Why? How?

Well, to begin with, it is free from the usual major undesirable side-effects of previously used corticosteroids even though it is three to five times more effective. Therapy with this preparation is significantly free from electrolyte and water disturbances and yet possesses most potent anti-inflammatory, anti-rheumatic and anti-

allergic properties.

This means that therapy with PREDNISOLONE Dumex is most satisfactory.

In fact, PREDNISOLONE Dumex is BY FAR the most potent of the recently introduced corticosteroids. PREDNISOLONE Dumex is available in bottles of 10 tablets, each tablet containing 5 mg. Delta-1-Hydrocortisone.

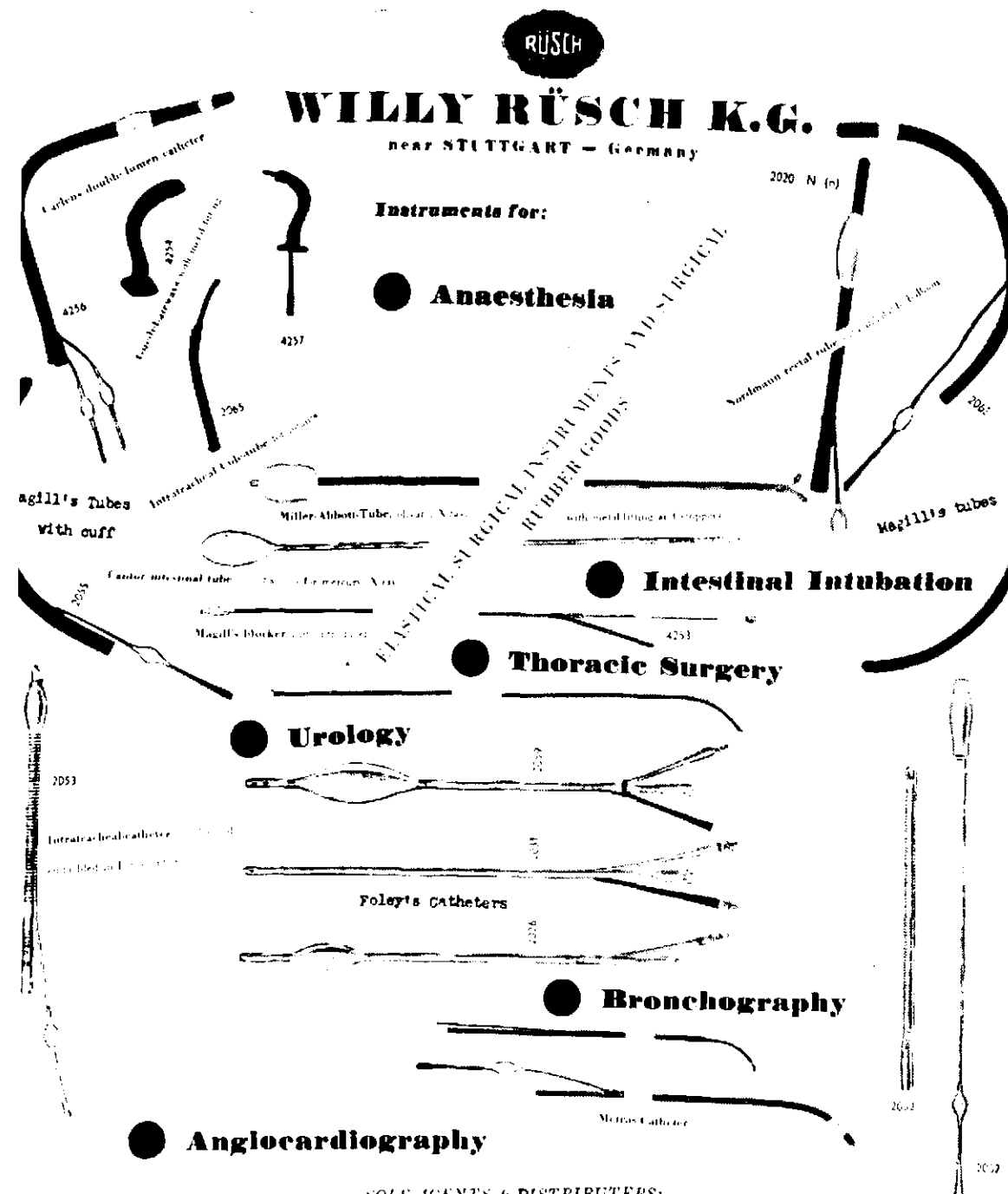
Also available:

Hydrocortisone Dumex Tablets
Hydrocortisone Intra-articular Dumex
Hydrocortisone Fortified Dumex Ointments
Prednisone Dumex

Full details from:

DUMEX PRIVATE LIMITED

Wavell House, Ballard Estate, Bombay-1



SOLE AGENTS & DISTRIBUTERS:

B. Mohanlal & Co.

Office:
414, Kalbadevi Road,
BOMBAY-2.

Showroom:
Anand Bhuvan, 1st Floor,
Princess Street,
BOMBAY-2.

Factory Representative: THOMAS SUCK, P.B. No. 1414, Bombay-1.

Parry's

Keep Pace
With the march
of medicine

WITH A WIDE RANGE OF
PHARMACEUTICALS &
SURGICAL REQUISITES:

FOR DISTRIBUTION
TO THE TRADE,
MEDICAL PROFESSION
AND INSTITUTIONS:

PARRY & CO. LTD.,

MADRAS P. B. No. 12
CALCUTTA P. B. No. 208
BOMBAY P. B. No. 506
NEW DELHI P. B. No. 172

Parvate

**HINDUETHAN
ANTIBIOTICS**



SURGICOM

Antibiotics :
Chemotherapeutics :
Haematinics :
Vitamins :
(Distributors
in Southern &
Eastern India)

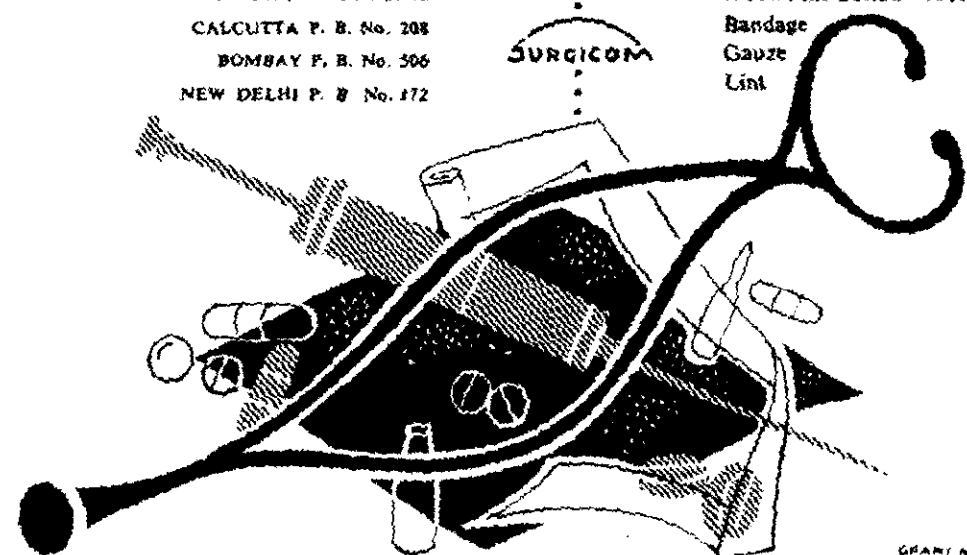
Penicillin -
Crystalline and
Procaine
Bicillin

Shark Liver Oil :
Adamin Liquid
and Capsules

Surgical Ligatures :
Catguts
Mersutures
Mersilk
Mersilene

Adhesive Plasters
& Elastic
Bandages :
Leukoplast
Leukoplastic
Handyplast

Absorbent Cotton Wool
Bandage
Gauze
Lint



The Indian Journal of Surgery

Vol. XIX

No. 1

CONTENTS FEBRUARY 1957

ORIGINAL PAPERS

The Importance of a Uniform Clinical Classification and staging of Carcinomas of the Upper Digestive Tract	J. C. Paymaster	1
Urinary Calculi and the method of their formation.	L. B. Joshi	7
Pancreatico-Duodenectomy for Carcinoma of the Head of Pancreas	A. K. Sen, Tapas Das Gupta and H. Pyne	20
Appendicectomy in the Treatment of Chronic Resistant Intestinal Amoebiasis	S. L. Malhotra	28
Dermatoplasty in the Cure of Incisional Hernia	Miss Anjali Mukherji	32
Solitary Plasmocytoma of Dorsal Vertebra	S. P. Srinastava and K. S. Mathur	39
Hydatid Cyst of the Spleen	A. R. Rao and V. Balasubramanian	42
A Case of Recurrent Lumbar Hernia through Petit's Triangle	A. K. Dutta Gupta	47
The Application of Split Skin Grafting to some Surgical Problems	H. W. Williams	50
Adenoma of the Liver	D. Bhaskara Reddy and C. R. R. M. Reddy	57

ORTHOPAEDIC SECTION

Tuberculosis of the Spine	B. Mukhopadhyaya and N. K. Mishra	59
Contributors' Addresses		81
Index to Advertisers		3rd Inside cover

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.

U. D. TETANUS & GAS GANGRENE ANTITOXINS (CONCENTRATED)

OFFER:—

1. UNIFORM POTENCY
2. MAXIMUM DEPENDABILITY
- AND
3. MINIMUM POSSIBILITY OF REACTIONS

Available in appropriate packings for both therapy and prophylaxis

UNION DRUG CO. LTD. CALCUTTA.

285, BOWBAZAR STREET.

Telephones:
BANK 7211
" 1901

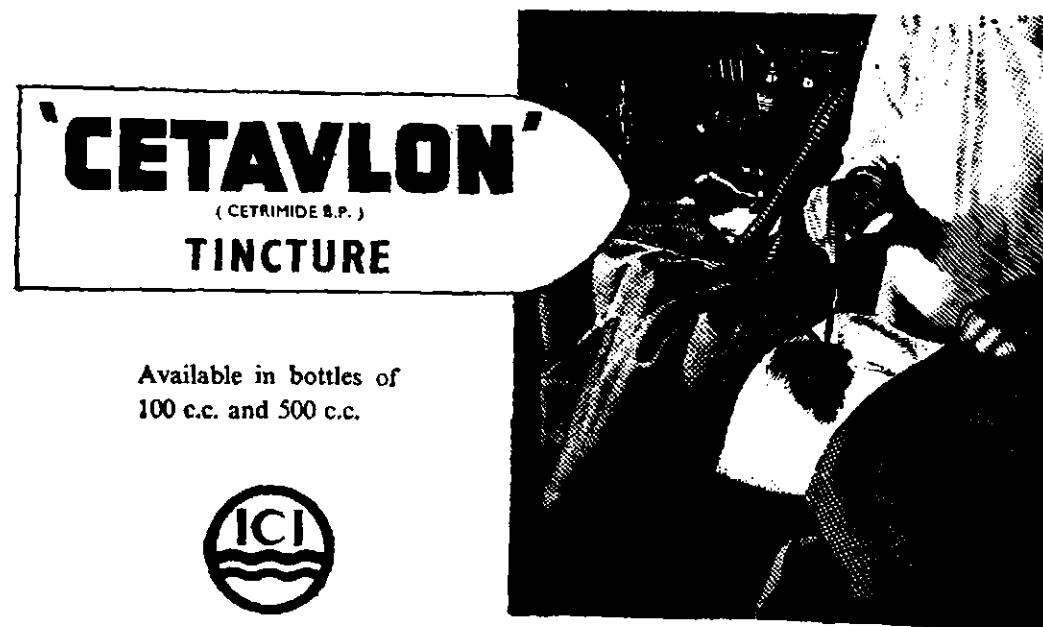
Madras Depot
"SAKKAR MANSION"
2, Jones Lane, MADRAS-1
Phone: 55172

Telegrams:
"BENZOIC" Calcutta

in pre-operative skin sterilisation...

Foremost among modern antiseptics, 'Cetavlon' finds numerous applications in surgery because of its powerful and persistent bactericidal action.

'Cetavlon' Tincture is a non-toxic, non-irritant formulation, particularly valuable for pre-operative sterilisation of the intact skin. It is coloured red, so that when applied to the skin it defines clearly the site of operation.



Available in bottles of
100 c.c. and 500 c.c.



Literature and further information available on request.

IMPERIAL CHEMICAL INDUSTRIES (INDIA) PRIVATE LTD.

Calcutta Bombay Madras New Delhi

Sole Distributors in India for

**IMPERIAL CHEMICAL INDUSTRIES LIMITED, PHARMACEUTICALS DIVISION
WILMSLOW, CHESHIRE, ENGLAND**

ICP 475

THE INDIAN JOURNAL OF SURGERY

Vol. XIX

FEBRUARY 1957

No. 1

THE IMPORTANCE OF A UNIFORM CLINICAL CLASSIFICATION AND STAGING OF CARCINOMAS OF THE UPPER DIGESTIVE TRACT *

by J. C. PAYMASTER, Bombay.**

The object of this short paper is to stress the importance of a uniform classification of carcinomas which occur in the region of the upper digestive tract. It is well known that these carcinomas are extremely common in our country for reasons hitherto unknown. The magnitude of this problem is bewildering when one realises that these carcinomas account for almost half the number of all the carcinomas observed at the Tata Memorial Hospital in Bombay. Observers in Western countries do not see much of this form of cancer and they quote the incidence of this disease as varying from 5 to 10 per cent of all carcinomas. It appears, therefore, that this form of disease is our own indigenous problem, associated with certain peculiarities, which we alone can appreciate, and unless we study the problem ourselves in a systematic manner, there shall be very little progress.

In the upper digestive tract there are several anatomical structures, from which a carcinoma could develop, and this would be of the squamous cell variety. A close observation of a large number of such carcinomas has shown that although they have more or less the same histological structure, they possess different biological characters regarding the degree of malignancy, the type of local and distal spread, and the response to a particular mode of therapy. Consequently there is a variation

in the prognosis of this disease in different anatomical sites.

A classification of practical value would therefore be one in which these carcinomas could be assembled into groups presenting almost identical behaviour. At the Tata Memorial Hospital during a period of 10 years (1941-1950) 8,100 cases with positive histological evidence of a carcinoma were observed to occur in the upper digestive tract. We divided them into three groups, namely, the carcinomas in the region of the oral cavity, the oropharynx and the hypopharynx. A glance at (Fig. 1) presents several important points. The first thing that strikes the eye of an observer is that only six anatomical structures are included in this group of oral carcinomas. They are the lips, the floor of the mouth, the alveoli, the hard palate, the anterior two-thirds of the tongue and the buccal mucosae. These structures are grouped together, with a definite purpose. Carcinomas which develop in them have certain common characteristics. They are composed of well differentiated squamous cells, and their local spread is comparatively slow. Rarely an anaplastic carcinoma is seen to occur in this site. Cervical metastases occur later in the course of the disease and bilateral metastases are infrequent, unless the primary disease has advanced and has crossed the midline. The mode of therapy is almost uniform in majority of these carcinomas.

This classification also affords a rapid visual analysis of the incidence of cancer in different anatomical sites. One sees con-

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

** Department of Surgery, Tata Memorial Hospital, Bombay.

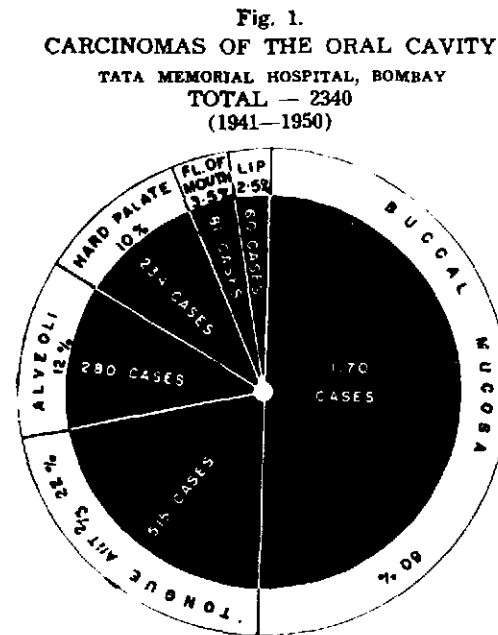
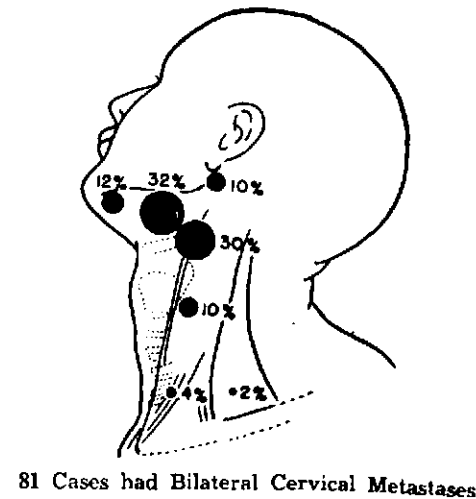


Fig. 1-A.
TATA MEMORIAL HOSPITAL, BOMBAY
DISTRIBUTION OF CERVICAL METASTASES
IN 500 CASES
OF ORAL CARCINOMA



vincingly that 50 per cent of cancer in the oral cavity is in the buccal mucosa. The least affected is the lip (2.5% of the total). In between, in gradually ascending order in numbers is the floor of the mouth, the hard palate, the alveoli and the anterior two-thirds of the tongue. Such a marked difference in the frequency of the disease in different sites has given a stimulus to an enquiring mind to probe into its causes. It is more than a mere probability that the habit of chewing betel-nut with slaked lime and tobacco and retention of this bolus into one of the gingivo-buccal sulci for many hours of the day plays a significant role in the production of buccal cancer. At the same time it should be admitted that this is not the only cause. In contrast to the small incidence of cancer in the lip in Bombay, the incidence of this cancer in Bihar is as high as 40 per cent. Again, the action of tobacco and slaked lime is said to be responsible for this Khaini cancer.

A word regarding the treatment of oral carcinomas will not be out of place at this

juncture. An early carcinoma of the oral cavity could be very successfully treated either by radiotherapy or by surgery, depending upon the experience of the individual as well as on the facilities afforded by the institution. The usual controversy of surgery versus radiotherapy should be condemned; their roles are often complementary and not competitive. Of course, there are certain locations in the oral cavity where surgery is preferred to radiotherapy. The well known examples are the carcinomas of the hard palate in which there is involvement of the bone and some of the carcinomas of the buccal mucosae with invasion of the mandible. It has been observed that carcinomas of the floor of the mouth do not respond well to radiotherapy and hence surgery has been employed more often with success.

A little over a decade ago, advanced oral cancers were given up as hopeless problems. Nothing more than a palliative course of radiotherapy was administered to them, and in many instances it was a mere placebo. To-day, due to advancement

Fig. 2.
CARCINOMAS OF THE OROPHARYNX
TATA MEMORIAL HOSPITAL, BOMBAY
TOTAL — 3600
(1941—1950)

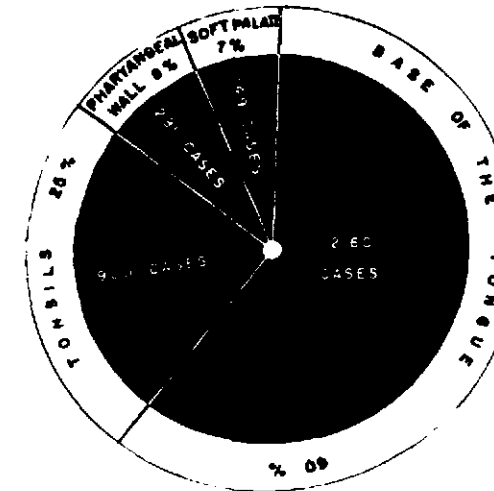
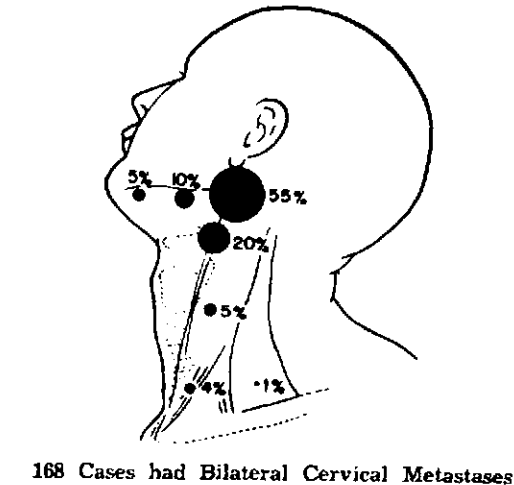


Fig. 2-A.
TATA MEMORIAL HOSPITAL, BOMBAY
DISTRIBUTION OF CERVICAL METASTASES
IN 500 CASES
OF OROPHARYNGEAL CARCINOMA



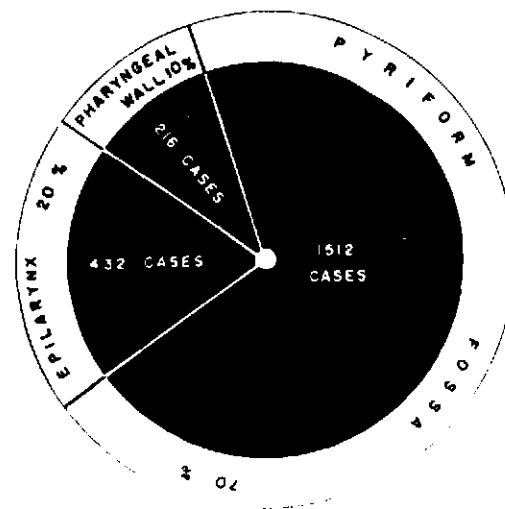
in surgical technique, improved methods in anaesthesia and unrestricted facilities for blood transfusions and antibiotics, major surgical procedures are being adopted with salvage of certain percentage of these cases.

The cervical metastases deserve a brief discussion. On each side of the neck the lymph nodes are aggregated into seven main groups (Diag. B). Metastatic deposits could occur in any one or more of them, from a primary carcinoma situated anywhere in the region of the head and neck. For small sized, mobile, metastatic lymph nodes on one side of the neck, the treatment of choice is a radial neck dissection. However, experience has revealed that when there is gross metastatic disease in the lymph nodes situated beneath the posterior belly of the digastric muscle (Diag. B No. 3), in spite of a meticulous neck dissection, recurrence of the disease is frequent. When there are metastatic lymph nodes in the supraclavicular region the chances of a permanent cure are remote. (Fig. 1-a) indicates that cervical

metastases from oral carcinomas occur more often, than not, in favourable positions to effect a cure by a radical neck dissection. Compared with other sites the prognosis of carcinoma in the oral cavity is quite favourable, provided the disease is not in an advanced stage.

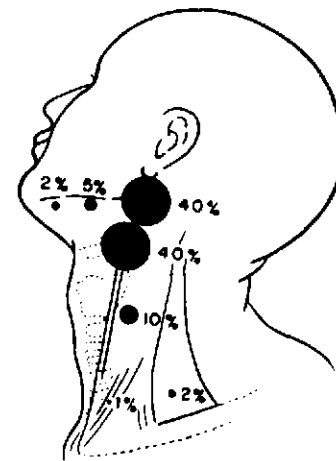
(Fig. 2) is constructed on the same basis as the previous one. It brings out certain facts in their true perspective. Carcinomas in the region of the oropharynx are well known for their high degree of malignancy and rapid growth, both local and metastatic. So rapid is the rate of growth in some of the carcinomas which arise in the base of the tongue, tonsils and the fauces that sometimes, in a matter of weeks the end proves fatal. The lymph node metastases in the neck also follow a slightly different pattern from those of the oral cavity (Fig. 2-a). The posterior and superior groups of lymph nodes are often affected, particularly the superior group of the deep cervical chain. Although carcinomas of the soft palate and the pharyngeal wall are not so rapid in growth, yet in them the cervical

Fig. 3.
CARCINOMAS OF THE HYPOPHARYNX
TATA MEMORIAL HOSPITAL, BOMBAY
TOTAL — 2160
(1941—1950)



metastases occur early and more frequently and follow the pattern observed in carcinomas of the base of the tongue and the tonsil. The very high incidence of carcinoma of the base of the tongue lends food for thought and serves as an incentive to a research worker. Why is the disease so common in the base of the tongue? As yet we have no answer to it; but we do know that it occurs most frequently in Hindu Gujarati males. The inaccessibility of structures in the oropharynx, together with the highly malignant nature of the carcinoma and its local and cervical spread, render surgical procedures impracticable and inefficient to control the disease. Once in a way a surgeon may be able to eradicate an early carcinoma in the oropharynx by the use of a scalpel or a thermo-cautery, but this would be an exception and not the rule. Radiotherapy is the treatment of choice for carcinomas in the region of the oropharynx. Moreover, the position of the primary disease and the cervical metastases is such that both of them could be treated simultaneously through suitable external ports of radiation.

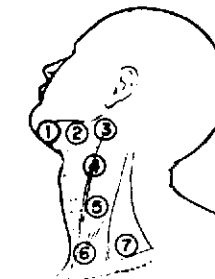
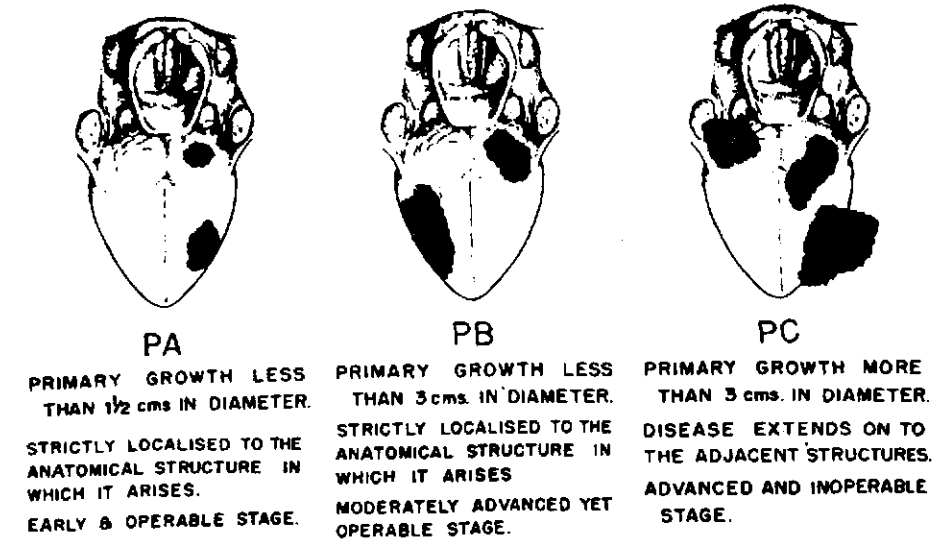
Fig. 3-A.
TATA MEMORIAL HOSPITAL, BOMBAY
DISTRIBUTION OF CERVICAL METASTASES
IN 500 CASES
OF HYPOPHARYNGEAL CARCINOMA



143 Cases had Bilateral Cervical Metastases

(Fig. 3) represents the distribution of carcinomas in the hypopharynx. The latter is made up of a group of structures called the epilarynx situated in the centre, with a pyriform fossa on either side and the pharyngeal wall behind. Hypopharyngeal carcinomas are composed of well differentiated squamous cells and are less rapid in growth locally. They almost resemble those which arise in the oral cavity. It is evident from (Fig. 3) that 70 per cent of carcinomas in the hypopharynx are located in one of the pyriform fossae, a treacherous spot for cancer to occur. The disease develops and grows silently without any symptoms and because of rich lymph drainage the cervical lymph node metastasis is often the first sign. Hypopharynx is a narrow structure and the malignant disease, in a short space of time, creeps over to the opposite side giving rise to bilateral cervical metastases. This fact has an important bearing on the mode of therapy. A carcinoma which has already spread far and wide to the superior group of the deep cervical chain is considered unsuitable for surgery; more so, if the

DIAG. A
PRIMARY GROWTH (P)



DIAG. B
SITE OF METASTASES

1. The submental group of lymph nodes.
2. The submaxillary group of lymph nodes.
3. The superior group of the deep cervical chain of lymph nodes.
4. The jugulo-digastric group of lymph nodes.
5. The mid-cervical group of lymph nodes.
6. The anterior supra clavicular group of lymph nodes.
7. The posterior supra clavicular group of lymph nodes.

metastatic spread is bilateral (Fig. 3-a). Once again radiotherapy becomes the treatment of choice for carcinomas of the hypopharynx. However, the small group of epilaryngeal carcinomas deserve a brief

discussion. They are slow in growth and give rise to symptoms early in the course of the disease. Situated in the central part of the hypopharynx and being in intimate contact with cartilagenous structures they are difficult to be treated with radiotherapy. Necrosis of the cartilage with severe pain is the commonest complication. In an attempt to avoid this complication some surgeons advise total laryngectomy.

Attempts have been made by observers to stage the spread the disease in the regions of the oral cavity, the oropharynx and the hypopharynx; but none of the methods suggested so far have met with unanimous approval. The reasons are that they are either too complicated and time-consuming for a busy clinician or that they are incomplete in certain important details. Since these carcinomas are extremely common in our country it is but natural that we are in a more suitable position to suggest a simple, practical method of staging the disease.

The following requirements are most essential for the purpose of staging the



DIAG. C

SIZE AND EXTENT OF THE METASTASES(M)

Ma. Metastatic mass less than 1½ cms. in diameter.

Metastatic lymph nodes mobile. Early and operable stage.

Mb. Metastatic mass less than 3 cms. in diameter.

Metastatic lymph nodes moderately enlarged and not fixed. Moderately advanced yet operable stage.

Mc. Metastatic mass more than 3 cms. in diameter.

Metastatic lymph nodes hard and fixed. Advanced and inoperable stage.

STAGING OF THE DISEASE

Clinical

Stage I—PA—M
PB—M

Clinical

Stage II—PA+1 or 2 or 3 or 4 or 5 or 6 or 7 Ma
PA+1 or 2 or 3 or 4 or 5 or 6 or 7 Mb
PB+1 or 2 or 3 or 4 or 5 or 6 or 7 Ma
PB+1 or 2 or 3 or 4 or 5 or 6 or 7 Mb

Clinical

Stage III—PA+1 or 2 or 3 or 4 or 5 or 6 or 7 Mc
PB+1 or 2 or 3 or 4 or 5 or 6 or 7 Mc
PC+1 or 2 or 3 or 4 or 5 or 6 or 7 Mc
PC+1 or 2 or 3 or 4 or 5 or 6 or 7 Ma
PC+1 or 2 or 3 or 4 or 5 or 6 or 7 Mb
PC—M (Rare)

Bilateral Cervical Metastases.
Distal Metastases.

disease: First an accurate estimate of the size and extent of the primary growth is obtained by using the symbols PA, PB and PC as indicated in (Diag. A). Secondly, the position of the metastases in the neck is indicated by numerals 1 to 7 as in

(Diag. B). The importance of the site of metastases in the neck has already been fully discussed. Lastly, the size and extent of the metastatic mass in the neck is denoted by Ma, Mb and Mc as in (Diag. C). A combination of these symbols gives the clinical stage of the disease.

In clinical stage I there are no known metastases anywhere in the body.

The clinical stages are indicated in the accompanying diagram.

It will not be out of place to mention here some of the objections raised against this method of staging:

- (1) That all anatomical structures are not of the same size.
- (2) That same anatomical structures vary in size in different individuals.
- (3) That associated inflammation may give a false impression of the size and extent of the lesion.
- (4) That palpable cervical lymph nodes may not be metastatic on histological examination.

Our answer to these objections is that in a clinical method of staging the disease, a small percentage of error is bound to creep in and experience alone could minimize this error.

From this short paper it is quite evident that a uniform classification is most essential. It enables observers to collect data in a uniform manner which permits accurate comparison. The marked difference in the incidence of the disease in different anatomical sites gives food for thought and research. The grouping of carcinomas presenting identical biological behaviour proves to be of great value in teaching the students who are interested in Oncology and in planning out a uniform line of treatment. Such a classification also helps in the prediction of prognosis. Lastly, unless the disease is accurately classified in stages a proper evaluation of a particular mode of therapy cannot be obtained.

Received for publication on 30-1-57.

URINARY CALCULI AND THE METHOD OF THEIR FORMATION

by L. B. JOSHI, Poona.

Urinary calculi, an extremely old problem, still remain a mystery, particularly regarding the etiology.

My last paper on the subject showed that the percentage of urinary calculi in the population of a locality varies directly with the percentage of temporary hardness of water in the area.

The present paper is a study of the architecture of the calculus. The standards and specifications of the building material, their designs and methods of construction, are considered.

Inorganic cell contents in plants:

Urinary calculi occur in all vertebrates, and we get structures allied to urinary calculi, even in plants. These are neither called calculi nor do they have any pathological bearing like urinary calculi.

Oxalates in plants:

Calcium Oxalate crystals are seen in plants. They display themselves in different patterns. The envelope shaped crystals, the dumbbell formed crystals and the long or short needles are all found in various plants. Like crystals in the calculi, these plant crystals remain unchanged on drying.

Non-living inorganic cell contents in plants (Fig. 1):

1. Raphides:— Composed of calcium oxalate. These are needle shaped and are freely situated or enclosed in a sac.

These dissolve in HCl only, and do not dissolve in acetic acid. Found in leaves of Nerium, Arum, Pistia (water plant).

2. Sphaeraphides:— Composed of calcium oxalate. These are with smooth surface, i.e. simple, or with spiny surface, i.e. compound.

These dissolve in HCl only, and do not dissolve in acetic acid. Found in petiole of Begonia leaf.

3. Cystolith:— Composed of calcium carbonate. It has got a stalk of organic material, cellulose. It looks like a bunch of grapes, with a spiny surface. It dissolves in HCl with evolution of bubbles, and also dissolves in acetic acid. The stalk however remains. Found in leaf of India rubber plant (Ficus Sp.).

Calculi can be produced in experimental animals and the crystals, in the laboratory.

Experimental production of calculi in laboratory animals:

(a) McCarison⁷ working on white rats showed the relation of urinary calculi to vitamin A deficiency. In the present work, calculi failed to develop, unless the diet, deficient in Vitamin A was supplemented by excess of absorbable calcium.

(b) Rosenow¹² selected bacterial strains from patients with urinary calculi, and

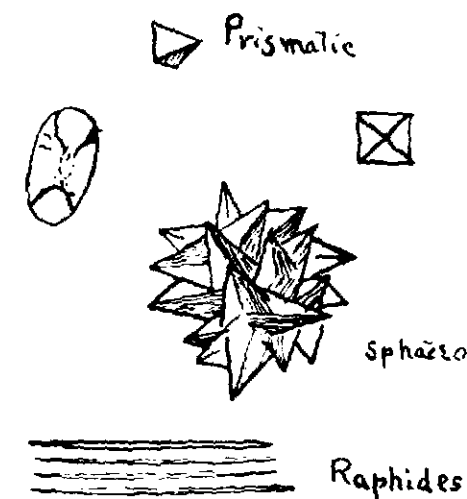


Fig. 1.
Oxalate Crystals in plants.



Fig. 2.

Green grass and 1 gram of Oxamide daily.

used dogs for his experiments. The bacterial strains were injected intravenously, or were implanted in the tooth socket. These animals developed urinary calculi.

There were difficulties in repeating this experiment. Organisms from calculi proper are dead, and do not grow. Implantations of selected bacteria in the tooth sockets were performed on three dogs and intravenous injections were given to six pups. These animals were fed on normal diet, and were killed six months later. On post-mortem, there were no calculi.

(c) Greta Hammerston, Ebstein, Keyser produced oxamide calculi in rabbits. This work was repeated. Metabolic cage was used for the collection of rabbits' urine. The diet of one set of rabbits was green grass and 1 gram of oxamide daily. The other group had 2 grams of calcium lactate, Vitamin D, 1 gram of oxamide, besides green grass. The first group remained unaffected by the poison (Fig. 2). The health of the second batch deteriorated and they passed oxamide gravel in the urine (Fig. 3).

Deficiency of vitamin A or excess of vitamin D devitalizes the mucosa of the urinary tract. The mucosal injury probably provides the protein (colloid) required for the formation of calculi.

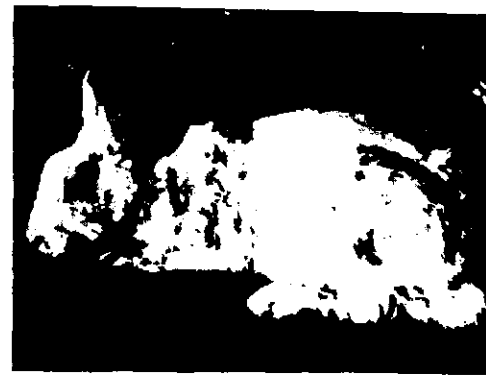


Fig. 3.

Green grass, 1 gram of Oxamide, excess of vitamin D, 2 grams of Cal. Lactate daily.

Attempts to prepare calculi in a test tube have not been successful. Crystals like those in the calculi and in the urine have been prepared in the laboratory.

Preparation of calcium oxalate urinary crystals in the laboratory:

Dr. Junnarker (Assistant Prof. of Path., Med. College, Poona) detected an envelope shaped crystal on the hemocytometer platform. This accidental finding suggested the method of preparing the crystal.

A drop of 1% oxalic acid is added to a drop of fresh blood from a Wintrobe bottle. Under high power the envelope shaped crystals can be watched as they develop. Stale blood from a Wintrobe bottle gives few crystals and none after 48 hours standing. Using unaltered venous blood, fine amorphous powder forms instead of the crystals.

Serum can be used in place of blood. Addition of potassium or ammonium oxalate has always to precede the oxalic acid for the formation of the crystal. Acetate or bicarbonate can be used in place of oxalate of potassium or ammonium. Oxalic acid probably converts the acetate or bicarbonate into oxalate.

The crystals for their formation have to withdraw calcium ions from the blood. Urine, cerebrospinal fluid, blister fluid are protein free filtrates of blood. Crystals can be prepared with ease from these fluids. Apparently, dissolved calcium in the blood is available for the formation of the crystals. From amongst the solutions of various strengths of oxalic acid used, $\frac{1}{2}$ to 1% gave the optimum size and number of crystals. No conclusions could be drawn regarding the optimum pH value. Very big and numerous crystals develop at 37 degrees centigrade.

Crystals so prepared and those occurring in the urine disintegrate on drying, or by bacterial activity. These can be preserved in solutions kept sterile with some anti-septic.

"Urinary calculi are agglomeration of crystals held together by a cement substance." "The crystals which form the calculi are the crystalline form of substances normally found in solutions in the urine."¹⁶

Calculi grow in spite of infection, are unaffected by drying for years, and defy all human efforts at dissolution. Structures of resistant character cannot be built with bricks of unstable crystals.

Preparation of calcium oxalate crystals as in calculi:

Rainy, in 1865, and later Ord and Shattock¹³ did the original work on this problem. They established that colloid matter modifies the crystalline morphology. Ord showed that the non-coalescent crystals of calcium oxalate could be varied to the coalescent form according to the amount of colloid and the salt present. Shattock showed that the coalescent forms formed the structural unit of calculi.

Shattock allowed calcium chloride to act on the oxalic acid through the medium of gelatin in a test tube. It was difficult to repeat the experiment, with gelatin as medium and egg albumen was used instead. The crystals described by the

original authors developed in a few weeks. A study of the morphology and the optical properties of these crystals, shows that these are calcium oxalate monohydrates (Fig. 4).

Crystals from cultures of fungi:

Calcium oxalate crystals can be prepared with the aid of fungi. *Penicillium Notatum* and *Aspergillus Niger* produce oxalic acid as an excretory product.

These fungi were grown on Richard's medium.

Richard's Medium:

KNO ₃	10 gms.
(potassium nitrate)	
K ₂ HPO ₄	5 gms.
(potassium hydrogen phosphate monovalent)	
MgSO ₄	2.50 gms.
(magnesium sulphate)	
Sucrose	50 gms.
Distilled water	1000 c.c.

In the present work calcium phosphate was used instead of potassium phosphate and glucose in place of sucrose.

Three month old cultures showed the envelope shaped crystals of calcium oxalate dihydrate (Fig. 5). Six months later the cultures died out but the crystals which had grown to some size had fused together and could be seen with the naked eye.

Fresh cultures were grown and other constituents added. The addition of urea and hippuric acid helped the formation of crystals. They grew more luxuriantly and larger in size than in the flasks without these additions.

Bacillus Pterfaralis Whitmori grown in broth produces calcium oxalate crystals. Formation of crystalline matter in the culture media is not a special property of the above mentioned organisms. *B. Coli* for instance deposits calcium carbonate crystals, as the medium becomes old (Figs. 6 and 7).



Fig. 4.
Calcium oxalate monohydrate in Egg albumen.



Fig. 5.
Envelop Crystals in cultures of Penicillium Notatum.

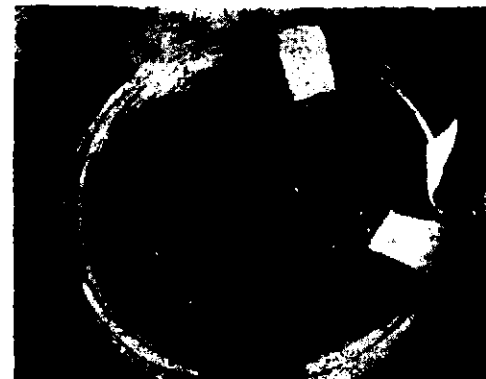


Fig. 6.
B. Coli culture.

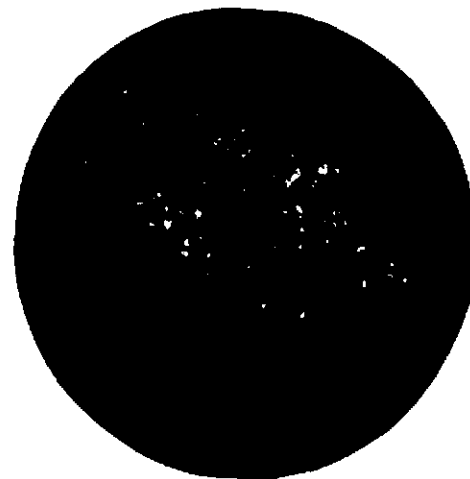


Fig. 7.
Crystals of Calcium Carbonate in the B. Coli culture.

Penicillin gets its oxalic acid from the glucose supplied in the medium. Oxalic acid in the urine comes from the oxalates and ascorbic acid metabolism. The two processes bear some resemblance.

Crystals built by fungi differ from those prepared by mixing oxalated blood and oxalic acid. Those derived from the fungi are stable on drying, do not disintegrate by any infective process and have been kept on a dry microscopic slide for over a year without any change. Crystals forming the

stone in the urinary tract must have some such origin. Association with proteinous matter during the development appears to be essential for the stability of the crystal.

Optical study of stones :

Petrology, a study of calculi with polarised light, is a routine procedure in Geology. During the last 25 years a similar study of urinary calculi has been carried out by several workers. Keyser⁴ of U.S.A. in 1923 wrote his paper on the



Fig. 8.
Salivary Calculus.

subject. Nakano⁸ in the same year described the crystals. M. Pillay⁹ of France 1927, in his article showed pictures of stone sections containing calcium oxalate as seen in polarised light.

J. A. Randell¹¹ in 1942 described the mono- and the dihydrates of calcium oxalates.

Prien and Frondel¹⁰ carried out detailed study of the optical properties of crystals. They give the data of refractive indices, cleavages, extinction angles, etc.

Very little work has been done on the method of development of the crystals and the structural details of the stones. Amor-

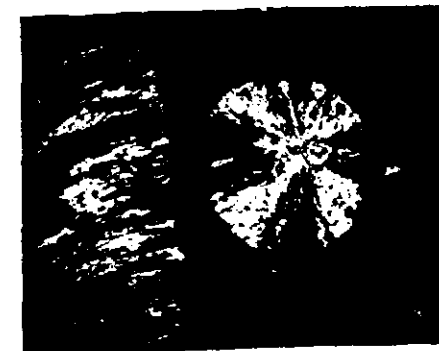
phous calculi cannot be studied by polarised light as they are isotropic (opaque when studied with polarised light). Many urinary phosphatic stones, salivary calculi, rhinoliths fall in this category (Fig. 8). Biliary calculi are usually isotropic. One specimen of biliary calculus revealed long needle shaped crystals arranged in spherical shape as a big sheet (Fig. 9 and 9-A). No attempt has been made here to ascertain the chemical nature of this stone as the present study was primarily for urinary calculi.

Crystals in the urinary calculi :

Oxalates : Calcium oxalate monohydrate and dihydrate can be recognised in crushed specimens (Fig. 10). A third type of oxalate crystal was noted, in association with uric acid stone. It resembles the dihydrate, but the cones on the ends are markedly elongated (Figs. 11 & 12). It may be the trihydrate described by some workers. Glassy crystals and microcrystals are fairly common.

Phosphates : The house top crystals could not be identified in crushed specimens or in the stones. Needle crystals, strewn without any order, present a rough granular appearance (Fig. 13).

Spherulites (spherical arrangement of needles): These appear like stars in sec-



Figs. 9 & 9-A.
Biliary Calculus.



Fig. 10.

Envelope form crystals in crushed gravel from urine.

tions and are fairly common. Sometimes these star spherulites are coloured. Micro-crystals and amorphous forms are seen.

Uric acid: These appear in the calculi as plates, long needles, and granules (Fig. 15).

Uric acid and urates could not be identified by the optical study.

Any of these above mentioned types of stone may be of amorphous type.

Growth of crystals in the calculi:

Crushed gravel of oxalates shows how the envelope shaped calcium oxalate dihydrate crystals arrange themselves methodically as in well built masonry. The



arrangement can be imitated by models, as the same depends on the morphology of the crystal. Similar arrangement is seen in the oxalate crystals in plants or in those derived from fungi.

The crystals of mono- and the dihydrates show growth banding or zoning. (These are rings showing how the crystal has grown.) (Figs. 16, 17 and 18).

The oxalate stones in some sections reveal twinning of the crystals (Fig. 19). The crystals may show parallel growth (Fig. 20). This shows that the growth is according to a plan.

Transformation of the oxalates from one to the other type does not occur in the calculi. A crystal of dihydrate may be surrounded on all sides by crystals of monohydrate and vice versa (Figs. 21 and 22).

Laboratory experiments suggest that the formation of mono- di- or trihydrate of calcium depends on the amount, and the nature of protein medium, in which the crystallization occurs.

Needle shapes are the earliest attempt by nature in the process of crystallization. Phosphatic crystals are small needles and those of uric acid are long ones. The phosphatic needles arrange themselves in spheres and are called spherulites (Fig. 14). The uric acid spheres are large and in sections appear as fan shaped or as



Figs. 11 & 12.

Third type of oxalate—? calcium oxalate trihydrate?

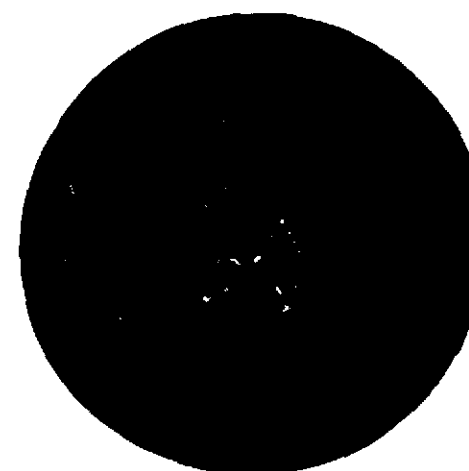


Fig. 13.

Needles of phosphates strewn.



Fig. 14.

Spherulites of phosphates.

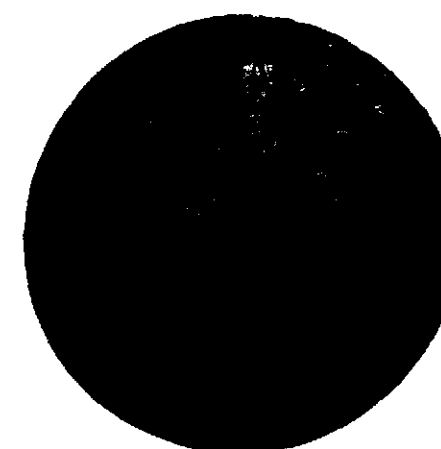


Fig. 15.

Uric acid plates needles and granules.

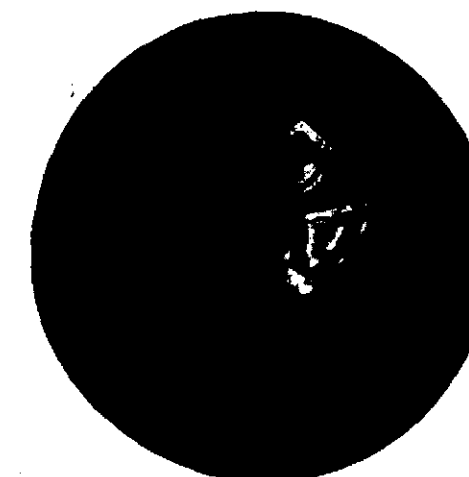


Fig. 16.

Zoning in Calcium Oxalate Dihydrate.

cones or as spheres, to the naked eye (Fig. 23).

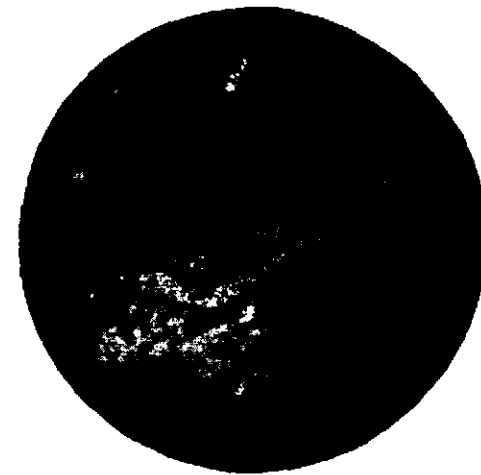
Grouping and arrangement of crystals in the stones:

Oxalates: The mono and the dihydrates may stretch across the field in the form of a well designed column constructed by a good mason (Fig. 24).

The oxalate crystals may spread as sheets of random masonry (Fig. 25).

The glassy crystals may spread across the field without any sort of plan (Fig. 24).

Uric acid: These crystals arrange themselves as spheres of large or small dimensions, and may appear as cones or fans as seen in the sections. In the centre are the plate crystals. Outside the plate crystals lie



Figs. 17 & 18.
Zoning in Calcium Oxalate Monohydrate.



Fig. 19.
Twinning in Oxalate crystals.

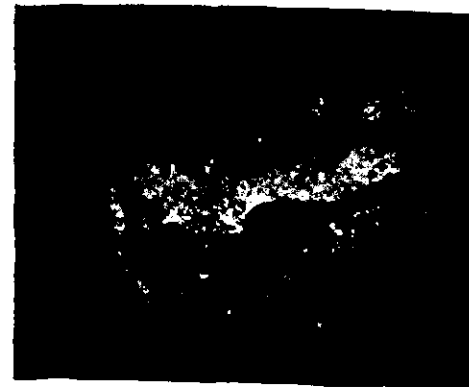


Fig. 20.
Oxalate crystals showing parallel growth.



Fig. 21.
Calcium oxalate dihydrate surrounded by monohydrates.

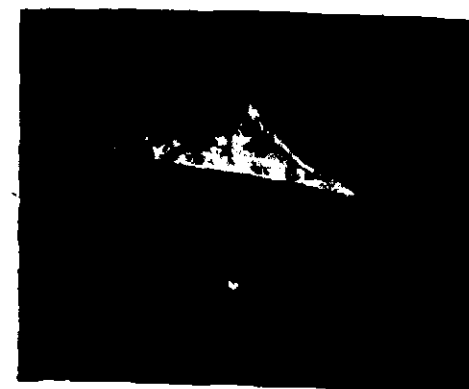


Fig. 22.
Calcium oxalate monohydrate in the midst of dihydrate.



Fig. 23.
Circular or fan shaped pattern of Uric acid.



Fig. 24.
Zoning of oxalates in the shape of a column.



Fig. 25.
Crowded crystals of oxalates with phosphates in the crevices.

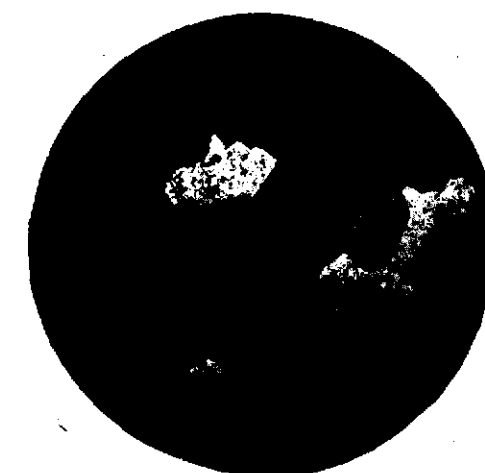


Fig. 25-A.
Sand stone for comparison.

the needle shaped crystals and the granules lie at the periphery. These granules are probably the needles seen in transection. One sphere of uric acid pattern may overlap the other or a fresh one may start right in the midst of another. The length of the needles seems to have some limit. When this limit is reached a fresh unit starts. The overall appearance seen in sections is of arcades (Fig. 26).

Colloids in Urine :

"Much importance has been attached to colloid crystalloid imbalance⁵ as a cause

of renal stone—a theory pronounced many years ago. The urine is a supersaturated solution and the crystalloids are held in solution, because of the presence of protective colloids....."

Validity of the above hypothesis appears doubtful from the ease, with which the crystals can be prepared in the laboratory, from blood, serum, c.s.f. or blister fluid.

Colloids in urinary calculi — Colloid as a cement substance :

The calcium oxalate dihydrate can be prepared in the laboratory, from normal



Fig. 26.
Arcades of uric acid.

urine, without any change in the urinary colloid. It is stated that "the precipitation of the crystalline bodies is not alone sufficient to form a calculus but it is one factor in the production of the calculus." Urinary calculus has been defined as "an agglomeration of crystals held together by a cement substance."¹⁶

In mucin, (a reversible colloid), quantities of triple phosphates are entangled. "Plugs of this material are formed and passed in the urine. These masses do not, after a lapse of months, form calculi." For this purpose an irreversible colloid is

required. Fibrin is the irreversible colloid that may occur in the urine, in inflammatory condition.¹⁴

If the colloid was acting as a cementing substance, separate stones in the kidney should coalesce. But this does not occur. We have seen that the crystals going to form the calculi are essentially different from those found commonly in the urine, the difference being their stability, i.e. capacity of holding their form and shape in dry condition. The protein or the colloid matter from the fungi or from the medium of egg albumen provides this essential protective factor to the crystals. Probably urinary protein (colloid) provides the same factor.

Assessing the amount of colloid in a stone is an extremely difficult problem. External appearance can be deceptive, (e.g. Fossil stones Fig. 27). Colloids and amorphous materials are isotropic and cannot be distinguished by polarised light.

Colloids in the calculi are proteinous and so are the uric acid and the urates. These facts increase the difficulty in estimating the colloids in the calculus.

If the colloid was the cementing substance it must be present in every section of a stone. However the amount of colloid substance in stones is extremely variable.

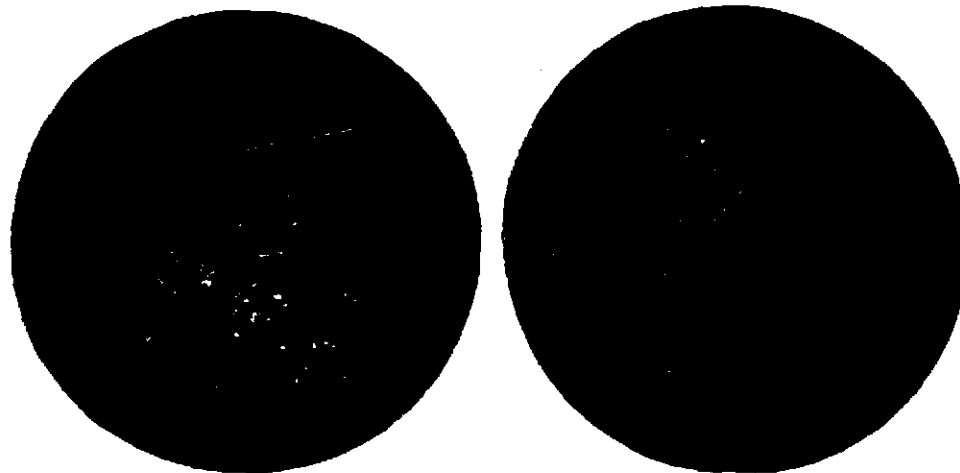


Fig. 27.
Fossil stone.



Fig. 28.
Long uric acid needles crossing the colloid rings.

In some sections of the calculi the colloid is almost non-existent, and in others it is abundant.

Concentric Rings of Colloids :

The colloid arranges itself in concentric rings. The phenomenon of concentric ring formation is common in many geological substances, such as agate. When a solution of salt is brought in contact with a gel it is precipitated in a series of rings instead of in a uniform manner. . . . These rings are called Liesegang⁶ rings. This is a process that occurs in precipitation. The observa-

tion about precipitation cannot be held to be true for crystallization.

We find that the crystal structure and pattern continues to grow unhampered across the rings of colloid. This happens in case of phosphates, uric acid, and oxalates of all kinds (Fig. 28).

In the case of phosphates the strewn granules pass right across the colloid rings. The spherulites are seen right in the midst of these rings or outside them. The strewn granules of phosphates too are no respectors of the rings (Fig. 29).

The glassy sheets of oxalates both of the mono- and the dihydrate variety stretch across, invading the colloids and engulfing them (Fig. 30).

Relation of colloids to urinary crystals :⁵

When the stone forming mechanism is present, when crystals are being so deposited by infection or colloid disturbance that they tend to fuse. . . . A drag net of fibrin is supposed to be catching the fish in the form of urinary crystals. Such an occurrence does not seem to be true. The zoning, the twinning, parallel growth and the micro-crystals tell a different story. The lay out and the patterns studied are also significant. These facts prove beyond the shadow of doubt that these crystals develop at the site where they finally lie, and grow in that position.



Fig. 29.
Phosphate needles crossing the colloid rings.



Fig. 30.
Calcium oxalate crossing the colloid rings.

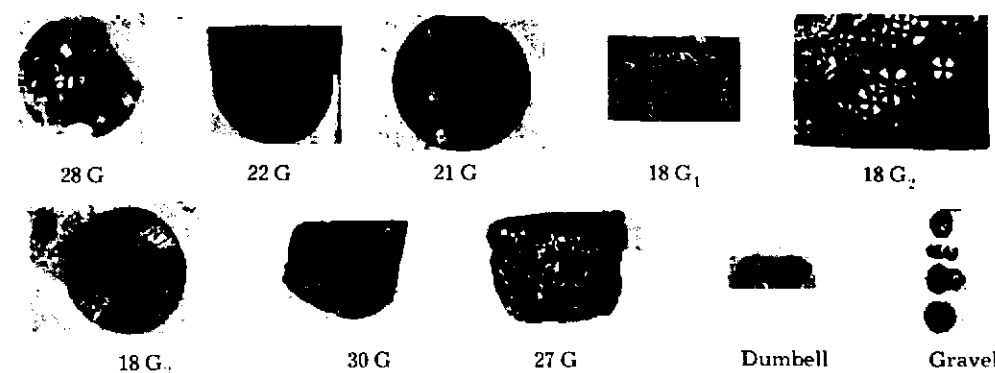


Fig. 31.
Optical studies of stones seen in nature.

Stones in Nature:

Crystallization in stones seen in nature, depends on the percentage of crystallizing material, viscosity of medium, and the rate of cooling. Glassy material often appears on the surface when the cooling is rapid and the viscosity of the medium is high. Well formed crystals occur when the cooling is slow and the viscosity is low. Fibrous structures are forms which are between the glassy type and the well formed crystals in the process of development. Spherulitic structure is simultaneous crystallization of fibres with radiate arrangement about a common centre. It may be a complete sphere or a small sector of a sphere. Spherulites may vary in size from microscopic dimensions to giant sizes. Microcrystals occur when crystallization is rapid. Twinning and zoning are methods of crystal growth. Concretions develop if the material clusters round a central nucleus (Fig. 31-G).

The characters mentioned above are common in stones seen in nature and in the urinary calculi. The method of stone building must therefore be similar in both cases.

SUMMARY

1. Unhealthy mucosa and excess of calcium are both required for the experimental production of calculi.

2. Crystals seen in the urine are unstable and are not the ones that go to form the calculus.

3. Crystals of the calculi are stable and develop in the presence of some protein matter.

4. Both the crystals of the calculi and the urinary crystals can be prepared in the laboratory.

5. Formation of urinary crystals has no relation to colloid crystalloid imbalance.

6. Calculi are not agglomeration of crystals held together by cement substance.

7. Crystals in the calculi develop at the site they finally lie and do not come from outside.

8. Colloid material (protein) gives stability to the developing crystals in the calculus.

9. Colloid is an inclusion in the stone.

10. Growth of the stone is not rhythmic but it is a continuous process.

CONCLUSIONS

Old ideas regarding the genesis of urinary crystals and the urinary calculi appear to be unsound. The process follows the same physico-chemical rules observed in the laboratory outside the body.

REFERENCES

1. Buchanan, R.: *Agricultural and Industrial Bacteriology*. Appelton Century Company, 1921. Page 218.
2. Datta Class Book of Botany. Oxford University Press, 1947. Page 162.
3. Hewitt Harold.: *Bacterial Calculi*. J. Path. Bacteriology. Vol. LIX. Page 657 to 664.
4. Keyser, L. D.: *Etiology of Urinary Lithiasis*. Arch. Surg. 6: 525, 553, 1923.
5. Keyser, L. D.: as quoted by Lowsley and Kirwin. Williams & Wilkins Company, 1944. Page 1584.
6. Liesegang.: as quoted by Tyrell. *The Principles of Petrology*. Methuen & Co., 1934. Page 222.
7. Mc. Carrison.: *Experimental Production of Stone in Bladder*. B.M.J. 1: 717, 1927.
8. Nakano, J.: *Biochem. Tokyo*. 2: 437 to 441, 1922-1923.
9. Pillay, M.: *Bulletin De. La Soc. France D. Urol.*, December 1927. Page 274 to 285.
10. Prien and Frondell.: *Studies in Urolithiasis*. J. Urol., 1947. Page 949 to 991.
11. Randell, J. A.: *J. Urology*. 48: 642 to 649, 1942.
12. Rosenow and Meiser.: *Production of Urinary Calculi by specific micro-organisms*. J.A.M.A. LXXVIII: 266, 1922.
13. Shattock and Ord.: *Microscopic Structure of Urinary Calculi of Oxalates of Lime*. Trans. Path. Soc., London. XLVI: 91, 1896.
14. Schade.: as quoted by Winsbury White. *Stone in the Urinary Tract*. J. A. Churchill, 1929. Page 3.
15. Smith.: *Minerals and Microscope*. Thomas Murby, London, 1923. Page 78, 83.
16. Walker Thompson.: *Genitourinary Surgery*. 3rd edition. Cassell & Co., Ltd., Sydney Wellington, 1948. Page 260.
17. White Winsbury.: *Stone in the Urinary Tract*. V. A. Churchill, 1929. Page 3.

Received for publication on 23-8-'56.

PANCREATICO-DUODENECTOMY FOR CARCINOMA OF THE HEAD OF PANCREAS

by A. K. SEN, TAPAS DAS GUPTA and H. PYNE, Calcutta.*

Introduction :

Pancreatico-duodenectomy for carcinoma of the Pancreatico-duodenal region is known to us since the days of Halsted (1899), when he resected a segment of the second part of the duodenum and a portion of the pancreas for ampullary carcinoma. His patient died after six months. Since then search for a radical surgical procedure is being continued and in the early part of this century many a surgeon proposed different techniques for radical surgery of the pancreas.

Much of our present knowledge concerning surgical management of removal of carcinomas from ampulla-papillary region and head of the pancreas is due to the brilliant American surgeon Allan Whipple. Since Whipple's description (1935) the operation of pancreatiko-duodenectomy has been widely used for carcinoma of the head of the pancreas and also for ampulla-papillary region. Enthusiasm has been somewhat restrained by the poor result of the operation and there are some who feel that the operation is not worth the trouble. But recently longer survival rates are being reported—in fact Alexander Brunschwig who is the first surgeon to perform successfully an extensive resection of the pancreas along with the duodenum, has in 1952 reported 3 cases with survival of more than 5 years; survival reports of similar duration are being published in literature from all parts of the world.

In this paper it is intended to describe a case of extensive pancreatic resection in carcinoma of the head and neck of the pancreas with usual reconstructive procedures and a routine follow up of about two and half years. The main aim is to establish that in selected cases, even in

Indian patients who are by far at a lower nutritional level than western patients, the prognosis is quite good after this operation and the result is quite encouraging and the method worth a trial.

CASE REPORT

S.D., a man aged 40 years was admitted in the R. G. Kar Medical College Hospitals on 8-9-1953 with a history of acute pain in the epigastrium and right hypochondrium radiating to the back, for 4 days. On enquiry about the past history of illness, a history of chronic pain in the right hypochondrium for the last 2 years could be ascertained. The pain was more or less colicky in nature and did not show any relevant relation with the patient's meal habits. During the first phase the pain was usually relieved by means of induced vomiting. The patient did not give any history of jaundice nor did he have any icterus during the course of examination.

On clinical examination — A firm, tender indefinite lump could be palpated below the right costal arch. Outlines were not clearly marked, shape being oval with $2\frac{1}{2}$ " x 1" in size. The tenderness in the region was so marked that on touching, the patient had severe pain. Entire right hypochondrium was rigid and not moving with respiration.

On the basis of clinical examination a probable diagnosis of a leaking duodenal ulcer with localised abscess formation was made and the patient was kept on conservative treatment. With the decision of keeping the patient on a conservative regime the usual hospital investigations were made. Blood examination did not show any leucocytosis but the icteric index was on the border line — 6.0 units. Urinalysis showed increased sp. gravity (1036) and plenty of phosphates.

The patient kept on improving and on 10-9-'53 a gruel meal fractional gastric analysis was done. The results of the analysis were reasonably within normal limits.

But on 17-9-1953 there was a sudden set back. The patient again had the same attack of pain and this time the pain was associated with melaena. This acute phase persisted for 3 days and subsided.

Radiological investigations of the gastro-intestinal tract and gall bladder failed to show any

pathological lesion. Failing in all these laboratory investigations, an exploratory laparotomy was planned. The patient was revived as far as possible and on 28-10-1953 one of us (A.K.S.) performed the exploration. On opening the abdomen, the entire head and neck of the pancreas was found to be involved by a hard mass of the size of a big orange, adherent to the adjacent parts of the duodenum. Gall bladder was found to be normal.

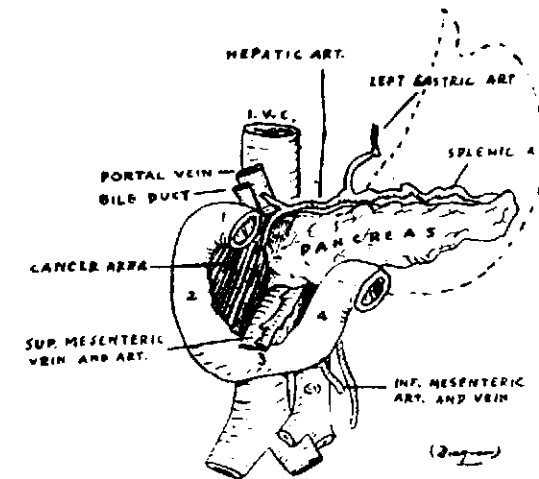


Fig. 1.

A diagram showing the area of involvement by Carcinoma.

The growth was found resectable. The superior mesenteric vessels were not invaded. The surgeon and the patient, being not prepared for such a radical surgery, the operation was postponed for a further date.

The growth was apparently a carcinoma and no biopsy was done with the idea that it might invade and extend to the entire abdominal cavity.

Pre-operative preparation :

It is not intended to describe in detail the pre-operative measures adopted in this case, as these have been fully and lucidly discussed by Brunschwig in his book "Radical surgery in advanced abdominal cancer (1947)" and by Rodney Smith in his book on "Surgery of pancreatic neoplasms (1954)". The only intention here is to focus one's attention to the poor nutritional level in Indian patients associated with a past history of suffering from so many diseases. Taking this into view the prolonged pre-operative regimen can be explained. In India all patients who submit to such radical surgery, will be considered as 'Poor Risk' subjects in the west and more over in Bengal, malaria being a common feature special care for the liver, as Brunschwig points out

in extensive operations, should always be taken. In our case all possible precautions and care were taken and the Hb was raised from 40% to 55% before the radical surgery was performed.

The patient being reasonably prepared the operation was performed on 7-11-1953 by one of us (A.K.S.).

Operative technique :

The abdomen was opened through the scar of the previous operation and the scar was excised. A preliminary re-examination of the head of the pancreas was made. Then the actual operation was started :—

- (1) The adhesions on the region of Rt. colic flexure were resected.
- (2) Transverse meocolon was incised and the colon retracted down.
- (3) A paraduodenal incision was made on the peritoneum and the first part of the duodenum was mobilised along with the pyloric part of the stomach. The part of the stomach between the antrum and the duodenum was resected.
- (4) Superior pancreatiko-duodenal artery was dissected, caught and transected.
- (5) The second part and the third part of duodenum were mobilised.
- (6) The bile duct was transected at the superior border of the duodenum avoiding the spilling of bile into the peritoneal cavity.
- (7) The colon was kept retracted downwards and a part of the body and neck of the pancreas was mobilised taking care of the superior mesenteric vein and artery and splenic and hepatic arteries.
- (8) The head of the pancreas was then mobilised taking care of the portal vein. The formation of portal vein by the junction of superior mesenteric and splenic veins was demonstrated.
- (9) The body of the pancreas about $\frac{3}{4}$ " lateral to the neck was transected with special care to the main pancreatic duct, which was dissected and ligated with catgut, turned round and cut.
- (10) The cut surface of the body of the pancreas was sutured by mattress sutures by means of catgut to exert firm compression and occlusion of several minor ducts.
- (11) The third part of the duodenum was fully mobilised, cutting the ligament of Treitz, which helped the mobilisation of the duodeno-jejunal flexure.

* From the Department of Surgery, R. G. Kar Medical College, Calcutta.



Fig. 2.
Surgical specimen of the mass removed.

- (12) The transection of the duodenum was done about one inch distal to the duodenojejunal flexure.

The transection permitted enmasse removal of the head, neck and part of the body of the pancreas, entire duodenum with the lower part of the stomach and an inch of jejunum and the surrounding lymph nodes.

The mass being removed, reconstruction was done as follows:—

- (1) The intestinal stump was closed on usual lines.
- (2) A Gastro-Enterostomy on usual lines was done.
- (3) A cholecystogastrostomy was done.
- (4) A choledocho-jejunostomy was done with meticulous care.
- (5) An Entero-enterostomy between the efferent and afferent loops of jejunum (distal to the choledocojejunostomy) was performed below the level of the transverse mesocolon.
- (6) The abdomen was closed as usual, leaving a cigarette drain in the raw area.

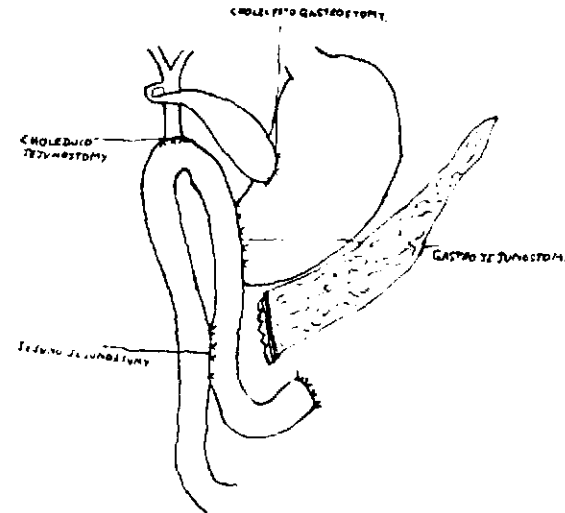


Fig. 3.
Diagrammatic representation of our technique.

During the entire period of operation, total amount of whole blood transfused was 1500 c.c. and plasmosan 500 c.c. So a total of 2000 c.c. fluid was transfused.

The specimen removed was sent for histopathological examination and the report revealed it to be a case of adenocarcinoma of the head of pancreas.

Post-operative management:

It is again not intended to give in elaborate detail the management. The principles governing such management have been discussed by various authors, and we followed them in their essential features, only with slight modifications which are essential under Indian conditions.

The salient features of the first part of the post-operative period has been summarised in the attached table along with relevant laboratory investigations which governed the prognosis.

(See Table I in next page).

Stool — As this forms one of the most important features for consideration after pancreaticoduodenectomy, this is being described separately from the table. First formed stool was passed on



Fig. 4.
Photomicrograph.

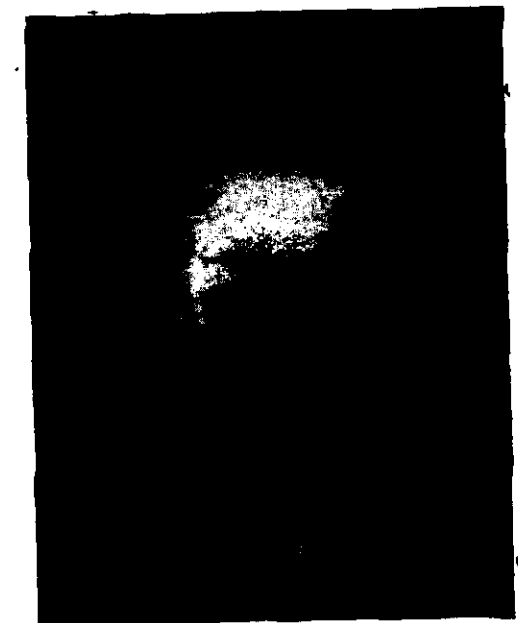


Fig. 5.
Photograph of Fistulous tract.

15-11-1953 (i.e. 8 days after operation). This was pale bulky and frothy; quantity being small. But since then he is regularly passing stool about 2 to 4 times a day and the stool is semisolid, slightly bulky and pale yellow in colour. He was taking normal diet including meat.

As has been already shown in Table I, our case developed pancreatic fistula which persisted for 73 days. In the first month or so, total quantity drained was about 10 oz. per day but in the latter part it was only 3 or 4 ozs.

(For composition and properties of fluid see Table I).

The depth of the Fistula was ascertained by Lipiodol in the tract and Barium meal in the stomach. The tract went right upto the pancreatic bed.

In spite of the fact that a pancreatic fistula developed the skin remained healthy all through and the fistula automatically healed on the 73rd day, i.e. on 23-1-1954.

The patient was discharged absolutely cured with an increase of body weight by 4 lbs. on 28-2-1954.

Follow-up:

A thorough follow-up has been maintained since discharge. Patient reported every month for first six months and in each examination urinalysis, stool, blood biochemistry with gastric analysis were done and every item was within normal range.

The patient when examined one year after the operation was absolutely cured and was quite satisfied with the results of the operation. In the second year, patient complained of indigestion and mild wasting. On examination a slight glycosuria 0.02% and hyperglycaemia — 135 mg./100 c.c. (fasting level) was found. Other examinations were normal. Soluble insulin 10 units with slight restriction of diet was advised. When the patient reported 4 months ago, he was quite well and had gained in weight. While compiling this paper the patient has replied to our letter and says he is well and still the urine is sugar free.

DISCUSSION

Sir Berkeley Moynihan in 1926 stated that "Radical treatment of malignant

OPERATION ON 7-11-53

TABLE I

Day with date (after operation)	Parenteral fluid intake	Oral fluid with diet	Fluid with diet	Gastric suction	Local wound	Laboratory Investigations	Treatment	Miscellaneous
1st Post-operative day 8-11-53	(i) 1500 c.c. 5% glucose-saline I. V. ii. 750 c.c. 5% glucose per rectum.	Nil	700 c.c.	517 c.c. continuous suction	Good	Blood sugar - 110 mg. per 100 c.c. (Pre-op - 96 mgm.) Creatinine - 1.3 mg. N.P.N. - 31.5 mg. Urine - Disatase - 50 Units Sugar - trace Sp. gr. - 1038.	Patient kept on antibiotic cover and plenty of vitamins with amino acids administered I. V.	Pt. behaving well.
2nd post-operative day 9-11-53	Isotonic glucose soln. 750 c.c. I. V. 5% glucose soln. 700 c.c. per rectum.	1 oz. of sterile water hourly. 1 oz. of horlicks whey 3 hourly.	1110 c.c.	418 c.c. intermittent suction.	Drain removed but a clear serous fluid drained out. So a catheter was kept as a drain, connected to the bottle.	Blood sugar - 112 mg/100 c.c. Chloride - 445 mg. Creatinine - 1.3 mg. N.P.N. - 31 mg. Protein - 52. Urine - No glycosuria Sp. gr. - 1028.	Same as before.	"
12-11-53	10% glucose soln. - 500 c.c. mixed with about 1000 mg. Vit. C & plenty K & B and amino acids.	Horlicks 2 oz. whey - 2 oz. Dab water - 2 oz. at frequent intervals and water ad lib.	1600 c.c.	250 c.c. suction 7-8 hourly.	Same fluid drained through catheter.	<i>Examination of fluid</i> - Total collection - 10 oz. (average) clear serous fluid. Sp. gr. - 1050, highly alkaline and could not digest protein or fat. Presumed to contain no active ferment (experimental). It could digest after activation with bile salts. Microscopically: - Pus cells and epithelial cells present. The flow of fluid diminished with epedrine gr. 1/4 I.M. Increased with hormones (Ephe-drine better than atropine - acts due to vaso-constrictor action).	Antibiotics stopped and Ledinac orally substituted. Ryle's tube taken off on 12-11-53.	The fluid could not excoriate the skin but all precautions were taken.
16-11-53	Nil	Rice and fish soup, oral vitamins and amino-acids.	1610 c.c.	Nil	Serous fluid continued to drain and collected in the bottle. Stitches removed. Otherwise normal.	Blood Biochemical studies all like 9-11-53 urine also normal.	Only supportive nutritional substances given.	Pancreatic fistula persisting but surrounding skin healthy.

disease of the pancreas by the surgeon can hardly be said to exist". But only a decade later Brunschwig successfully performed an extensive resection of pancreas and duodenum for carcinoma of the head of the pancreas. Rodney Smith has categorically stated that the process of mobilisation of pancreas and duodenum is easier than was previously thought of. Benedito Montenegro (Sao Paulo) while discussing about pancreaticoduodenectomy, has said in 1952 that though the carcinoma of the head of the pancreas makes the problem serious, still partial pancreatectomy should be done whenever possible.

It is quite likely that the ideas about surgical treatment of carcinoma of the head of the pancreas are changing and surgeons from all parts of the world are publishing their own experiences on radical resection.

Workers on pancreatico-duodenectomy have suggested various techniques, but considered opinion favours two of them. Both of them are essentially same, only difference being that (1) in one the pancreatic secretion from the remaining pancreas is allowed to drain into the jejunum—Cattell and Whipple's technique (2) in the other the remaining part of the pancreas is occluded with mattress suture and no communication is made with the jejunum—Brunschwig's technique.

In this case we have more or less followed the technique of Brunschwig with one major variation, i.e. we have performed an additional cholecysto-gastrostomy (Fig. 3) along with choledochojejunostomy. The common bile duct in this case was not dilated and we anastomosed the gall bladder to the stomach as an additional measure, in case the anastomosis of the choledochojejunostomy stenosed. The usual practice with Anglo-american surgeons today is to perform only a choledochojejunostomy, but Brunschwig in one of his cases performed an additional cholecysto-jejunostomy along with choledochojejunostomy.

In our case we have, like Brunschwig left the remnant of the pancreas without

anastomosing with the jejunum. That the patient is leading an almost normal life corroborates the present belief that even with occlusion of the pancreatic duct the patients can lead a normal life. Sometimes the lining membranes of the stomach and small intestine (also Meckel's Diverticulum) in man, have heterotopic pancreatic tissue. In the light of Brunschwig's series of cases and also the present case in question it seems probable that such a phenomenon is not so rare as was thought to be, until recently.

In our case we have studied the physiological changes after pancreaticoduodenectomy. The studies show that the changes, if any, are all within normal limits. The results are all tabulated in the following tables:—

TABLE II

Plasma Protein		N. P. N.		Fasting Blood Sugar	
Pre Op.	Post Op.	Pre Op.	Post Op.	Pre Op.	Post Op.
5.3 Gm.	5.1 Gm.	30.5 mg.	31 mg.	98 mg. per 100 c.c.	112 mg. per 100 c.c.

TABLE III

Post Op. time in weeks	Fat intake	Fat in stools	Fat absorbed	Nature of stools
7 weeks	Appxly 300 gms. in 6 days	30 Gms.	90%	Light yellow in colour slightly bulky
10 weeks	Appxly 350 gms. in 8 days	42 Gms.	42	Pale yellow in colour

In addition to the studies reported in table 2 and 3 the patient was fed on moderately high protein (minced meat) diet and

the stool after 24 hours showed only few meat fibres suggestive of digestion of meat.

Fat absorption studies have been reported by Brunschwig, Whipple, Whitfield, Gourrevitch and Thomas and their reports are quite encouraging — on an average it varies from 80 to 83%. It appears therefore as stated above, that occlusion of pancreatic secretion is quite compatible with human existence. In those cases in whom there is faulty fat absorption or frank steatorrhoea or the like, pancreatin can help a great deal. Workers at Mayo Clinic confirm this and report improved protein and fat absorption with pancreatin. These are perhaps the cases where heterotopic pancreatic tissue in stomach and intestine is not quite marked.

Since normally pancreatic secretion passes to the intestine, so authors like Cattell and Whipple advocate Pancreatico-jejunosomy. Moreover one school says that unless pancreaticojejunostomy is done a pancreatic fistula develops and Dr. Maxzinner of Cincinnati (U.S.A.) describes that in one of his personal cases pancreatic fistula persisted for about 2 years. The patient became emaciated and run down but as soon as the fistulous tract was implanted into the jejunum the patient was cured. Though in this patient there was a pancreatic fistula yet we cannot agree with the opinion that this was due to not anastomosing. Brunschwig in his personal series of cases has not met with any fistula. Moreover Brintall has described a technique after a study of 17 cases, which is essentially that of Child's (1944). In this he has performed telescoping of pancreatic stump into the cut end of the jejunum. This has been accepted as a reasonably good method of diverting pancreatic fluid to jejunum. But even after this type of reconstruction Brintall reports formation of pancreatic fistula in a number of cases. Of course they automatically sealed off within a few days. In our case also the fistula was sealed off automatically but took a long time of 73 days. The cause in our case was perhaps due to local infection of wound.

The presenting features in our case were a bit different from the descriptions available in the literature. Our patient was admitted with a picture suggestive of a subacute abdominal catastrophe and never gave history suggestive of pancreatic neoplasm. The diagnosis could only be made on opening the abdomen. Occult blood in stool and also melaena are not common features. One thing stands prominent that the description of jaundice in cancer of the head of the pancreas can no longer be accepted as invariable.

Womac (1952) has described 3 clinical types of the carcinoma of the head of the pancreas and this classification seems worth considering:—

- (1) Carcinoma originating at the ampullary region — the symptoms appear earlier and the prognosis is better.
- (2) Islet tissue tumours — susceptible to local extirpation, and if functioning the lesion kills the patients quicker by affecting the metabolic action.
- (3) Carcinoma of the acinous cell — Jaundice is an important symptom which occurs by invasion of the common bile duct, and here the prognosis is the worst.

Is there a place for pancreaticoduodenectomy in the surgeon's repertory? There have recently been some suggestions that so extensive an operation is not worth the trouble, for post-operative survival is very short. This is a fallacious argument. Palliation is at times the sole aim of surgery and though this is not so in this case, still it should be noted that effective palliation is obtained even when life is not prolonged. Sufferings can be avoided by resection and this operation should be done for all operable cases. Furthermore Orr reports that an average survival record is 15 months in all cases after resection and in palliative measure it is only 4 months.

Whipple (1951) in an editorial review stated that until an earlier operation was

possible, "the cures with radical surgery in ampullary growth will remain few and in cancer of the pancreas will continue to be palliative". Soon after this, Brunschwig reported 3 cases with a survival rate of more than 5 years after Pancreatico-duodenectomy. The largest personal series of cases is that of Cattell and Warren, who stressed as did Whipple and others, the difference — both in operative mortality and post operative prognosis between carcinoma of the pancreas itself and that of ampulla of Vater. The resection-operative mortality was 13.6%. Of 38 survivors of resection for carcinoma of the pancreas, only 2 (5%) survived 5 years or more. Of 28 survivors of ampullary carcinoma 3 (11%) were alive and well 9 years after the operation, and 11 (40%) lived 3 years or more. Reviews by Rodney Smith and Moore and Young husband (1954) give a similar impression.

From a review of these cases it becomes quite apparent, that though the results of radical pancreaticoduodenectomy are not very encouraging this can be compared favourably with some standard results of operation for cancer at other sites. Our case though only continuing 2½ years after the radical operation, is living quite well. He can be reasonably expected to live longer.

It has become quite evident that if the diagnosis can be made early and if the patient can stand the one stage pancreaticoduodenectomy, it should be done in all operable cases. About the early diagnosis, Dodd in 1949 wrote "I make a plea that in cases in which painless jaundice has been present for a month or so, the possibility of carcinoma of the pancreas should be considered and a surgical opinion sought." The statement merits repetition, as it indicates the correct line to be followed if cases are to come to surgery early enough so that a curative operation may be per-

formed and the survival rate increased to more than 5 years.

SUMMARY

Two and half year survival after Pancreatico-duodenectomy in a case of Carcinoma of the head of the pancreas has been reported. The operative technique and the effect of Physiological investigations are described in detail. Also a review of relevant literature is made.

REFERENCES

1. Brunschwig, A.: Radical Surgery of Advanced Abdominal Cancer. 1947.
2. Brunschwig, A.: Ann. of Surgery. 136: 610-624, 1952.
3. Brintal, E. S.: Surg., Gynec. & Obst. 95: 181-193, 1952.
4. Cattell, R. B. and Warren, K. W.: Surgery of Pancreas, Philadelphia. W. B. Saunders & Co., 1953.
5. Child, C. G.: Ann. of Surgery. 119: 845, 1944.
6. Dodd, H.: British Medical Journal. 2: 1509, 1949.
7. Moore, R. G. and Young Husband, T. D.: Brit. J. Surg. 41: 562, 1954.
8. Maingot, R.: Abdominal operations. 1948.
9. Orr, T. G.: Ann. of Surgery. 136: 618, 1952.
10. Montenegro Benidito (1952): Year Book of General Surgery (1953-54)—Edited by Graham.
11. Smith Rodney.: The Surgery of Pancreatic Neoplasms, Edinburgh, E. & S. Livingstone. 1953.
12. Whipple, A. O., Parsons, W. B. and Mullins, C. R.: Ann. Surg. 102: 763, 1935.
13. Whipple, A. O.: Surg., Gynec. & Obst. 93: 112, 1951.
14. Whitfield, A. G., Gourrevitch, A. and Thomas, G.: Lancet 1: 180, 1952.
15. Womac.: Ann. of Surg. 136: 610, 624, 1952.
16. Zininger Max.: Ann. of Surg. 136: 610, 624, 1952.

Received for publication on 6-8-56.

APPENDICECTOMY IN THE TREATMENT OF CHRONIC RESISTENT INTESTINAL AMOEBIASIS

by S. L. MALHOTRA, Bhusaval.

For some years almost every new anti-biotic has been hailed as the drug of choice for treating chronic amoebiasis but none has proved ideal. Hargreaves (1945, 1946) gave encouraging reports of results of combining penicillin with amoebicidal drugs in resistant cases. He believed that secondary infection was an important cause of lack of proper response to anti-amoebic treatment. Armstrong et al (1950) reported an immediate cure rate of 94% with aureomycin but the relapse rate was also high. Most et al (1951) treated 41 cases with aureomycin, terramycin or bacitracin and found terramycin superior to aureomycin for immediate response whereas bacitracin was only 50% effective. However, the relapse rates were very high: 40% of cases treated with aureomycin and terramycin relapsed within 2½ months.

Antibiotic mixtures were first reported on by Felsenfeld and his co-workers (1951) and they found a combination of neomycin and bacitracin most effective. Armstrong and his associates (1955) reported on the combination of antibiotics and other known amoebicidal drugs. They found a combination of chloroquine and diiodohydroxy-quinoline and either chloroquine 100 g or chlortetracycline residue 4 g a highly effective treatment for immediate cure. Singh (1955) has similarly reported on various antibiotics and other amoebicidal combinations.

We have been using a combination of carbarsone, Diiodohydroxy-quinoline, aureomycin with either emetine or chloroquine in resistant cases since 1951 and there is no doubt that the immediate results are most satisfactory but in our experience almost 50% of cases relapsed within a year and required repeated courses. The importance of self re-infection was stressed by the writer (1949): post-defaecation ablution being responsible for a high rate of

potentially infective fingers. The writer (1952) also observed that re-infection from carriers or other sources such as food was equally important and re-infection whether with one's own amoebae or the amoebae of others was the main problem in resistant cases.

The present report is meant to show that re-infection may yet be of another type, i.e., re-infection from chronic amoebic ulcers in the appendix and this report deals with only those resistant patients who had taken several courses of amoebicidal combinations and had reached the stage when they could not remain free from symptoms without the aid of amoebicidal drugs. The effect of appendicectomy in them has been studied.

MATERIAL AND METHOD

This report includes a personal series of 15 cases. All the patients had chronic intestinal symptoms of 5 to 10 years duration. The diagnosis was based on previous history, tenderness and thickening of the coecum, clinical symptoms of flatulence, borborygmi, straining at stools, stool examination and histo-pathology of the excised appendix. Sigmoidoscopy was done in 4 cases and in none of the patients colonic ulcers were seen although the histo-pathology of the appendix of all these cases showed amoebic ulceration and cysts could be demonstrated in 2 of these 4 sigmoidoscopy cases. Chittani et al (1955) have also made a similar observation and have found amoebic ulcers in less than 5 per cent of their cases on sigmoidoscopic examination. The role of sigmoidoscopy in the diagnosis of amoebiasis seems to have been over stressed.

Only those patients have been included who have had more than 3 recurrences and who had been at various times treated with

combinations of emetine, carbarsone, iodo-chlorohydroxy-quinoline, diiodohydroxy-quinoline, chloroquine, sulphaguanidine, aureomycin and terramycin. They all had thickened and tender coecum and all complained of straining at stools. Most of them have had to take either iodo-chlorohydroxy-quinoline and aureomycin in protracted courses and they kept well so long as they kept on taking one or the other of these amoebicidal drugs. Cysts had been found in the stools of all the patients at one time or the other in their history; but only two showed cysts before appendicectomy. The reason for this low positive incidence is thought to be due to the use of amoebicidal drugs because the excised appendix in all the cases studied showed amoebic ulcers.

TREATMENT AND FINDINGS

All the patients in this series were subjected to appendicectomy and the excised organs were examined histo-pathologically for evidence of amoebiasis. Six of these patients were given iodo-chlorohydroxy-quinoline for 3 days immediately preceding appendicectomy. Four of these had been given in addition a course of aureomycin for 3 days immediately preceding the operation. The rest received no amoebicidal drugs during the six weeks before the operation but had been previously taking, either alone or in combination, carbarsone, sulphaguanidine, aureomycin, terramycin, iodo-chlorohydroxy-quinoline for varying periods to remain free from the disturbing gas colics, flatulence, straining at stool and constipation.

The histo-pathology of the appendix in all the 15 patients showed remarkable similarity: marked fibrosis with small focal abscesses in the wall. The characteristic of these was necrosis with a mild mononuclear cell infiltration. An interesting feature in 6 cases was complete lack of the mucosa. *E. histolytica* could be demonstrated in six specimens. In others the changes were so characteristic of focal *E. histolytica* infection showing quiet necrosis with a mild mononuclear cell

infiltration as to be diagnostic. In two *E. histolytica* was demonstrated in the material squeezed out of the lumen of the un-fixed appendix. The appendix of another patient showed charcot-leyden crystals and adult thread worms in the squeezed material.

On naked eye examination the lumen of the appendix in all the specimens was very much narrowed due to fibrosis.

FOLLOW-UP AND RESULTS

9 appendicectomised cases have been followed up for 2 to 3 years, the other 6 appendicectomised cases have been followed for 8 months. All appendicectomised patients reported remarkable clinical improvement in their symptoms. One had a parasitic relapse but no return of symptoms. The parasites cleared up with a course of terramycin for six days. Whereas previously these patients had to more or less continuously take, in combination or alone, one or more amoebicidal drugs: now they hardly used these. One patient noted recurrence of symptoms after one year of the operation; but these cleared up with a 10-day regimen of carbarsone and there was no need to continue taking one or more of the amoebicidal drugs as was the case before the operation. This patient gave a history of chronic dyspeptic symptoms in other members of his family and it is likely he had been getting re-infected from that source.

DISCUSSION

Several causes of failure in treatment of amoebiasis have been suggested by various workers. Hargreaves (1946) and Wright and Coombes (1948) emphasized that in resistant cases secondary pyogenic organisms became established in the diseased bowel wall and therefore, before specific anti-amoebic treatment could be expected to succeed the secondary infection needed elimination. Priest (1945) and Manson-Bahr (1945) suggested that

(1) It was possible that an infection made emetine fast as suggested by Adams

yielded less readily to other antiamoebic drugs. Claims for the development of strains of *E. histolytica* resistant to emetine though often made in the past have not been generally accepted. Jones (1952) has investigated this by using in vitro and in vivo techniques using young rats as hosts. He was not able to induce any resistance to emetine in the parasite.

(2) Conditions obtaining in the war zone (Burma campaign) did not permit the minutiae of treatment which was so essential for the management of amoebiasis.

(3) Debilitated condition of patients.

Malhotra (1949) emphasised the importance of re-infection from others or self re-infection from infected fingers. The present cases suggest that re-infection can take place from diseased appendix. The lumen of the diseased appendix due to fibrosis becomes so narrowed that the amoebicidal drugs do not reach the ulcers inside it and thus a nidus of infection remains in the gastro-intestinal tract from which the reinfection of caecum and colon is kept up. So long as the patient keeps on taking amoebicidal drugs no fresh ulcers form in the caecum or colon but as soon as these drugs are stopped re-infection from the appendix takes place giving rise to coecal ulcers and the tell-tale symptoms.

In most cases where the appendix is not so fibrosed and the drugs can easily traverse its lumen the effects of treatment with the amoebicidal drugs are excellent and in them there is no place for appendicectomy.

It is only in cases as have been included in this series where due to long standing and chronic ulceration and fibrosis of the appendix the lumen is hardly patent that this mechanism seems to be operative. It is in such patients that appendicectomy is indicated and gives excellent results. Once this inaccessible nidus of infection has been removed, reinfection even if it takes place

can be quickly overcome as the drugs can easily act on the coecal and colonic ulcers.

Appendicectomy is not advised in recent infections as these are usually amenable to the available combination of amoebicidal drugs. In such combinations we have always used either emetine or chloroquine with other less readily absorbable drugs as we believe that disease is systemic and not purely intestinal and unless the "metastases" are also eradicated at the same time as the intestinal infection, reinfection will certainly take place. Vegas (1953) has also emphasised this point while reporting on the evaluation of recently introduced amoebicides and considers this combination of two drugs logical.

Andreasen (1953) has expressed fears that to operate upon a patient with amoebic dysentery is to invite an exacerbation of colitis that may prove fatal. This may be so in cases of acute amoebic dysentery but our experience shows that it is certainly not so in cases of chronic amoebiasis and our patients had a perfectly smooth convalescence.

SUMMARY

15 cases of resistant chronic intestinal amoebiasis all failures with amoebicidal drugs were treated with appendicectomy. The histo-pathology of the excised appendix in all these cases was remarkably similar and showed focal *E. histolytica* infection.

These patients have been followed up for a period of 8 months to 3 years and have remained symptom free excepting two patients who got re-infected and these recurrences were more readily cured with amoebicides than was the case before appendicectomy.

Follow up examination of stools showed parasite relapse in one patient (6.6%). This was thought to be due to re-infection from a carrier.

Re-infection from the diseased appendix seems to be an important factor in these

resistent cases. Since due to narrowing of the lumen of the appendix with chronic fibrosis the drugs do not reach the appendicular amoebic ulcers, appendicectomy appears to be the most rational method of eradicating this "inaccessible" focus of re-infection in these resistant cases.

No Surgical complications were noted after appendicectomy and convalescence was uninterrupted in all the patients.

Appendicectomy is not advised in recent infections as these clear up with the available amoebicidal drugs.

REFERENCES

1. Andreasen, A. T.: *Emergency Surgery*. John Wright, Bristol. Page 424, 1953.
2. Armstrong, T. G., Wilmot, A. J. and Elsdon-Dew, R.: *Lancet* ii: 10, 1950.
3. Armstrong et al.: *Ibid*, ii: 1180, 1955.
4. Chuttani, P. N., Chuttani, H. K. and Jolly, S. S.: *J. of Ass. Physicians, India*. 3: 96, 1955.
5. Felsenfeld, O., Kadison, E. R. and Ishihar, S. J.: *Amer. J. Publ. Hlth*. 41: 1078, 1951.
6. Hargreaves, W. H.: *Trans. Roy. Soc. Trop. Med. & Hyg.* 38: 237, 1945.
7. Idem.: *Quart. J. Med.* 15: 1, 1946.
8. Malhotra, S. L.: *Ind. Med. Gaz.* 84: 96, 1949.
9. Malhotra, S. L.: *Lancet* i: 823, 1952.
10. Manson-Bahr, P. H.: *Manson's Tropical Diseases*. Cassel & Co., London. 1945.
11. Most, H., Tobie, J. E., Reardon, L. V. and Bozicevich, J.: *Amer. J. Trop. Med.* 31: 414, 1951.
12. Priest, R.: *Trans. Roy. Soc. Trop. Med. & Hyg.* 38: 250, 1945.
13. Singh, I.: *Lancet* i: 527, 1955.
14. Vegas, J. S.: *J.A.M.A.* 151: 1059, 1953.
15. Wright, A. W.: *Coombes, A.E.R. Lancet* i: 243, 1948.

Received for publication on 8-8-'56.

DERMATOPLASTY IN THE CURE OF INCISIONAL HERNIA *

by Miss ANJALI MUKHERJI, Calcutta.

Operative treatment for the cure of large sized abdominal herniae, incisional or otherwise, has been a problem with surgeons for ages and as yet no agreement about the operative procedure suited to every case has been reached.

Despite the improvements in ensuring asepsis, in avoiding anaesthetic hazards, in the operative technic and in the postoperative management of cases, incidence of postoperative abdominal hernia is not uncommon. In abdominal emergencies and traumatic lesions where scrupulous attention to technic might not have been possible, incisional hernia is a possibility. In elective operations where all possible care is taken hernia may develop after certain complications, e.g. partial disruption of the wound following sepsis, haemorrhage, post-operative distension, frequent vomiting, and pulmonary complications. Certain predisposing factors influence the development of incisional hernia. This type of hernia is more prone to develop in obese persons and in multiparous women with abnormally pendulous abdomen. Debility and malignant growth also increase the chance of incisional hernia due to malnutrition and hypoproteinaemia. Inefficient postoperative management may result in an incisional hernia.

Incisional herniae are found to occur more commonly after infra-umbilical vertical incisions specially after gynaecological operations and particularly when some of the predisposing factors are present. In incision through flat muscles and in traumatic conditions where motor nerves are injured herniation is a possibility. Incisions encroaching on the linea semilunaris are likely to be followed by postoperative hernia.

*A paper read at the XVI Annual Conference of the Association of Surgeons of India held at Hyderabad (Dn.) in Dec. 1954.

The anatomico-physiological changes in abdominal hernia are well known; certain special features come in the operations of incisional hernia which make repair more difficult.

1. Infraumbilical Vertical Incisions

(a) Infraumbilical middle line incision:

The hernial protrusion in these cases is strictly central. In its progress the recti are equally displaced on either side. If the anterior rectus sheath is intact, it is stretched by the hernial protrusion and gradually it becomes thinned out forming a covering for the hernial sac. But if the divided margins of the rectus sheath do not unite due to some reason or other they shrink and cling to the medial edge of the muscles on either side. In this case the hernial sac has no other covering in front except the skin and the subcutaneous fat. The edges of the recti in well developed cases become less vascular, fibrous and atonic. And so they form an inefficient support for effective repair.

(b) Infraumbilical paramedian incision:

Herniae following this incision present themselves in two forms.

(i) When margins of the anterior rectus sheath have united firmly after the operation, the hernia presents itself in the middle line and has the same anatomical features as mentioned above.

(ii) If however, the margins of the divided rectus sheath fail to unite then the hernia protrudes through a weak line on one side of the middle line. In this type of hernia the continuity of the rectus sheath to the linea alba on the side of the incision is lost; thus the integrity of the anterior support is greatly reduced. This is because, the recti maintain their cohesion so long as their sheaths on either sides are connected together at the linea alba. In

these cases as the herniae progress the linea alba is pushed away to the opposite side. But as its anchorage to the pubis remains intact and the rectus muscle on the side opposite the incision enclosed within its sheath maintains its connections with linea alba, it does not recede too far away from the middle line. The medial leaf of the rectus sheath on the side of the incision clings to the edge of the linea alba. The rectus on the side of the incision along with its sheath having lost its connection with the linea alba fails to afford any effective support to the underlying structures and with the incresae in the bulk of the hernial protrusion it recedes from the middle line more and more and the hernia becomes more prominent on the side of the incision. This is helped by the increasing bulk of the hernial protrusion, fatty abdomen, the action of gravity and increased intra abdominal pressure pushing the edges of the rectus out.

When the separation of the recti extends up to the pubis, the bladder lies at the floor of the opening, extraperitoneally.

2. Hernia through flat muscles

This type of hernia results after drainage of infective intra-abdominal lesions through muscle cutting incisions or wound sepsis and consequent destruction and weakening of the muscles following traumatic lesions.

In exaggerated cases the hernial sac is not often the stretched peritoneum but a false membrane formed during the process of healing, covering the intestines. This membrane is very thin in texture and adherent to the overlying stretched out scar. During dissection it is not possible to separate the overlying scar easily without causing a rent in the false membrane. The intestines shine through this thin membrane and are irregularly adherent to its inner aspect in various places and also at the margins of the opening, unlike a hernia through or near the middle line. It is therefore not always possible to get a flap of the false membrane to be stitched comfortably margin to margin, or efficiently overlap them

during repair. Fascia transversalis cannot be differentiated.

The internal oblique and transversus muscle retract medially towards the rectus sheath and laterally towards the outer half of the inguinal ligament, the crest of the ilium and the lateral border of the body in cases of hernia through the lower half, and towards the costal margin in upper half.

The edges of the muscles surrounding the opening are sheet like and fibrous. They lose their elasticity and muscular character. These and the muscle sheets on the medial and lateral sides are held away from each other in exaggerated cases by their medial lateral attachments making their proper mobilisation and efficient suturing without tension difficult; nor is it possible to get a strong foothold for the sutures to be passed through the muscular fibres that they are meant to appose. Even when it becomes possible during operation, it has to be done under tension and they are most likely to cut through.

3. Hernia following injury to nerves:

These herniae are due to lack of muscle support caused by injury to the motor nerves of the muscles. The muscles are toneless and they fail to withstand the intra-abdominal pressure. This is also true with hernia at the linea semilunaris. They appear as a general bulge and the hernial sac is devoid of a neck or pseudo neck.

For the cure of the group of cases where the anatomical deficiency is exaggerated beyond reasonable limit various operative procedures are recommended. A short resume of the more important operative procedures is given.

(i) Cattel and his associates claim that proper dissection of different layers of tissues and suturing them up in different layers should sufficiently fortify the abdominal gap. Their ten year follow-up statistics have yielded highly favourable results. In big incisional herniae it is almost an impossible task to appose the



Fig. 1.

Herniation of muscle after Gallie's operation.

thin fibrous margins of the peritoneal opening and even if this is possible in some cases, tension at the suture line is too great and the sutures are likely to cut through. In infraumbilical herniae the thinned out edges of the recti are so attenuated that sutures do not easily hold and they afford a very weak support to the bulky abdomen.

(ii) Gallie's fascial strip implants have been widely practised in these cases. The results have been satisfactory in moderate sized herniae but the results in very big sized incisional herniae have been rather disappointing. Apart from the usual disadvantages of fascial strip suture which is well known, there are certain special disadvantages in this group of cases. To effect a proper double layer interlacing in large incisional hernia, the length of the fascia that is necessary may cause herniation of the thigh muscles through the gap with attendant disability and moreover the

vitality of the grafted fascia may be jeopardized due to its bulk. The degree of muscle herniation that may follow will be realised from the photograph of a case where fascia lata strips were used for the cure of inguinal hernia. The other important consideration in the repair of the big abdominal hernia lies in the distraction strain in the line of anchorage of the fascial strips. During the immediate post-operative period, abdominal distension that invariably follows causes a strain on the line of anchorage, and as a result the sutures may cut through in some places thus weakening the support. Later on, the pull of the muscles and the weight of the pendulous abdomen further increases the distraction strain in the peripheral part of the repair and may induce a recurrence.

(iii) Rectus transposition operation of Nuttall.

(iv) Use of pedicled flap of iliotibial band of Wangenstein.

These operations have their advocates. In Nuttall's operation excessive dissection is necessary to effectively mobilise the recti. The type of patients who are more prone to have incisional herniae are usually bad surgical risks, and to ensure their safety minimum interference should be the maxim. Moreover the quality of the muscles and their integrity is usually very poor in this group of cases, so that even after crossing the recti, adequate support may not be obtained.

In Wangenstein's operation the dissection is far too extensive and the operative procedure is too elaborate. This operation has not got a favourable response.

The inconsistent results obtained with these operations have led to the use of various grafts, homogenous and heterogenous, to reinforce the area of repair. These generally are :—

- (a) fascial patch transplant.
- (b) skin transplant—Mair's.
- (c) wire filigree.
- (d) plastic inserts.



Fig. 2.

Section of human skin removed 18 days after implantation showing giant cell granulation tissue springing up from the mother tissue and spreading out round the graft. Within this granulation tissue remnants of necrotic blood vessels is seen. Union between the graft and the parent tissue is incomplete. (H & E x 100)

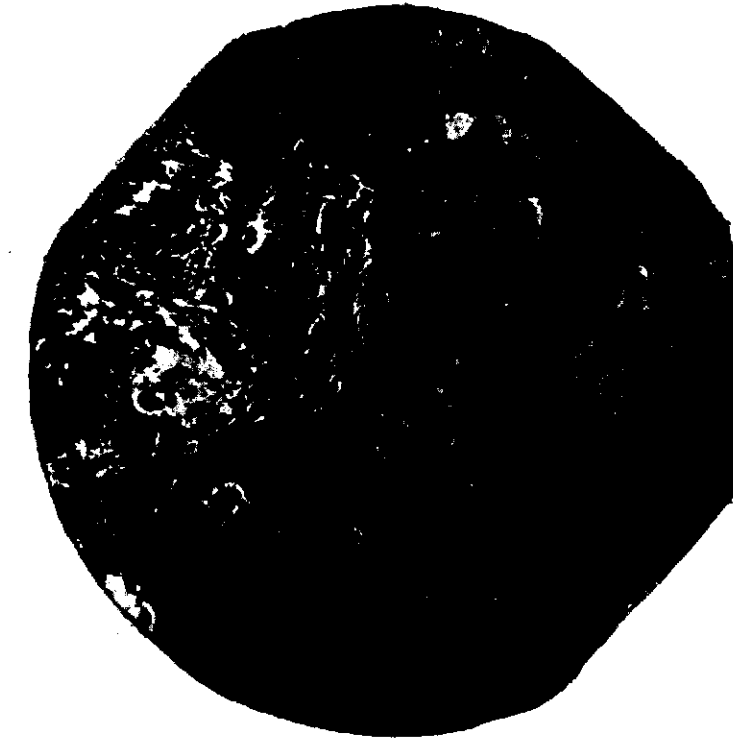


Fig. 3.

Section of human skin removed 21 days after implantation showing foreign body reaction specially round suture material and union between graft (top) and parent tissue. (H & E x 100)

Though recommended by some surgeons from time to time fascial patch transplant has not gained sufficient popularity because of uncertain viability of the transplant.

At present the choice of alternative operations lie between skin transplant and metal and plastic inserts. It is not yet time to assess the results of the latter procedures. To me it seems that in spite of the very many advantages claimed, the fact that the insert will always remain foreign to the tissues is by itself a drawback. For all these reasons I took up the

study of the repair of hernia by dermatoplasty and followed up their results in the treatment of big sized abdominal incisional herniae.

Studies on buried skin graft :

Historical.

The presence in the corium of the skin of an easily accessible source of fibrous tissue has led to the investigation of its use in the repair of tissue defects for a fairly long time. It seems that the first to use skin without epidermis as graft to repair post operative hernia were Loewe (1913).

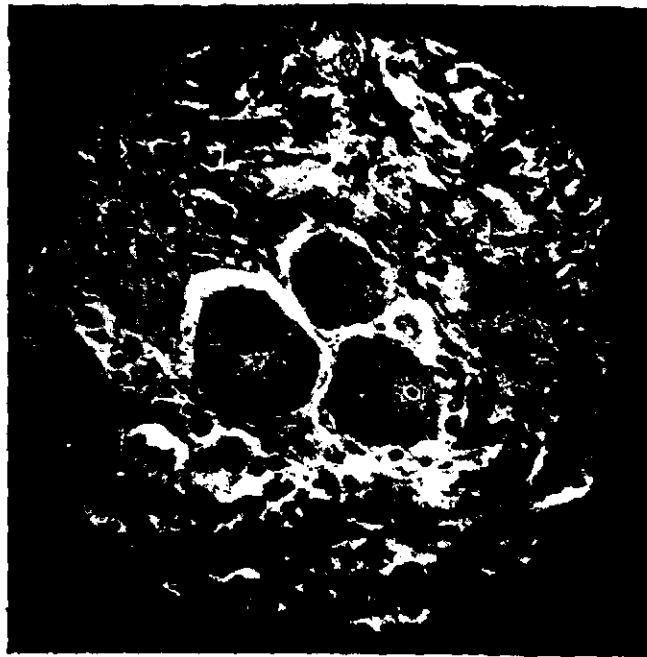


Fig. 4.

Section showing details of granulation tissue with foreign body giant cells shown in Fig. 2. (H & E x 440)



Fig. 5.

Section of human skin removed 28 days after grafting shows almost complete union through intervening granulation tissue which appear broken at one point due to the presence of the remnants of few necrosed blood vessels surrounded by foreign body reaction. (H & E 100)

and Rehn (1914). This operation did not become popular, but the idea was quickly taken up by the plastic surgeons and the histology of the buried skin graft was mostly studied by them. Uihleen (1939) and Cannaday (1942) revived the method of Loewe and Rehn in all types of large hernias and reported gratifying results. Mair (1936) used whole thickness skin graft and published encouraging results in 1945.

The main objection against the buried skin graft is the chance of formation of epithelial cysts and also introduction of sepsis from the glands of the skin. The

earlier workers tried to minimise the chance of epithelial cyst formation by removing as much of the epidermis as possible before grafting the skin. This type of graft is known as cutis graft and it contains all the elements of the skin except the epidermis. But it has been found that it is not possible to remove all the epidermal elements from the graft by mechanical means as the glands are deeply buried in the dermis. Thus the practicability of the use of a buried skin graft depends on the ability of the body to remove the epidermal elements, for, otherwise the implanted epithelium will result



Fig. 6.

Section of human skin removed 42 days after implantation showing union between graft and parent tissue specially on the right hand side. (H & E x 100)

in cyst formation. Mair (1945) in a comprehensive review and experimental work on whole skin graft suggests that the deciding factor is not the quantitative reduction in the amount of the epithelium but the fixation of the graft under tension. This has been corroborated by Ordie Shaffer and others.

Experimental studies.

In order to convince myself of the experimental studies presented by Mair I carried out some experiments on human subjects. This was done in eight cases and I am presenting the histological sections of some of the buried skin removed at different intervals (Figs. 2 to 6).

This paper is based on the experience of eleven operations for abdominal herniae performed between 1949-'54, of which eight were cases of infraumbilical incisional herniae, two are cases of big sized umbilical herniae and one is a case of hernia through the flat-muscles—upper left, following stab injury necessitating removal of the spleen, followed by parietal

sepsis. Of the infraumbilical incisional herniae only one was through the linea semilunaris.

The technic followed in the repair of these cases was that of Mair with a few modifications. In all the cases suitable sized skin large enough to bridge over the defect and overlie it conveniently on all sides was taken and anchored to the deep fascia and the muscles by marginal stitches of silk at suitable intervals. The size of the skin has varied, the maximum size that has been utilised is $4\frac{1}{2}'' \times 3\frac{1}{2}''$. Care was taken to see that the external margin of the transplant extended beyond the lateral limits of the recti on either side. This technical detail ensures a better pull on the recti towards the middle line and when the graft is transformed into a sheet of fibrous tissue and gets adherent, it acts as a broad internal belt and not only serves to resist the intra-abdominal pressure but can also withstand the distraction effect of the flat muscles on the recti.

Even with these details there remain a chance of some of the marginal stitches cutting through and causing curling in of the margins in places. To overcome this possibility a few stitches with bigger bites were used, to further anchor the surface of the graft to the base, thus ensuring safety to the marginal stitches.

The wound was closed with a rubber sheet drain in every case.

The usual postoperative care was taken during the after treatment. A suitable antibiotic was given in every case for a week or ten days.

In most of the cases there was a collection of clear fluid which persisted to drain for five to six days and in one case upto the 13th day. The fluid was cultured in most cases at intervals. Only in one case where the fluid exudation persisted for 13 days, culture of the fluid on the 9th day showed growth of staphylococcus aureus. This however did not materially alter the course and the wound became dry after the 13th day.

The results in these cases have been followed up for varying intervals (Table I). There has been no recurrence in this series.

TABLE I			
1. Nature of case	No. of case	Followings	Result
2. Umbilical hernia	2	2 and 2½ yrs	No recurrence
3. Infrumbilical	8	1½ to 5 yrs.	"
Through flat muscles	1	5 yrs	"

In conclusion I must admit that it will not be fair to draw any dogmatic inference from this small series of cases. But judging from the various aspects, I am of opinion that the method is simple, the operation is less time consuming and the result in my series has been gratifying.

My thanks are due to Dr. M. N. Sarkar, M.B., F.R.C.S., the Principal of the Calcutta Medical College for kindly allowing me to utilise the hospital records of some of the cases and to Dr. P. Chatterji, M.B., F.R.C.S.(E) for giving access to his case records and for guidance in the preparation of this paper.

REFERENCES

1. Budrick, Gillespie and Higginbotham.: Fascial suture operations for hernia. *Ann. Surg.* 106: 335, 1937.

2. Cannaday.: The use of cutis graft in the repair of certain types of herniae and other conditions. *Ann. Surg.* 115: 775, 1942.

3. Clarke.: The formation of inclusion dermoid cysts following whole thickness skin graft repair of hernia. *Brit. Jour. Surg.* 39: 346, 1952.

4. Gallie and Le Mesurier.: A clinical and experimental study of the free transplantation of fascia lata. *Jour. Bone. & Joint Surg.* 4: 600, 1922.

5. Harkins.: Cutis graft, clinical and experimental studies in their use as reinforcing patch in repair of large ventral and incisional herniae. *Ann. Surg.* 122: 996 1945.

6. King.: Incisional hernia. *Brit. Jour. Surg.* 23: 35, 1935.

7. Mair.: Surgery of abdominal hernia. Edward Arnold, London. 1948.

8. Medical Annual: Page 119, 1951.

9. Ordie Shaffer.: The comparative merits of whole skin and dermal grafts in the repair of massive hernias. *Surgical Forum, American College of Surgeons.* Page 499, 1951.

10. Peer and Paddock.: Histologic studies in the fate of deeply implanted dermal grafts. *Arch. Surg.* 34: 268, 1937.

11. Watson.: Hernia. 3rd edition, Henry Kimpton.

12. Zavelata and Uriburu.: Whole thickness skin graft in the treatment of hernias, analysis of 211 cases. *Surg., Gynec. & Obst.* Page 91, 1950.

Received for publication on 29-5-'56.

SOLITARY PLASMOCYTOMA OF DORSAL VERTEBRA

by S. P. SRIVASTAVA and K. S. MATHUR, Agra.*

A solitary myeloma of the skeleton is seen infrequently in comparison with the incidence of the multiple form of the disease. Many tumours which appear to be solitary in the early stages of the disease become generalized within 2 months to 3 years. It is of interest that the Bence-Jone's protein is more often detected after the disease is obviously generalized than during its solitary phase.

REVIEW OF LITERATURE

Ewald (1897) seems to have described the first case with a solitary tumour. His patient had abnormal protein in the urine. The tumour was composed of cells resembling plasma cells.

Shaw (1923), Zdansky (1927), Martin, et al (1928), Rogers (1930), Geschickter (1930), Stewart and Taylor (1932), Harding and Kimball (1932) reported cases of solitary plasma cell tumours of long bones (middle third of humerus, upper third of femur, neck of femur, shaft of femur, upper third of femur, upper third of humerus and upper third of femur respectively) most with pathological fractures and negative Bence-Jone's protein in urine.

Walthard (1924), Busser and Lichterberger (1933) and Busser and Bugant (1937) described cases of solitary plasma cell tumours of spine. Walthard did laminectomy on a man aged 55 years who had tumour of the 7th cervical and 1st dorsal vertebra with compression of spinal cord for ten months. He died after operation and at autopsy no other tumour was detected. Busser and Lichterberger described a woman of 52 years who had plasmocytoma of 3rd lumbar vertebra with ultimate invasion of spinal cord for 7 years before operation. She survived for 3 years

after the operation. Busser and Bugant's patient was a woman aged 53 years. She had solitary myeloma of 12th dorsal vertebra.

Leedhan Green (1938) reported two cases of plasma cell tumours of the pelvis in men aged 50 and 40 years respectively, who remained well for 2½ years and 6 months respectively after X-ray treatment.

Paul and Pohle (1940) were able to summarize 45 cases of solitary myeloma of skeleton; several of these were later found to be diffuse. Willis (1941) believed only 13 cases could be accepted as truly solitary. Amongst them, there were 10 men and 3 women ranging in age from 29 to 68 years. Single foci were more commonly recorded in proximal portion of femur (5 cases) dorsal vertebrae (3 cases) and pelvis (2 cases). Involvement of long bone was associated with a pathological fracture in all but one case.

Willis, in his paper on Solitary Plasmocytoma reviewed Culter's two cases of solitary tumours and added a third case of solitary tumour in the ileum. One of Culter's cases was a man of 55 years who had tumour in the ileum and who remained well for 20 months after deep X-ray therapy. The second case had a plasma cell tumour in the 2nd lumbar vertebra of a male negro aged 52 years, skiagram of whose skeleton failed to reveal any other lesion six years after the onset of symptoms.

Solitary extramedullary plasma cell tumours may occur in other sites. These are listed in detail by Hellwig (1943) who found 127 such cases reported since 1905. In 65 the tumour originated in the air passages, the second most common site was the conjunctiva. A few cases were reported in lymph nodes, ovary, thyroid, intestine,

*From the Departments of Surgery and Medicine, Medical College, Agra.

kidney and skin. Many of these patients were well after resection of the tumour.

The two cases reported by Wahi and Razdan (1946) from this hospital were cases of multiple myelomatosis. The case reported below is the first case of solitary myeloma seen in this hospital.

CASE REPORT

Dori, Hindu male, aged 45 years was admitted to hospital complaining of inability to use the lower limbs, and pain in the lower part of the chest and back, duration one year. The illness began one year back with pain in the chest followed three days later by weakness in both lower limbs. The weakness in lower extremities increased gradually and he noticed difficulty in walking until the present stage, when he could not use his limbs at all. He had suffered from gonorrhoea and syphilis 20 years back. There was nothing contributory in his family history.

On examination, he was a person of average build. Cranial nerves were normal and fundus showed no abnormality. Neurological examination of upper limbs including motor, sensory and reflexes were normal. Both lower limbs were spastic with complete loss of motor power. Knee jerks and ankle jerks were exaggerated and ankle clonus present. Planter reflexes were extensor on both sides. The examination of cardiovascular, respiratory and abdominal systems showed no abnormality. Glands were not enlarged.

Wasserman test was strongly positive. Urine examination showed the presence of Bence-Jones protein. X-ray of the spine (Fig. 1) showed evidence of destruction of the bodies of 5th and 6th dorsal vertebrae suggestive of a new growth. Skiagram of the skull, ribs and long bones showed no abnormality. Myelography was done but the findings were inconclusive.

The patient was given a full course of anti-syphilitic treatment without any relief. The patient was then operated upon under general anaesthesia in the left lateral position. A longitudinal paravertebral incision 8" long was made from the spinous process of 3rd thoracic to 9th thoracic vertebra. After cutting through the muscles the laminae were exposed. The spinous process of the 4", 5", 6" and 7" thoracic vertebrae were excised and the laminae from the 4th to 7th thoracic vertebrae were removed, thus exposing the growth in the vertebral column and the dura mater of the spinal cord. The vertebral bodies were destroyed by the growth which was very friable and vascular.

The spinal cord was surrounded by the growth all around. After decompression of the cord and



Fig. 1.

Plasmocytoma of thoracic spine showing involvement and expansion of the 5th and 6th thoracic vertebra.

controlling the oozing of blood by hot packs and gelfoam the spinal muscles were stitched together. The skin wound was also sutured after putting a rubber drain for 24 hours. 600 c.c. blood was given by transfusion during and after the operation and 250 c.c. of plasma. The pulse remained rapid for 24 hours and then settled down.

The rest of the post operative course was uneventful and the patient was nursed on his side.

The bladder was emptied by a catheter which was kept indwelling for 3 or 4 days and enema had to be given every third day. The piece of tissue removed for biopsy showed plasma cell myeloma on histological examination. There was some improvement in the muscular power after the operation and the patient had to be kept on a plaster bed to avoid any strain on the spine or pathological dislocation. Deep X-ray was advised but the patient left the hospital before full course of treatment.

COMMENTS

The case described above was a case of solitary plasmocytoma of the 5th and 6th dorsal vertebra along with pressure symptoms on the spinal cord. He had gradually increasing weakness followed by spastic paraplegia. The X-ray of the spine revealed the presence of destruction of the

REFERENCES

vertebrae due to a growth. There were no characteristic features in the skiagram suggestive of plasmocytoma. It was not until the operation was done and biopsy material examined that the diagnosis was made. Urine was in fact examined after the biopsy for Bence-Jone's protein. The positive W.R. delayed the operation and with positive history of syphilis he had to be treated by an intensive course of Penicillin injections.

The advantage of the operation was decompression of the cord. The growth could not be removed in toto.

The presence of solitary plasmocytoma for 1 year before admission and during the course of 3 months that he was in the hospital along with the presence of Bence-Jane's protein which is found only in 20% of solitary tumours make this case worthy of record.

SUMMARY

1. The Literature regarding the incidence of solitary plasmocytoma of bones is reviewed.

2. The report of a case of solitary plasmocytoma of spine with presence of Bence-Jone's protein in urine and treated by spinal decompression and deep X-ray therapy is given.

1. Busser, F. and Bugaut, L.: *Ann. Anat. Path.* 14: 423, 1937.
2. Busser, F. and Lichtenberger, R.: *Ibid.* 10: 202, 1933.
3. Ewald, K.: *Wien. Klin. Wehnscher.* 10: 169, 1897.
4. Geschickter, C. F.: *Ann. Surg.* 92: 425, 1930.
5. Harding, W. G. and Kimball, T. S.: *Amer. Jour. Cancer.* 18: 1184, 1932.
6. Hellwig, C. A.: *Arch. Path.* 36: 95, 1943.
7. Leedhan-Green, J. C. et al.: *Brit. J. Surg.* 26: 90, 1938.
8. Martin, J. F. et al.: *Bull. Assoc. Francais Etude Cancer.* 17: 537, 1928.
9. Paul, L. W. and Pohle, E. A.: *Radiology.* 35: 651, 1940.
10. Rogers, H.: *Brit. J. Surg.* 17: 518, 1930.
11. Shaw, A. F. B.: *J. Path. and Bact.* 26: 125, 1923.
12. Stewart, M. J. and Taylor, A. L.: *Ibid.* 35: 541, 1932.
13. Wahi, P. N. and Razdan, A. N.: *I.M.G.* 81: 128, 1946.
14. Walthard, B.: *Schweiz. Med. Woch.* 54: 285, 1924.
15. Willis, R. A.: *J. Path. and Bact.* 53: 77, 1941.

Received for publication on 17-7-'56.

HYDATID CYST OF THE SPLEEN

by A. R. RAO and V. BALASUBRAMANIAN, Madras.

Practically no organ in the human body is free from infestation with *Taenia Echinococcus*.

Since the gastrointestinal system is the portal of entry, the liver is the commonest organ to be involved. Next in order comes the lung since it is the next filter. The involvement of other organs is determined by chance and by the vascularity of the organ.

Among the unusual situations are to be mentioned the thyroid, the spleen, the breast, etc.

Mahadevan and Menon recorded ten cases of hydatid cysts for the years 1923-32. Reddi and Anguli² (1953) reported 33 cases of hydatid disease from the General Hospital, Madras, during the years 1932-52. In both these, hydatid cyst of the spleen is not recorded. Dew¹ (1928) records an incidence of 2.1% as far as hydatid of the spleen is concerned.

Pathology of Hydatid Cyst of the Spleen: Hydatid cysts of the spleen (as elsewhere) can be primary (i.e. where the hexacanth embryo gets implanted only in the Spleen), or secondary, where a primary cyst in another organ ruptures and the liberated scolices land in the spleen and grow there. In such cases many small cysts may be found in the spleen. This is what Dew calls (1928) secondary echinococcosis.

A primary univesicular Splenic hydatid (with its brood capsules) usually remains in that state for a long time without giving rise to daughter cysts. This is so since the cyst is protected from trauma because of its deep situation. But due to trauma or some other cause, daughter cysts may form in some cases.

Various authors have classified Splenic hydatids into different groups depending on their location and subsequent extension. Thus Dew (1928) quotes Dieulafoy

who classified hydatid cysts of the Spleen into central, cortical and juxta-splenic. Clinically they were classified into ascending or thoraco-abdominal type and the descending-abdominal type.

Some Authors have classified these on the basis of 'presentation' of the cyst as in the case of pseudo-cysts of the pancreas.

Such classifications are perhaps superfluous since whatever the initial location of the cyst the final picture is one of a large cyst. Thus a central cyst may enlarge to such an extent as to resemble a cortical cyst and vice versa.

Course: A splenic hydatid cyst usually grows to a big size before it gives rise to symptoms. This is obvious because a small cyst in the spleen is not likely to produce any sort of disturbance and so will be allowed to grow to a big size. This is the reason why splenic hydatid is rare in children. Even a big uncomplicated cyst produces only vague symptoms, unless the



Fig. 1.

patient comes for a swelling in the abdomen. A big cyst is perhaps more prone to complications like rupture, etc.

Preoperative diagnosis of hydatid cyst of the spleen can only be considered as a possibility when a patient, comes with a cystic swelling in connexion with the spleen. In the routine investigation of a splenic cyst, the presence of hydatid disease in another organ may be helpful; or a Casani's test will have to be depended upon.

When the patient comes for a solid enlargement of the spleen (e.g. due to an expanding central cyst) the diagnosis is very difficult, particularly so in a country like ours where other causes of splenic enlargement are so common, e.g. malaria.

The first case is of interest in that the diagnosis was made before laparotomy, during routine investigation. The second case presented many difficulties in diagnosis. Hydatid cyst was also thought of as a possibility.

CASE REPORTS

CASE 1.

Mrs. S., a female aged 35 years was admitted on the medical side for enlargement of the spleen. Apart from a gradually increasing swelling of two years' duration she had no other complaint. There was no history of fever.

Examination revealed a smooth solid enlargement of the spleen—almost upto the umbilicus. Since the routine haematological and other investigations were negative, a splenic puncture was decided upon. During splenic puncture, clear colourless liquid was aspirated. This was examined microscopically and found to contain hooklets.

Thus a diagnosis of hydated disease of the spleen was made.

A plain skiagram of the abdomen did not reveal any calcification.

Following aspiration, the patient had a slight rise of temperature for a few days. The swelling of the spleen had now become solid in some places and cystic in some places.

She was transferred to the surgical side for further treatment.

The treatment contemplated was splenectomy and accordingly under general endotracheal

anaesthesia the abdomen was opened by a left paramedian incision. The diagnosis was confirmed. The cyst was aspirated after suitably packing the area; 10% formalin was injected; the cyst wall came off very easily, with suction. There were no daughter cysts. Splenectomy was then performed along the usual lines. (Figs. 2 and 3).

Her post operative course was uneventful.

CASE 2.

Mrs. K., aged 55 years, a labourer was admitted on 30-7-1955 for a lump in the abdomen, of more than 2 years' duration.

On interrogation the following history was obtained.

The patient was keeping very good health till about 3 years ago. The complaint started as occasional attacks of pain in the left hypochondrium; it had no relation to food, and used to disappear after a while on fomentation. It used to come on roughly once in 10 days.

About 2 years ago, she noticed a gradually increasing swelling in the left hypochondrium. For the past 10 months—patient felt uncomfortable after food and a little breathless on extension of Spine. Patient did not suffer from attacks of fever or pain in the back. Her micturition and defaecation had been normal. She noticed slight deterioration in general health.

There was an obvious fullness in the upper abdomen involving the left hypochondrium, left lumbar, upper half of the umbilical region and the whole of the epigastrium. The lump was filling the left loin. By palpation the extent of the tumour was made out as occupying the above mentioned regions. Its borders (except the upper) were firm. Except at the periphery, the tumour felt soft and cystic. Ballotment was possible. A vague notch was felt on the lower margin of the tumour. The tumour was very freely moving with respiration and was not tender. Fingers



Fig. 2.



Fig. 3.

could not be insinuated between the tumour and the costal margin. The liver was not palpable and there were no other palpable lumps in the abdomen. The tumour was dull on percussion all over. Hydatid thrill was not elicited. There was no free fluid in the abdomen. The tumour did not fall forward in the knee elbow position.

The Cardiovascular system and Respiratory system were clinically normal.

Provisional clinical diagnosis:

The diagnosis was between a splenic cyst and hydronephrosis.

Among the cysts of the spleen, hydatid cyst was thought of, in spite of the rarity of the condition. Hydatid thrill was not elicited.

Investigations:

The following investigations were done to arrive at a diagnosis.

1. Urine—Normal in colour. No albumin or sugar; no deposits.
2. Hb—50%.
3. B.P.—130/88 mm. Hg.
4. Urine output in 24 hours—930 c.c.
5. Total W.B.C.—6400/cmm.; D.C.—P 60, L 34, E 4, N 2.

No malaria parasites.

B.S.R.:

At the end of 15 minutes—8 mm.

At the end of 45 minutes—33 mm.

Plain skiagram of abdomen:—Soft tissue shadow of the tumour seen—no calcification. Barium meal series showed that the stomach was pushed to the right of the vertebral column and it occupied an antero-posterior position. The small intestines were pushed down. Barium enema with screening showed that the splenic flexure was pushed down. Barium filled the colon freely and the colon emptied normally. Intravenous urography showed that the right kidney functions well. No excretion of dye by the left kidney. Casoni's test was not done because antigen was not available.

Exploration was decided on and the patient was prepared for surgery.

Operation Notes:

The abdomen was opened by a left paramedian incision from the costal margin to 2" below the umbilicus and the rectus muscle was split in the direction of its fibres. As soon as the peritoneum was opened the tumour which was from the spleen was found to occupy the entire wound. Splenectomy was decided on. Mobilisation of the spleen was attempted and it was difficult because

the exposure was inadequate. Another incision had to be made transversely starting from the middle of the vertical incision towards the loin. The muscles were cut across. The wound was carefully packed with pads all round.

There were 3 large whitish areas on the surface of the spleen and these areas were cystic. There were adhesions between the greater omentum and the spleen on the medial side and there was profuse haemorrhage during the separation. This was controlled. After separation of these adhesions the organ was gently lifted up a little and the splenic pedicle was secured between clamps, divided and ligatured. The spleen was then almost completely free from any attachments and it was delivered out of the wound. When the last adhesions were severed from the lower pole of the spleen there was an inadvertent puncture into the cyst and a little fluid and also 2 cysts escaped out. But by this time, the entire spleen was outside the wound. It was found that the kidney had been pressed upon by this huge spleen. The kidney was flat and appeared smaller than normal. When the viscera were inspected, there were a few very small white plaques on the serous surface of the pelvic colon. Two of them were excised for pathological examination.

Microscopic appearance of the specimen:

The spleen was 8½" in length and 8" in breadth (Fig. 4).

There were areas of whitish discolouration on the surfaces. The upper third of the spleen was not involved and was normal. The central portion of the tumour was cystic—the periphery firm. The splenic notch was not distinctly seen.



Fig. 4.



Fig. 5.

A small window was cut in the specimen and a number of daughter cysts were seen (Fig. 5). The weight of the specimen was 7 lbs. The cyst fluid was examined under the microscope and scolices were seen.

Histopathological report on the spleen with cyst:

"There is an increase in the fibrous tissue of trabeculae with congestion of pulp. Lymphoid follicles are atrophic. The wall of the cyst consists of laminated fibrous tissue with collection of lymphocytes and areas of haemorrhage. The laminated wall is lined by a layer of foreign body giant cells. "Hydatid cyst."

Plaques on colon — 4124 55 — Wall of hydatid cyst."

Post-operative intravenous urography:

13-9-55 — Both kidneys were functioning. The pelvis and calyces on the left side were smaller than on the right side.

Discussion

In the first case diagnosis of splenic hydatid disease was made in the medical wards.

After the aspiration the solid enlargement of the spleen had become cystic practically all over—probably because the hydatid fluid had seeped through the puncture hole and had collected under the capsule of the spleen.

In the second case the history of complaint did not give any clue to the site of lesion. The clinical findings were not typical of either a splenic or a kidney tumour. The hydatid thrill was not elicited in this case. The laboratory tests of kidney function pointed to a kidney lesion. The minute volume of urine was only 0.4 c.c., blood urea was a little raised, viz., 45 mgm% and the standard clearance was only 56.45%. The barium meal pictures did not help much to locate the site of lesion. The stomach was pushed to the right. The barium enema pictures and screening also were not of much help. They showed only the splenic flexure displaced downwards. The intravenous urography did not show excretion from the left kidney. This was very much in favour of a left kidney lesion. It is extremely unusual for an intraperitoneal organ like the spleen to cause compression on the kidney to an extent to cause complete non-function. Even in enormous enlargements of the spleen in Banti's syndrome, intravenous urography always shows good function of the left kidney. A thoraco-abdominal approach to the tumour was originally contemplated in the second case because of the large size of the tumour and also because either a kidney or a splenic tumour could be comfortably dealt with. It was not used because in the event of spill from the cyst, both the pleural and peritoneal cavities were likely to be contaminated. There was an unfortunate incident during operation. When the spleen was almost entirely out of the abdomen, there was an inadvertent puncture of the cyst. Prognosis should be guarded in this case because of the fact that the plaques on the pelvic colon showed wall of hydatid cyst. There must have been a rupture of the cyst already.

Hydatid cysts of the spleen must always be treated, because of the danger of rupture by trauma or spontaneously, resulting in massive haemorrhage and/or further spread and involvement of the peritoneum.

Conservative operative treatment like excision of the cyst alone is recommended by some; splenectomy is recommended only when the spleen is completely destroyed, or where there are multiple cysts, or when there is a complication like rupture.

It must be admitted that excision of the cyst alone is safer where splenectomy is likely to be very difficult because of dense and extremely vascular adhesions.

Except under such circumstances, splenectomy appears to be better at least from the view point of total eradication of the disease. This is particularly so since removal of the spleen has no unpleasant sequelae.

Hence splenectomy was performed in these cases.

SUMMARY

Two cases of hydatid cysts of the spleen are described along with some details regarding pathology of such cysts in general. These are the first two recorded cases in the Madras General Hospital.

ACKNOWLEDGEMENT

We are thankful to the Dean, Govt. General Hospital, Madras, for permission to publish these case reports. One of the authors (V.B.) wishes to thank his chief Dr. C. P. Viswanatha Menon, M.S., F.R.C.S. for permission to record this case.

REFERENCES

1. Dew.: 'Hydatid Disease'. The Australasian Medical Publishing Company, 1928.
2. Reddi and Anguli.: The Indian Journal of Surgery. 15: 100-103, 1953.

Received for publication on 26-3-'56.

A CASE OF RECURRENT LUMBAR HERNIA THROUGH PETIT'S TRIANGLE

by A. K. DUTTA GUPTA, Calcutta.

INTRODUCTION

Spontaneous lumbar hernia through Petit's triangle is a very rare type of hernia and its recurrent variety is rarer still. This case, therefore, seems worth recording.

CASE REPORT

Patient named 'S' female, aged 37 years, was admitted in the Medical College Hospital on 2-4-1954 for recurrence of a swelling in the right lumbar region overlying the Petit's triangle, since 5 years.

History of the Illness.—The patient had a hernia through the right Petit's triangle 15 years ago (1941). It gradually went on increasing in size for 6 years with dragging pain for 2 years. It assumed a big size of 6" in diameter and was completely reducible. She was operated on 9 years ago (1947)

in the same hospital. She was well for about 2 years and noticed re-appearance of the swelling in 1949 which was gradually increasing in size.

On Examination.—General build and nutrition—fair. She had old Kyphoscoliosis of the lumbar spine on the right side with pigeon breast (rachitic) and multiple neurofibromatosis with pigmentation. Liver and spleen were not palpable and heart and lungs showed no abnormality.

Local.—There was a hemispherical swelling of 5" diameter overlying the right Petit's triangle (Fig. 1). It extended above to near the last rib, below on the upper part of the gluteal region (2" below the iliac crest), medially to near the mid-

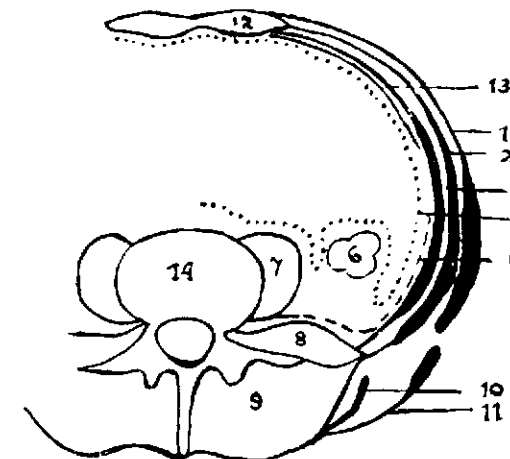


Fig. 2.

Diagram of cross section of right half of the abdomen at the level of the Petit's triangle (gap between 1 and 11) to show the position of the mesh.

1. M. Obliquus externus.
2. M. Obliquus internus.
3. M. transversus abdominis.
4. Peritoneum.
5. Steel mesh (dash line).
6. Ascending colon.
7. M. Psoas major.
8. M. quadratus lumborum.
9. M. Sacrospinalis.
10. M. serratus posterior inferior.
11. M. latissimus dorsi.
12. M. rectus abdominis.
13. Fascia transversalis (incomplete anteriorly).
14. Vertebra.



Fig. 1.

Clinical Photograph of the Recurrent Lumbar Hernia through right Petit's triangle. Scar of the previous operation is seen over the swelling.



Fig. 3.

X-Ray shows the position of the stainless steel mesh on the right side. The lateral part of the mesh is curved on itself fitting with the curvature of the flank (shown by 2 margins on the lateral side).

line and laterally to the mid-axillary line. It had a fairly defined outline. It appeared on standing or sitting and increased in size on coughing with expansile impulse, and diminished when the patient lied down on the left side. It was reducible on pressure. The swelling was soft and elastic in consistency. A gap was felt at the site of the Petit's triangle after reduction, but the margins of the gap were not so well felt as before the first operation when it admitted 3 fingers. The swelling was tympanitic on percussion.

Notes of the first operation.—Incision was made over the swelling. Latissimus dorsi muscle was so atrophied that it was practically not visible. No muscle was seen in the floor of the triangle. Lateral margin of the Erector spinae muscle formed the medial border of the gap. It was a sliding hernia with caecum, ascending colon and terminal ileum as the contents. Appendix was removed. The sac anterolateral to the colon was excised after ligature. The gap was repaired by fascial sutures taken from the fascia lata of the thigh, sutures being placed between external oblique and erector spinae muscles.



Fig. 4.

Shows no recurrence of hernia.

Recent operation.—Operation was done on 25-5-1954 under Nitrous oxide and Oxygen anaesthesia. The abdomen was opened by a low right paramedian incision. An incision was then made on the peritoneum of the right flank 2½" away from the Colon. The caecum, ascending Colon and the posterior perietal peritoneum were dissected off from the posterior abdominal wall over a fairly wide area extending above to an inch below the last rib, medially to the lateral border of the Psoas major muscle and below over the Iliacus muscle to the level of the Psoas major. A stainless steel mesh (Surgaloy Mesh) of adequate size was placed on the denuded posterior abdominal wall behind the posterior perietal peritoneum. This was fixed in place by fine stainless steel sutures (interrupted). It was fixed above on the Quadratus Lumborum muscle behind the right Kidney, medially to the lateral border of the Psoas Major muscle, below to the Iliac crest, and laterally to Transversus Abdominis muscles well beyond the right paracolic gutter (Fig. 2). The lateral part of the mesh was therefore curved on

itself fitting with the curvature of the flank. The caecum and ascending colon with the posterior parietal peritoneum were put back in their positions in front of the steel mesh. The incision in the peritoneum of flank was closed by a continuous catgut suture. The abdomen was then closed in layers beginning with the anterior parietal peritoneum.

The patient had Penicillin injections in the post-operative period which was uneventful. On 2-6-1954 stitches were removed when union was good. On 9-6-1954, a straight X-ray of the abdomen was taken to see the position of the steel mesh (Fig. 3). On 16-6-1954, the patient was discharged from the hospital.

The patient has been followed upto date and she is well without any recurrence of the hernia (Fig. 4).

COMMENT

There was recurrence of the hernia inspite of the operation of hernioplasty done with fascial strips. I believe this was due to weakness of the musculature round the gap mainly the oblique muscles. The spinal deformity might have played some part in the causation of weakness of the area.

The operation for the recurrent hernia was therefore devised to avoid dependence on the musculature. A stainless steel mesh

which is a fine malleable but unyielding structure was placed over the gap on its inner aspect, and well beyond on all sides. This would form a strong barrier at the source of the hernia. The malleability of the mesh does not interfere with the movements of the body. The mesh was fixed by steel wire sutures to prevent its slipping. No untoward local reaction was noted up to date. Similar mesh of Tantalum etc. can be used.

CONCLUSION

The method of repair as adopted for the recurrence is suggested as the proper treatment for lumbar hernias where strength of the musculature is in doubt.

ACKNOWLEDGEMENT

Thanks are due to Dr. M. N. Sarkar, Principal and Superintendent, Medical College & Hospitals, Calcutta for allowing me to publish this case. Thanks are also due to B. P. Banerjee (P.R.C.A. student) for drawing Fig. 2 for me.

REFERENCE

1. Dutta Gupta, A. K.: An unusual case of Lumbar Hernia through Petit's triangle. Ind. Med. Gaz. 83: 232, 1948.

Received for publication on 26-3-56.

THE APPLICATION OF SPLIT SKIN GRAFTING TO SOME SURGICAL PROBLEMS

by H. W. WILLIAMS and ANAND.

From personal experience, I know that the average general surgeon finds practical difficulties in grafting, which discourage him from attempting such procedures too often. It is proposed to discuss some common conditions in which a conservative attitude towards grafting leads to prolonged treatment and even permanent disability and to outline some of the practical details of grafting.

GROUP 1

Neoplasms: Fig. 1 shows the large graft necessary to close the defect following excision of an epithelioma in a 20 year burn scar of the popliteal region. This case also underlines the need for ample skin replacement in flexures.

Fig. 2 is of a case of recurrent fibromata in the subcutaneous tissues of the leg. The tumours recurred four times following excision by different surgeons. The Tata Institute report was fibrosarcoma but after consultation I agreed to perform a fifth local operation. There were three nodules adherent to the skin, so the whole area down to muscle was excised and the graft applied direct to the muscle. A year has now elapsed without recurrence; previously three months was the maximum period.

Fig. 3 is of a patient in whom a rodent ulcer had destroyed the right eye, cheek and part of nose. The whole was excised leaving exposed bone in orbit and nose. A dental compound mould was made of the defect, which was then covered with a thin graft. This was held in firm apposition by silk stitches through the skin edge tied over the mould. After five days the mould was removed and this photograph taken. Ideal repair in such an area will be by full thickness flaps but recurrences are quickly detected through thin grafts and the final

repair (if desired) should be delayed for a year.

GROUP 2

Non Neoplastic Skin Lesions: It has long been considered that on surfaces exposed to weight bearing or friction, split skin grafts prove unstable. Several recent papers have cast doubt on this. In 1953 Wynn Williams² reported a case of plantar keratoderma treated by excision of the whole skin of both heels, which were then grafted. I treated a similar case a year ago and the skin is standing up to wear, the patient free from pain on standing or walking. Split grafts will survive even where the blood supply is poor. Grafting is therefore an ideal treatment for indolent ulcers of which varicose ulceration of the leg is one variety. The large tropical ulcer will also heal most quickly by this treatment. The ulcer, after cleaning with Eusol for a few days, should be ruthlessly curetted or better still, excised in one piece.

A foul ulcer 3" in diameter of a year's duration, on the foot of a leper is shown in Fig. 7, four months after grafting. The graft has contracted even more than is usual; but the ulcer remains healed.

In Gujerat a chronic eczema of the dorsum of the hands and of the legs near the ankle, is common. The condition sometimes responds to antihistaminics, but whatever treatment is used, relapse is the rule. Conscious of the objections which can be raised to using grafts for a condition that can presumably appear in new areas, I grafted one patient's leg. He was very grateful and persuaded me to treat his hand similarly. X-ray treatment gives good results but requires seven exposures at weekly intervals; I find that a villager who travels a long distance for treatment prefers a ten days stay if possible.



Fig. 1.
Popliteal graft after excision of epithelioma in burn scar.



Fig. 2.
Fibrosarcoma of fascia of leg. Grafting after excision down to muscle.



Fig. 3.
Extensive rodent ulcer, 5 days after excision and grafting by stent mould.



Fig. 4.
Tropical ulcer being curetted with steel rule.



Fig. 5.
Same case as in Fig. 4, after grafting. Note 2 sutures left long to fix dressing.



Fig. 6.
Same case as Fig. 4 & 5 on removal of dressing on 5th day.



Fig. 7.
Trophic ulcer in leper 5 months after excision and grafting.



Fig. 8.
Chronic Eczema of leg of 7 years duration. Photograph 6 weeks after excision and grafting.

Finally in this group I would mention keloid scars. Some small ones lend themselves to excision and very careful approximation of flaps and others may respond to X-rays. The one seen commonly in Gujarat is over the sternum in a butterfly fashion. In these, results with X-rays alone are disappointing. Complete excision and grafting offer the best result. We give a dose 800 r to donor and recipient areas on the day before operation. Haemostasis, always vital to a good 'take', is essential here. Even the smallest clot due to oozing will delay healing and cause local hyper-

trophic scarring. It occurs most commonly at the periphery.

GROUP 3

Burns: Reference has already been made to epithelioma occurring in a burns scar. Because of this, not an infrequent sequel, as well as deformity, burns scars should be excised early. Gross fibrosis is common and blood supply being poor, simple ulceration common. Split skin tends to contract and in certain sites a pedicle graft of whole skin and subcutaneous tis-



Fig. 9.
Acid burn fixing chin. 10 days after excision and grafting.



Fig. 11.
Extensive burn of scalp. Mobility of skin 9 months after grafting.



Fig. 10.
Acid burns prior to a series of plastic operations, but three months after split skin had been successfully grafted to both eyelids by Sir Archibald McIndoe.

sue is advisable. Where scars are not densely fibrotic but supple, judgment must be exercised as to whether the defect is primarily due to skin shortage or distortion. If the latter predominates the deformity may be rectified either completely or partially, by Z plastics or a similar rotation procedure. If however, there is actual skin shortage, such measures will fail. The whole area of scar should be excised, both in linear extent and in depth and the margins undercut for a quarter of an inch all round. When the graft is applied, the interrupted sutures should wrap the graft over the raised skin edge. Subsequent contracture will pull out this overlap. In the primary treatment of burns, no method has yet been advised which can predict the depth of skin destruction at the time of burning. By the 10th—14th day this is apparent and the eschar being removed, the granulating areas should be grafted. The flat square edge of a 6" steel ruler is ideal for removing the granulations cleanly. Where large areas are involved, the sheets of split skin should be laid on tulle gras together and cut into strips $\frac{1}{4}$ " wide.

Acid burns produce a chemical change in the skin, akin to tanning. The dead skin separates very slowly; when the demarcation is clear, it should be excised and grafted with a single sheet of split



Fig. 12.
Immediate grafting of donor area in Indian forehead flap.



Fig. 12-A.
Rhinoplasty by forehead flap. 1 month after showing colour changes in graft.



Figs. 13 & 14.
Partial rhinoplasty in 1 stage. Rim of notes fashioned from pedicle graft from above defect and the resultant wound filled with split skin graft.

skin. Eyelids may be grossly distorted by burn contracture and even where the defect is fully corrected by a graft subsequent contracture of the graft may par-

tially reproduce the defect. Marked over correction is therefore required. Split skin grafts are ideal and should be applied over a stent mould sutured in place for 5 days. Fig. 10 shows such a correction of upper and lower lids performed last year by Sir Archibald McIndoe.

Fig. 11 demonstrates the fact that subcutaneous tissue will grow beneath a split skin graft, so that in a few months the new skin is fully mobile and the marked depression at the periphery of the graft is obliterated.

The scalp was grafted by broad strips of split skin laid in contact. The photograph was taken after nine months.

GROUP 4

Miscellaneous: Road accidents commonly lead to avulsion of large areas of skin from the legs, whilst accidents with machinery may similarly involve the forearms. Even when the skin is not completely avulsed, its blood supply has usually been jeopardised by crushing and immediate grafting



Fig. 15.
Web contraction of axilla from burn. Excision and grafting.



Fig. 16.
3 weeks after.



Fig. 17.
Cutting a graft of the thigh with a Humby knife.

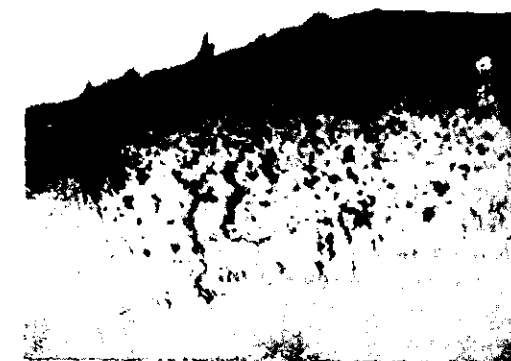


Fig. 18.
Donor site.

with 4" strips of split skin provides the best primary treatment.

Rhinoplasty by forehead flap is an Indian contribution to plastic surgery and in Gujarat is still frequently required. Most general surgeons who attempt this procedure leave the scalp defect to granulate between the first and second stages but if the whole raw area is grafted at the first operation sepsis is avoided and when the pedicle is returned the permanent defect is already grafted. These two photographs (Figs. 12 and 12-A) show the early colour changes that occur in all grafts. In the first weeks and months the graft is much

darker than the surrounding skin due presumably to the slow establishment of the mechanism by which melanin is removed from the skin. Slowly the disparity in colour disappears though texture differences may still be apparent.

Technique: The instruments available for cutting grafts are numerous though many hospitals still use the old Thiersch knife or common razor blade. The latter has its use for obtaining postage stamp grafts for small areas. If a local anaesthetic is used, a rigid, flat surface is provided which cuts easily with the blade held in a 7" pair of Spencer Wells. The most

modern instrument is the electric dermatone. I was not impressed with experiments with this type of instrument in 1953 although a sturdy, easily sterilised dermatone driven by compressed air, looked most promising. However Clarkson Reid¹ reports most favourably on a year's experience with an electric dermatone. Such instruments are not likely to be available to the general surgeon so the choice narrows to the Blair blade, the Humby knife or the Paget dermatone. The latter cuts a graft up to 8" x 4" but I would agree with Clarkson that "it is a time consuming method and there is often trouble with the cement" and it is not suitable for thin grafts. The Blair knife needs much practice but the Humby knife which gives reliable medium thickness grafts, is more easy to manage. Both of these knives need care in sharpening and most plastic surgeons prefer to do this personally. For the occasional operator, both the Blair and Humby knives can be obtained with expendable blades, which ensures a good cutting edge.

The easiest place to obtain a graft from is the thigh. For facial grafts the skin of the upper medial surface of the arm gives a better colour and texture match. After cleansing with 1% Cetavlon and application of towels, an assistant raises the soft tissues on the medial side of the thigh with a flat hand. I prefer a Gabarro board to the simple wooden board for obtaining a flat surface. Whichever is used, the knife must closely follow the board.

Absolute haemostasis must be obtained in the area to be grafted and then the graft should be sewn in with interrupted sutures of very fine silk or linen thread, keeping the graft taut. When the graft has been sutured, any tiny blood clot is washed out

with a stream of saline from a eustachian catheter and bulb. Some of the sutures are left long and after the application of tulle gras and moist saline gauze, cotton wool (or dry flavine paraffin wool) is applied accurately and the sutures tied firmly over. More wool is applied and finally an elastocrepe bandage.

The donor area is covered with tulle gras and dry gauze and a cotton bandage applied over minimal cotton wool. The dressing is left for 10 days by which time it should be healed.

It is our practice to do the first dressing in the operating theatre on the 5th day when the long sutures are cut and a simple light dressing applied. Where it is impossible to obtain pressure in the manner described, it is better to make a mould in Dental Compound and to apply the graft to it. This is useful in eyelid and orbital grafts particularly, as already described. After two weeks, grafts can be lightly massaged with a lanoline cream such as Nivea Creme, particularly at the margins which tend to be rigid and uncomfortable.

SUMMARY

The technique of split skin grafting is described and a series of cases presented in which this treatment is effective.

REFERENCES

1. Clarkson and Campbell Reid.: Use of the Electric Dermatone. B.M.J. 3rd October, 1953.
2. Wynn Williams.: Plantar Keratodermic treated by Split Skin Grafts. British Journal of Plastic Surgery. 6: 2, 1953.

Received for publication on 7-3-'56.

ADENOMA OF THE LIVER

(Report of two cases)

by D. BHASKARA REDDY and C. R. R. M. REDDY, Visakhapatnam.*

Although primary carcinoma of liver is a common neoplasm in some parts of the world as in Africa, India and China benign hepatic cell adenomata are rare. Most of them are silent and asymptomatic during life and cases which produce symptoms, or have treatment or surgical intervention are still rarer. Few cases have been recorded (Hunter³) where surgical intervention has given the patients a cure. These cases usually can occur in both very young and old people. They may be single or multiple. They are usually seen in the right lobe of the liver but occasionally in the left lobe as in the cases recorded below. They are yellowish brown or yellowish red in colour, sometimes pedunculated and showing degenerative changes. There are altogether very few cases recorded in the literature. Hoffman² in 1942 reviewed 58 cases from literature and cited 2 of his own. Packard⁴ and Stevenson in 1944 have reported successful resections in children of 13 years and 7 months respectively. Warvi⁵ in 1945 recorded 3 cases of benign hepatoma. These tumours cause symptoms owing to their weight, size or

pressure on the surrounding viscera such as stomach, duodenum, kidney or bile ducts. Occasionally they present as an acute abdominal emergency as a result of torsion or haemorrhage into the peritoneal cavity. Beling¹ in 1941 advocated peritonoscopy as a most useful aid for diagnosis and for purposes of biopsy. The potentialities of these tumours turning out malignant must always be borne in mind and whenever they produce symptoms they must be removed.

On reviewing the autopsy records of both Pathology and Forensic Medicine Departments of Andhra Medical College we have encountered only 2 cases of adenoma of the liver as incidental findings in the autopsy room. We came across in the same period 38 cases of primary cancer. Both the cases are recorded below for their rarity and for their asymptomatic nature.

Case Report 1:

P. C., Hindu male, aged 10 accidentally fell down into a well and was drowned. Autopsy was done on 28-11-1954. P.M. No. 45/54. Revealed frothy fluid from the nostrils, hands were sodden,



Fig. 1.

Case Report (1). Photograph showing section of the liver with the circumscribed tumour nodule in the lateral end of left lobe of the liver.



Fig. 2.

Case Report (2). Photograph of the liver showing circumscribed, encapsulated tumour in the middle of the left lobe of the liver.

* From the Department of Forensic Medicine, Andhra Medical College, Visakhapatnam.



Fig. 3.

Photomicrograph showing hyperplasia with cord of liver cells of varying sizes surrounding thin strands of fibrous tissue. No lobular pattern could be made out.

all the organs were congested, petechial haemorrhages over the serosal coats. The liver weighed 960 gms. Over the lateral end of the left lobe of the liver, a circumscribed yellowish tumour 1.6" in diameter was seen. The tumour was lobulated rest of the liver did not show any change (Fig. 1).

Case Report 2:

Christian female, aged 20 years drowned herself in a well. Previous history did not reveal any symptoms referable to liver. Postmortem 55.55 was done on 22-11-1955 and presented typical signs of drowning. Liver weighed 1260 gms. A raised yellowish area was seen in the middle of the border of the left lobe of the liver. Cut section revealed a circumscribed encapsu-

lated, yellowish nodule 1" in diameter and lobulated. The rest of the liver was congested and did not reveal any growth or cirrhotic changes (Fig. 2).

Histological study: In both the cases, the tumour was studied in detail histologically and they presented identical appearances. General picture is that of hyperplasia with cords of liver cells of varying sizes surrounded by thin strands of fibrous tissue (Fig. 3). No lobular pattern could be made out, or bile duct hyperplasia. Nodules consisted of loose cells which showed irregularity in size and arrangement. No evidence of any regeneration of liver cells. No evidence of mitosis or hyperchromatism. Normal liver cells can be seen compressed at the edge of the tumour and rest of the liver studied under the microscope did not reveal any change.

Histological diagnosis: Adenoma of liver.

SUMMARY

1. Literature on adenomas of liver briefly reviewed.
2. Two cases of adenomas of liver which are incidental autopsy findings are recorded.

ACKNOWLEDGEMENT

With pleasure, we acknowledge the services of photo-artist, Mr. A. S. Edwin.

REFERENCES

1. Beling, C. A.: Selection of cases for Peritoneoscopy. Arch. Surg. 42: 872, 1941.
2. Hoffman, H. S.: "Benign hepatoma. Review of literature and report of a case". Ann. Int. Med. 17: 130, 1942.
3. Hunter, W. R.: A case of benign hepatoma. Brit. Jour. Surg. 36: 425, 1949.
4. Packard, G. B. and Stevenson, A. W.: "Hepatoma in infancy and childhood. discussion and report of patient treated by operation". Surg. 15: 292, 1944.
5. Warvi, W. N.: "Primary tumour of liver". S.G.O. 80: 643, 1945.

Received for publication on 25-5-56.

ORTHOPAEDIC SECTION

TUBERCULOSIS OF THE SPINE*

by B. MUKOPADHAYA and N. K. MISHRA, Patna.

The many-sided problems presented by tuberculous affection of the spine are so vast that it is not possible to discuss within the time at my disposal every aspect of the subject in the light of experience gained in the management of these patients. I have, therefore, decided to restrict my discussion to a few problems which have seemed insurmountable in the past and continue to cause difficulty in the present.

Tuberculous disease of the spine is by far the commonest and certainly the most serious form of osteo-articular tuberculosis. Out of a total of 924 cases of bone and joint tuberculosis treated by us between April 1949 and December, 1955, 473 were cases of spinal disease (Fig. 1) and Table I. The disease can occur at any age but in our series the highest incidence was encountered in the first and third decades of life, the incidence falling off considerably after the fourth decade (Fig. 2). The youngest patient was six months of age when first seen and already the disease was in an advanced stage involving more than four dorsal vertebral segments. The oldest patient was 76 years of age. Unlike other reported series of cases, where the incidence as between sexes has been more or less equal, in our series there was a definite preponderance of male patients who formed 62.4% of the patients (Fig. 3). Among the childhood cases, there was a definite history of contact in almost 20%—the source of the contact being either one or the other parent or near relations in the family. Careful interrogation of the economic level of our patients revealed that nearly two-thirds of our patients came from the lowest income groups who are chronically under-nourished, whose food is grossly deficient in protective food factors, who live under extremely insanitary

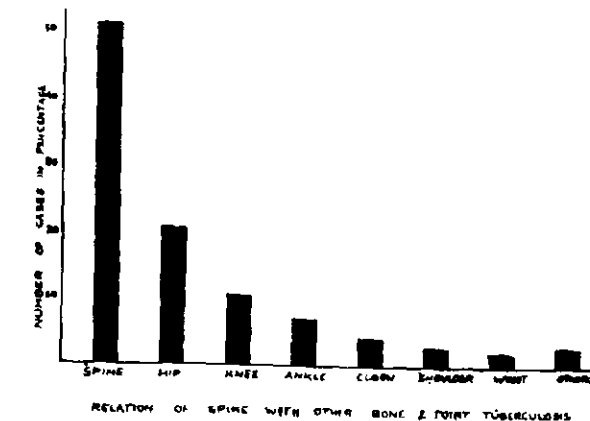


Fig. 1.

INCIDENCE OF SKELETAL TUBERCULOSIS IN VARIOUS REGIONS

Table I

Diseases.	No. of Cases.	Percentage.
Tuberculosis of Spine	473	51.1
Hip	189	20.4
Knee	97	10.5
Ankle	66	7.1
Elbow	36	3.9
Shoulder	25	2.7
Wrist	14	1.6
Others including unspecified	24	2.7
Total	924	100

conditions and who came up for treatment only when the disease is so advanced that the patient is completely crippled by the acutely severe symptoms. A survey of 50 patients revealed that all our cases were caused by human type of tubercle bacilli and there was not a single case of bovine bacillus infection. The materials were collected from abscesses and operative materials. Multiple lesions, i.e., spinal lesions associated with other lesions in the body,

*A Paper read at the XVII Annual Conference of the Association of Surgeons of India at Amritsar, Dec. 1955.

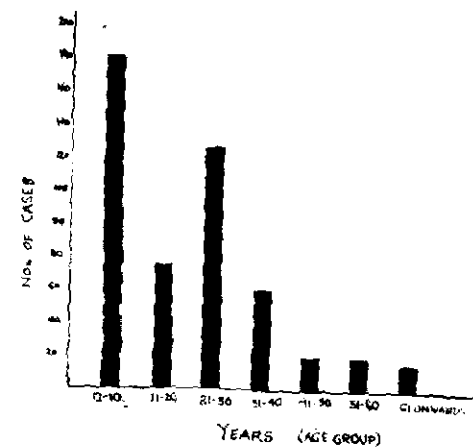


Fig. 2.

A Graph showing the incidence of bone and joint tuberculosis in our series according to age.

e.g., chest, glands, other joints, kidneys, etc. were met with in 18.6% of our cases. The relative frequency with which the various segments of the spinal column were involved were as follows:—

Cervical including cervico-dorsal	9.4 %
Dorsal	40.2 %
Dorsi-Lumbar	13.1 %
Lumbar	25.4 %
Lumbo-Sacral	3.3 %
Unclassified	8.6 %

Lesions in more than one area of the spine was met with in 9% of cases.

The figures show the marked preponderance of dorsi and dorsi-lumbar disease as compared to the other regions of the spine. No satisfactory explanation of this peculiar distribution of the lesion is forthcoming. The number of vertebrae involved varied from one single vertebra to 14 vertebral segments, the average number of involved segments being 3.8 vertebrae. This is so because the vast majority of our patients were first seen when the disease was already well-advanced with destruction, collapse, abscess formation and defor-

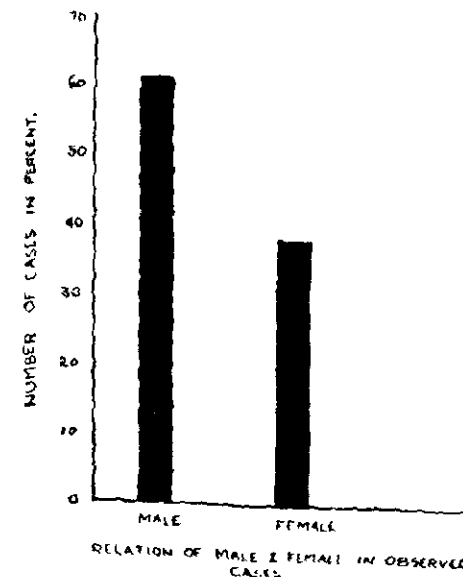


Fig. 3.

Shows the incidence of tuberculous disease as between sexes — male and female.

mity. Only a few cases were seen in the "so-called" early stages of the disease, where diagnosis presented any serious difficulty. The incidence of abscesses detected clinically or radiologically varied with the site of the disease.

Cervical	38.4 %
Dorsal	60.0 %
Dorsi-Lumbar	64.2 %
Lumbar	69.5 %
Lumbo-Sacral	40.0 %

It is principally with the problems of treatment that the present paper is concerned. Every discussion on the treatment of spinal tuberculosis must begin with the admission of two facts—

(a) We are dealing with a secondary lesion caused by a haematogenous spread from a primary focus — active or latent, either in the lung or in a lymph gland and the body as a whole must be considered to have had living tubercle bacilli implanted within it at many locations. This means that the maintenance and enhancement of the general resistance of the patient must always remain one of the prime objectives of all methods of treatment. In the past,

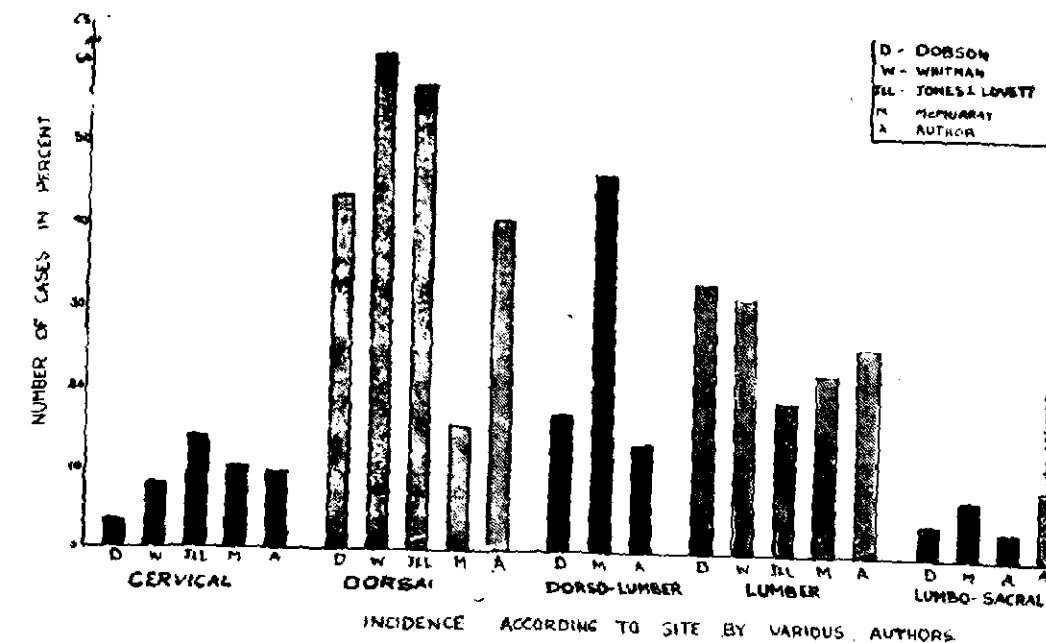


Fig. 3-A.

Shows the incidence of tuberculous disease of the spine according to the regions involved — a comparative study of the author's own series and that of other workers.

this conception coupled with the disastrous results of surgery performed before the advent of anti-tuberculous drugs, dominated the concepts of treatment of tuberculous of the spine. It was conceded that in the treatment of tuberculous disease there was no substitute for time and prolonged, uninterrupted and continuous local and general rest combined with good food and a sanatorium regime formed the sheet anchor of treatment. With this method there was a 25 to 30% mortality and the period of treatment varied from two to five years. In the presence of sinuses the method often failed. It did not fulfil the three basic requirements of an ideal method of treatment. These requirements are—

- (1) The method should stop further progress of the lesion and bring about a quick arrest of the disease. It should also prevent the onset of complications.

- (2) It should restore full function in the diseased area and prevent deformities.
- (3) It should not be time-consuming and uneconomical.

From all these points of view conservative treatment failed to fulfil the requirements of an ideal method.

(b) The second fact is that the disease is extremely chronic and slow in its evolution. Quite a length of time elapses between the implantation of infection and the appearance of physical signs. Even when the disease is suspected, localization of the disease and therefore, confirmation of the diagnosis is impossible until the appearance of radiological signs. Radiological signs do not appear until the disease is fairly advanced and has attained a certain size. The earliest radiological signs are either—

- (i) reduction of intervertebral space, or

- (ii) a radiologically visible area of bone destruction, or
- (iii) an abscess shadow.

In terms of the pathology of the disease, all these are evidences of late lesions. Thus a time lag is almost inevitable in the diagnosis of this lesion even where all modern methods of investigation are available.

The advent of specific and potent anti-tuberculous drugs raised hopes that perhaps some of the pre-conditions of an ideal method of treatment will be fulfilled. Until 1951 most of our patients were treated by prolonged, continuous and uninterrupted local and general rest, good and nourishing food, fresh air and prolonged anti-tuberculous drug therapy consisting of a combination of Streptomycin, para-aminosalicylic Acid and later on, of isonicotinic acid hydrazide when it became available, in adequate doses. These drugs were used for prolonged periods irrespective of the risks and dangers of the emergence of drug resistance. The drugs failed to arrest the local spread of the disease, could not prevent local destruction of tissue and had no dramatic influence on the period of treatment necessary to bring about complete healing of the lesion. With the use of these drugs the appetite improved rapidly, most patients put on weight quickly, painful symptoms were controlled in a relatively short time, and the mortality from the disease was reduced to nearly 15%. However, the beneficial effects produced in the initial stages of treatment was not always sustained. Success was achieved in the treatment of sinuses, three-quarters of which healed spontaneously under prolonged anti-tuberculous drug therapy. The drugs did not appear to have any markedly beneficial effect on inaccessible abscesses. Where the abscesses could be repeatedly aspirated and the drugs instilled locally, general impression was that the drugs helped the absorption of the abscesses.

The comparative failure of anti-tuberculous drug therapy to resolve the local infection in vertebral disease is very likely related to the nature of local tissue

reaction to tuberculous infection. The local lesion in this disease passes through two stages — a very early vascular stage to be followed by an avascular stage. In spinal disease, diagnosis in the early vascular phase of the disease can hardly ever be made with certainty. The fully tuberculous follicle is devoid of blood vessels. As the tuberculous process spreads, the highly cellular tuberculous inflammatory tissue invades the surrounding tissues and bone, cartilage and even dense fibrous tissue offer only a temporary barrier to its progress. The process is accompanied by necrosis of the capillary walls and a well-marked obliterating endarteritis of the larger vessels. Rapid invasion of the soft tissues surrounding the bone causes loss of blood supply to large areas, accompanied by wedge-shaped areas of bone sequestration (Figs. 4 & 5). The occurrence of sequestration in tuberculous lesions have not been sufficiently emphasised in the past. Tuberculous sequestra are hard to identify in skiagrams. They consist of relatively fragile, decalcified bone and thus do not throw a dense contrast shadow but they influence the prospects of healing in the same way as in septic osteomyelitis. Because of the avascularity of the lesion and the fact that a tuberculous focus is usually isolated by a fibrous wall, drugs administered through the parenteral route cannot reach the centre of the diseased area in therapeutic concentrations. Even if administered locally through a sinus, the drug cannot be uniformly diffused and distributed into the interstices of the involved area. The complicated structure of the bony tissue adds to the difficulty of dispensation of the drug. Diagnosis can hardly ever be made with certainty in the early vascular phase of the lesion. If the anti-tuberculous drugs are to act upon the local lesion effectively, it is necessary that a pathway be opened surgically to allow the drugs to reach the diseased area in adequate therapeutic concentration. This can be achieved if the grossly diseased, necrotic and avascular central areas of the lesion are removed surgically leaving only

the relatively vascular peripheral areas of the disease. By a combined administration of anti-tuberculous drugs both locally and parenterally, a high concentration of the drug at the site of the disease can then be achieved. At a stage when diagnosis is possible a pathway must be opened surgically to allow the drugs to get access to the diseased area in proper concentrations. If this is not done the drugs can act only indirectly by enhancing host resistance and such a process is naturally a time-consuming one.

There is another reason why it is desirable to attack the disease surgically. The presence of large amounts of toxic tuberculous material in the body places a great strain on the defence mechanism. It is hard to build up the patient's resistance when his health is being undermined by toxic absorption. The removal of this material would banish the single most important depressing influence from the patient's system and thus enable him to fight the general infection from a more favourable and advantageous ground.

In making a direct assault on tuberculous lesions, the surgeon fears not so much the infection itself, as the inability of the tuberculous soil to deal with secondary infection. There is also the danger of a general dissemination of infection following surgical procedures. The success of anti-tuberculous drug therapy in controlling sinuses and also in the treatment of acute forms of tuberculous lesions including tuberculous meningitis and miliary tuberculous has made it possible to make a direct attack on the tuberculous lesion. They have practically removed the risks of general dissemination following surgery when new vascular channels are unavoidably opened up in a tuberculous soil. Anti-tuberculous drugs prevent the formation of post-operative sinuses and thus the fear of secondary invasion of a tuberculous lesion and the serious consequences thereof, are removed. One can now hope to perform elective surgery with a reasonable chance of success in the presence of active



Fig. 4.

Shows a large centrally situated sequestrum between the bodies of two diseased vertebrae.

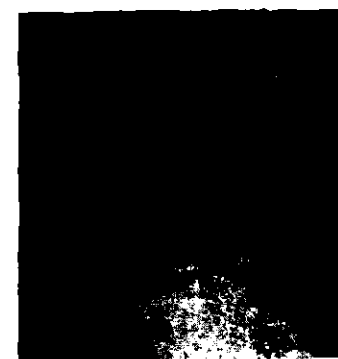


Fig. 5.

Shows sequestration of the whole body of the third lumbar vertebrae. This was removed at operation.

tuberculous infection. Without the protection afforded by these drugs, direct surgical attack on active tuberculous lesions carries prohibitive risks.

In view of these considerations, we have during the period under review treated 56 cases of advanced spinal tuberculosis with what may be termed a combined method of attack. The case can be divided into two groups.

(a) Where long-standing sinuses were present. These were all very advanced and neglected cases in low general condition with a prolonged history of the infection — the duration of the disease varying from 1 year to 9 years. 21 cases had lesions in other parts of the body.

(b) Fairly advanced cases with well-marked tissue destruction but without evidence of sinuses or clinically palpable abscesses. Most of these cases showed presence of abscess in the skiagram or at operation.

The following routine was followed in the management of these cases:—

(i) Once the diagnosis is established and all investigations completed, the patient is hospitalized. He is given 3 to 4 weeks conservative treatment consisting of local and general rest, good food, haematenics, small repeated transfusions if considered necessary and anti-tuberculous drugs.

(ii) At the end of this period an attempt is made to perform as thorough a removal of the involved tuberculous tissue as technically possible through a direct approach to the site of the disease, irrespective of the presence of abscesses or sinuses in the line of incision. The aim of surgery is to leave a healthy, raw, vascular and

bleeding surface at the bottom of the wound. The operation is a major one and requires full use of modern resuscitative measures and good anaesthesia.

(iii) A thorough spraying of the raw area with Streptomycin powder is done. An indwelling catheter is left in the depth of the wound through which anti-tuberculous drugs are instilled daily for 3 weeks after the operation. Penicillin is also given parenterally to prevent secondary wound infection where operation is performed in the presence of sinuses.

(iv) Primary closure of wound is performed, even in cases of sinuses and the patient is placed on a well-fitting plaster bed extending from the head to below the knees. The plaster bed is kept ready before the operation and is placed on a wooden frame to permit easy nursing care.

A word about the local instillation of Streptomycin through the indwelling catheter. This must be performed under strict aseptic precautions and should never be left at the mercy of the ward nurse. Any carelessness in this respect will spell disaster for the whole plan of treatment. During the post-operative period, systemic administration of anti-tuberculous drugs is continued. The combined use of these drugs by parenteral and local routes brings a high concentration of these drugs at the site of the disease and help to combat the residual local infection rapidly.

The original plaster bed is removed after 3 weeks along with the stitches and the indwelling catheter. The wound healed by primary intention in almost every case. In a few cases there was a small collection of sero-sanguinous fluid along the track of

the catheter. This was gently squeezed out at the time of the removal of stitches. Patients are not given continued institutional care as open air institutions for the treatment of cases of skeletal tuberculosis do not exist in our State. They are discharged in plaster immobilization with instructions to carry on with rest and anti-tuberculous drug therapy at home. They are instructed to report at once in case any untoward symptoms, e.g., fever, pain, loss of weight, etc. appear. As a routine they are called after 8 weeks when the plaster is removed, the part x-rayed, a thorough check-up performed and the progress of recovery assessed. The patient is again immobilized and the same routine of treatment continued. The total period of plaster immobilization varies between 4 to 8 months depending on the site of the disease and the individual response of the patient. At the end of this period, activity is allowed in stages. Anti-tuberculous drug therapy is continued for the whole period of convalescence.

In this series of operated cases, except for absolute contra-indications to surgery on medical grounds, no patients were discarded because of age, physical condition, location of lesion or presence of other foci of disease including active disease of the lung. As a matter of fact, in the early days of performing this type of surgery, we preferred to have what can be called "Salvage Problems". The results with this form of management have been uniformly successful. The improvement in the general conditions of the patient following operation has been very striking. This has been most dramatic in cases who were acutely ill and run down before operation specially where anti-tuberculous drugs had not been used parenterally for prolonged periods before operation. Where this had already been done the response was not quite as spectacular. The patients put on weight rapidly, toxæmia disappeared, appetite improved, temperature settled down to normal when the patient was febrile before operation and the rapid

change in the outlook of the patient's condition was very striking indeed. Surgical attack on the spinal lesion produced a beneficial effect on the lung lesion where present, which started to heal more rapidly following operation.

The distribution of the 56 surgically treated cases were as follows:—

- (a) Cervical Spine 2
- (b) Dorsal Spine 38 — 37 lesion of body of vertebra.
1 Laminar lesion.
- (c) Lumbar 16

Among these, there were 9 cases of paraplegia.

Cervical disease can be attacked from a lateral incision, care being taken to avoid injury to the cervical spinal nerves. Endotracheal anaesthesia is essential and the lesion is approached along the posterior aspect of the neuro-vascular bundle and the pharynx and from the antero-lateral aspect of the lesion. Following surgical attack, the lesion heals rapidly within 3 to 4 months. We use a cervical collar for 6 months from the time that rigid immobilization is given up.

It is specially in dorsal spinal disease that an intelligent combination of surgery and anti-tuberculous drug therapy has produced an entirely new outlook in what has hitherto been a dire and intractable condition requiring usually two or more years of recumbancy and even so, very often leading to considerable deformity and disability. This is specially true of children where the disease may destroy anywhere upto 6 or 8 vertebrae and cause very gross degrees of deformity. The use of anti-tuberculous drugs has not succeeded in staying the process of progressive destruction of vertebral bodies. Mortality in dorsal spinal disease is fairly high, and paraplegia specially in upper and mid-dorsal disease very common indeed. In

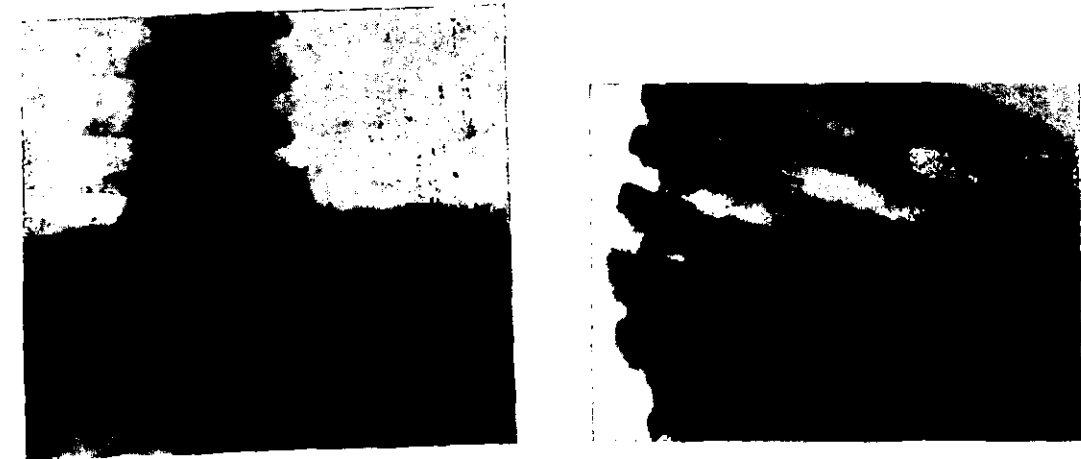
untreated cases the incidence of paraplegia is as high as 40% in our series. In lumbar and cervical regions, the pus can track away from the affected vertebrae. This is not to say that it always does so. But in the thoracic region it usually remains pent up as a persistent paraspinal abscess. In the early stages such pus is under considerable tension and so causes destructive of healthy bone in its neighbourhood. The abscess factor dominates the treatment of spinal tuberculosis and healing rarely occurs in the presence of the abscess, whatever method of local treatment is used.

Costo-transversectomy, complete evacuation of the abscess and removal of all the surrounding necrotic tissues should be done in these cases. This, in our opinion, is even more urgent in children than in adults, because dorsal spinal disease is most destructive in children. This involves removal of portions of vertebral bodies so as to reach relatively healthy areas above and below. The earlier in the disease the operation is performed, the less destructive will be the operation. Once the necrotic tissues are removed, further progression of the lesion is halted. The relatively healthy vertebrae above and below come in contact with each other and there is a strong tendency for them to fuse by bony ankylosis. Of the 37 cases of dorsal spinal disease in which this operation has been performed, 30 have fused post-operatively by bony ankylosis within a period of 6 months from the operation. In other 7 cases, although the disease was arrested and healing achieved, bony ankylosis did not occur. This may be the result of failure of vertebral bodies to collapse on each other. With this method, we have succeeded in arresting further progress and preventing increasing deformity. This is in contrast to the results of conservative therapy where dorsal disease usually heals by fibrous ankylosis and has a strong tendency to attacks of recrudescence and almost always requires a posterior spinal fusion operation to stabilize the results of conservative therapy. In our series we

have a number of patients who have been under conservative treatment combined with anti-tuberculous drug therapy for periods of from 5 to 6 years with persistent discharging sinuses and dorsal spinal disease who have now healed with firm bony ankylosis following adequate surgery and are free to move about. Such results are extremely encouraging (Figs. 6 to 13).

Disease of the lumbar spine is relatively benign as compared with dorsal spinal disease. Here spontaneous bony ankylosis is not uncommon as healing progresses. However, extensive destruction of vertebral bodies is usual in children before healing starts and abscess formation and sinuses are common and the disease may run a very protracted course. Sound healing with minimal deformity can be achieved in a fraction of the time previously required, if the abscess is drained and the necrotic tissues removed surgically. A total of 16 cases have been treated by this method in all of whom a firm bony ankylosis between the remaining portions of the involved vertebral bodies was achieved within 6 months of the operation. In a few cases of lumbar disease, thorough removal of the diseased tissues left a fair-sized cavity at the bottom of the wound. This was filled up with fresh cancellous chip grafts taken from the iliac crest. All that can be claimed about such grafts is that they did not sequestrate and are incorporated in the body. Our study does not permit of any opinion as to whether addition of fresh cancellous grafts favour quicker bony fusion.

This presentation is not intended to suggest that Surgery is the only method of treatment in spinal tuberculosis nor that all cases of the disease are suitable for surgery. The disease may be so wide-spread as to preclude any adequate surgery or the patient may be seen for the first time when the disease has already entered the healing phase. Disturbance of the local lesion at this stage will amount to "meddle-some surgery", on the other hand the disease



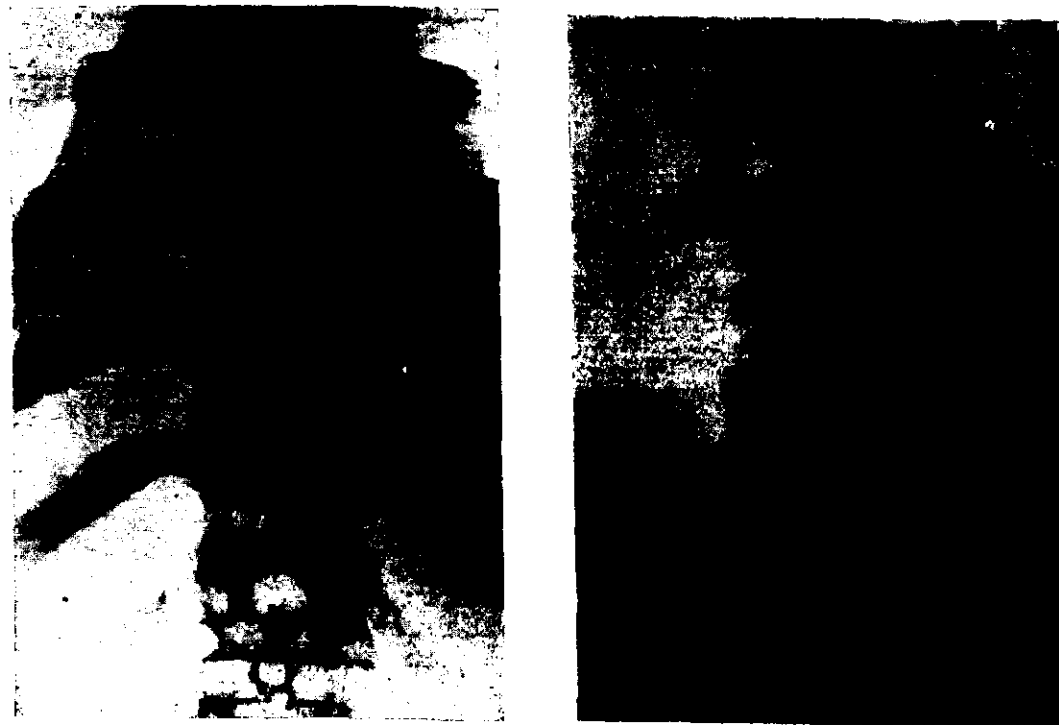
Figs. 6 & 7.

A. P. and Lateral X-rays of the spine showing active disease of the 8th, 9th, 10th and 11th Dorsal Vertebrae with para-vertebral abscess.



Figs. 8 & 9.

Same cases as above 4 months after operation. This shows complete healing of the lesion with bony fusion between the involved vertebrae.



Figs. 10 & 11.

A. P. X-ray view of a case of the disease of the 8th, 9th and 10th Dorsal Vertebrae with a large para-vertebral abscess and a sub-arachnoid obstruction in the Myelogram. This case had complete para-plegia of 8 months duration.



Figs. 12 & 13.

Same case 6 months after operative decompression of the cord and removal of tuberculous material. There is evidence of complete healing of the lesion, bony fusion of the affected segments of the vertebrae, absence of abscess shadow and relief of obstruction in the sub-arachnoid space.

may be in an anatomically inaccessible area, e.g. atlanto axial disease or lumbosacral disease. During the period under review when these cases of operation were performed, a larger number of cases were treated on orthodox conservative lines. We are struck by the speed of recovery in the operated group. All that is claimed for the method are the following:—

- (a) In the presence of anti-tuberculous drugs, surgery performed through active tuberculous tissues is not fraught with any serious risks.
- (b) It enables a definite diagnosis to be made even in the earliest stages where diagnosis may be in doubt.
- (c) Surgery adequately performed when combined with general care can arrest further progression of the local lesion almost immediately. This disproves Gridlestone's statement that in Osteoarticular tuberculosis there is always an interval in space and time before healing can start.
- (d) Surgery helps to prevent some of the worst complications of spinal tuberculosis.
- (e) Surgery performed at an early stage of the disease, by arresting further progress, helps to prevent increasing deformity.
- (f) In laminar and transverse diseases Surgery is eminently satisfactory in bringing about a rapid cure.
- (g) It is a method by which the disease as well as such complications as abscesses, sinuses, multiple lesions and persistent paraplegia can be tackled at the same time.
- (h) By this method we can salvage patients who are resistant to conservative treatment and are liable to be given up as hopeless.
- (i) It considerably reduces the necessity of secondary procedures like

spinal fusion, which adds materially to the total time period of treatment.

- (j) In the few cases of spinal disease where the lesion is situated centrally in the vertebral body with the surface remaining intact, surgery performed after careful localization with tomograms offers an opportunity for establishing a correct diagnosis.
- (k) It brings about bony ankylosis of the vertebral bodies in a very high percentage of cases, thereby removing the risks of a relapse or recrudescence. Posterior spinal fusion is after all an indirect and palliative measure and does not help in the elimination of the disease. If successfully performed before healing of the local lesion has taken place, posterior fusion, in fact, tends to hinder healing by preventing collapse of the vertebral bodies. Operation as described here favours collapse of the healthy vertebra above the centre lesion to the relatively healthy element below. Direct surgical attack on the lesion thus has considerable advantages over fusion operation.
- (l) Where multiple lesions are present, e.g., visceral disease with spinal tuberculosis, it has been our experience that surgical attack on the spinal lesion has a beneficial effect on the visceral lesion; such visceral lesions show signs of rapid healing following surgery for spinal disease. Two factors may operate in bringing about this change. Surgery may have the effect of auto-vaccination and thus may boost up immunity reactions. It also improves general health of the patient by eliminating large areas of toxic absorption.

PARAPLEGIA

When one concedes that tuberculous involvement of the spine itself is a large problem for solution, the superimposition of a partial and specially complete paraplegia thereto is truly serious in its implication. If we exclude cases of transient paraplegia, there were 114 cases of established paraplegia encountered in this series — an incidence of just over 24%. This incidence is higher than that reported by most other authorities. This may be due to the fact that many cases report for treatment only after the onset of paraplegia and the disease in its early and even late and advanced stages is neglected and the patient continues to walk about in spite of the disease. Our youngest patient was 2 years of age and the oldest 69 years. One child with atlanto-axial disease developed sudden pathological dislocation while in hospital and died almost instantaneously. The child was under skull traction but the ignorant mother removed the traction and tried to feed the child at her breast and as she moved the neck to feed the child, there was a sudden gasp and the child was dead. Slow pathological subluxation in disease of this region is not uncommon (Fig. 14) and I mention this tragic case only to emphasize the importance of handling these patients with the utmost care and gentleness. Moderate skull traction is

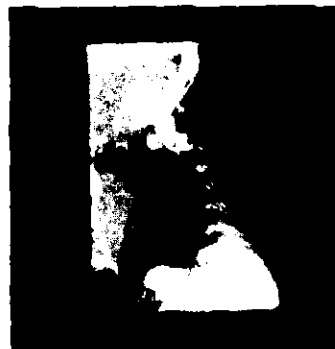


Fig. 14.

Shows disease of the Atlanto-axial articulation with sub-luxation of the first cervical vertebra and a large retro-pharyngeal abscesses.

the treatment of choice and usually succeeds in reducing the subluxation and also relieving early cord pressure symptoms.

The distribution of paraplegia among the 114 cases according to age was as follows:

0 to 16 years	..	34 cases
17 to 40 "	..	52 "
Over 40 "	..	14 "
Over 50 "	..	5 "

Though the incidence seems very low in the higher age group, it should be noted that out of 3 patients with Potts' disease above the age of 60 years, two cases had paraplegia whereas out of 180 cases in the first decade there were only 18 cases of paraplegia. The percentage incidence of paraplegia in the different age groups of our series were —

0 — 10 years	..	10	% of cases develop para-
11 — 20 "	..	24.2	plegia.
21 — 30 "	..	37.3	
31 — 40 "	..	28	
41 — 50 "	..	33.3	
51 — 60 "	..	50	
61 onwards	..	66.6	

From this table it will be seen that when tuberculous disease of the spine occurs after the 5th decade, the risk of paraplegia developing in such cases is as high as 50% or even more whereas the chances of paraplegia developing in children is much smaller. The largest number of cases, however, are seen in the 3rd decade. This may be because of the relative frequency of the disease at this age, the stress and strain of life during this period and specially the risks of pregnancy and childbirth in female patients during this time. In actual fact, in our series of cases of paraplegia, there was a higher incidence of the condition among women who formed 62% of the total cases and in quite a large number of them the paresis started either during pregnancy or immediately following childbirth. This relationship has been so

pronounced that we have come to regard pregnancy and childbirth as special hazards of caries-spine.

Although 114 cases were seen with established paraplegia, full records with complete follow-up examinations are available for only 100 of them. No case in our series developed paraplegia while under treatment in strict recumbancy combined with anti-tuberculous drug therapy. This is of great significance in relation to the problem of prevention of this dreaded complication. Most of our cases were first seen when the condition was already well-established and well-advanced.

There were 5 cases in whom there was slight motor paraplegia when first seen and the paralytic symptoms deepened in spite of the institution of strict conservative regimen. This is quite understandable because there is almost always a time lag in the arrest of erosion and the local tissues in the infected area are still giving ground while the general vitality may begin to get restored and during this period the effect on the cord may continue to progress.

The distribution of lesion in these 100 cases of paraplegia were as follows:—

Cervical	..	7
Cervico-dorsal — this includes lesion of the upper four dorsal vertebrae	..	16
Mid-dorsal	..	47
Lower dorsal and upper lumbar	..	35

There were five cases in which there were double lesions of the spine, the paraplegia being caused by one or other of the lesions. When only motor symptoms are present, it is sometimes difficult on clinical examination alone to determine which one of the lesions of the spine was responsible for compression symptoms. In such cases a myelogram is of great value.

The incidence of paraplegia according to site of disease were as follows:—

Cervical disease	13.4	% of cases
Cervico-dorsal disease	64	"
Dorsal	45	"
Dorso-lumbar & lumbar	10.8	"

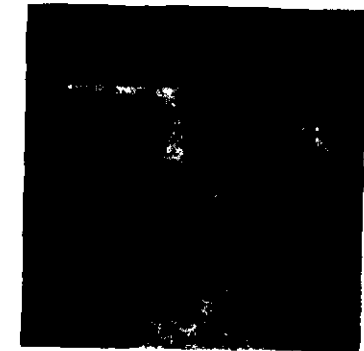


Fig. 14-A.

A Barium swallow X-ray in a case of cervico-dorsal disease with para-plegia and a para-vertebral abscess. It shows how the oesophagus has been pushed forward by the para-vertebral abscess causing dysphagia.

The very high incidence of paraplegia in Cervico-dorsal disease specially in children is due to several factors —

- The lack of space in the superior mediastinum causing tension inside the paraspinal abscess. (Fig. 14-A)
- The change in the normal curvature of the spine at this level favours narrowing of the spinal canal with the onset of a kyphotic deformity. Even slight pressure in the presence of this narrowed cavity may cause interference with cord function.
- The cord fills up the canal at this level almost completely and there is very little free space round the cord inside the canal. Any swelling inside the canal encroaches on the cord very early in its course.
- Sudden jerks or even minor accidents are liable to give rise to a subluxation of the superior portion of the spinal column, thus causing sudden pressure on the cord. In a number of cases of paraplegia in disease of this region there was a history of a sudden onset of complete paralysis following slight accidents. Two of these cases were, at

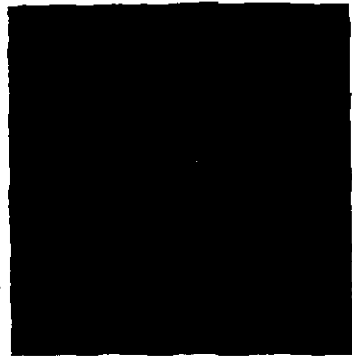


Fig. 15.



Fig. 16.

Figs. 15 & 16. A. P. and Lateral X-ray of a spinal tumour type of para-plegia with sub-arachnoid obstruction.

the first examination, mistaken as case of post-traumatic paraplegia. In these two cases, a sudden onset paraplegia was the presenting symptom of the disease.

Out of 100 cases of paraplegia, 99 were the result of vertebral body disease while one was caused by laminar disease involving the laminae of D_2 & D_3 vertebrae. One case of vertebral body disease presented the classical features of spinal tumour syndrome (Figs. 15 & 16). This patient was admitted with symptoms of slowly progressive paraplegia but the spinal X-rays were negative except for a slight reduction of D_{10} & D_{11} vertebral inter-space. Myelography showed obstruction at the same level and at operation a tense tuberculous abscess was encountered anteriorly behind the vertebral body. The abscess was about 1 c.m. in diameter and was extradural, lying between the vertebral body and the posterior longitudinal ligament. Culture of the material removed from the abscess grew tubercle bacilli.

A careful analysis of the clinical features of our cases leads us to group our patients into the following categories:—

I. Early Onset Paraplegia —

In this group, the paraplegia appears within 6 to 18 months from the clinical

onset of the disease. This group can be further subdivided into —

Rapid onset	.. 34 cases.
Gradual onset	.. 46 "
Sudden onset	.. 6 "
Spinal Tumour Syndrome	.. 2 "

In the rapid onset group, the paraplegia is usually symmetrical in both lower limbs, starts as motor paralysis and progresses within a period of 1 to 3 weeks to almost complete motor paralysis with or without involvement of sensory and visceral functions. Left untreated it may pass from complete motor paraplegia in extension through a period of painful flexor spasms to a complete motor paraplegia in flexion and by this time, sensory and visceral functions are almost always involved. In our experience the sensations of position and passive movement are more often and earlier involved than other sensations. Vibration sense often persists for a long time. Bladder symptoms are variable in type while the rectal symptoms are usually in the nature of constipation.

In the gradual onset type of paraplegia, the symptoms are more variable and does not always follow a definite pattern. The degree and extent of paralysis in the two

limbs is often asymmetrical. Mistakes in diagnosis are common in this type of case. I can vividly remember the case of a child who was treated for nearly 4 months as a case of Cerebellar ataxia before the true nature of the lesion was suspected. The other mistaken diagnoses include Kummell's disease, Gumma, Neoplasm, Amyotrophic lateral sclerosis, subacute combined degeneration of the cord and even hysteria.

In the sudden onset group, the paraplegia is usually full and complete from the start. In the presence of a history of injury, such cases are liable to be mistaken as post-traumatic paraplegia with disastrous consequences if an attempt is made to immobilize the spine in hyper-extension. Careful enquiry into the severity of the injury causing paraplegia helps the diagnosis.

The difficulties of diagnosis in the spinal tumour syndrome type of paraplegia are too well-known to need emphasis. Of our two cases, one was due to laminar disease and the diagnosis could be made because of local signs of pain, tenderness and swelling over the region of the spinous processes. In the second case, the diagnosis was established only after operation.

II. Late onset Paraplegia —

Only 12 cases of late paraplegia were encountered in our series. Classical late onset paraplegia occurring many years after apparent healing of the spinal disease occurred in only 4 cases. The others were cases of paraplegia occurring at least 2½ years after the clinical onset of the disease. In our opinion there is no essential difference between the two types of paraplegia except that these cases usually progress much more slowly than the early onset cases.

Cause of Paraplegia :

Whatever may have been said about the cause of paraplegia in the past we are con-

vinced that mechanical pressure over the spinal cord exists in every case of paraplegia. Myelograms in these cases invariably show either complete or persistent partial obstruction of the subarachnoid space at the level of the lesion (Figs. 17 to 21). Following operative decompression of the cord the obstruction is relieved and the dye gravities to the bottom of the spinal canal. In order to test the validity of the mechanical factor in the causation of paraplegia, we performed myelograms in a number of cases of caries spine with gross deformity and paraspinal abscess without paraplegia. These cases failed to show any evidence of obstruction at or above the level of the lesion, confirming the view that paraplegia supervenes only when mechanical pressure is produced on the cord as a result of the tuberculous lesion. We are convinced that the conception put forward by Butler and Seddon in their classical paper published in 1935 in which they maintained that the cause of early onset paraplegia is toxic changes in the spinal cord due to the close proximity of a tuberculous lesion is not correct. The vacuolation of cord fibres which they described is very likely the result of circulatory changes brought about by mechanical pressure. Their claim that paraplegia and clinically palpable abscess do not co-exist in Potts' disease is also incorrect. We have 4 cases in our series where advanced paraplegia persisted in spite of large clinically palpable abscesses and relief occurred only after operative decompression of the cord. In paraplegia the cord is compressed but not crushed, the compressing agent differing from patient to patient. The compression can be caused by encircling tuberculous granulation tissue round the cord, pressure from a fluid abscess inside the spinal canal, pressure from sequestered portions of bone or intervertebral fibro-cartilage, a paraspinal abscess communicating into the spinal canal and thereby transmitting mediastinal pressure changes into the cord, or from a mechanical narrowing of the canal due to the displacement of a vertebral body (Figs. 22 & 23). Each one of



Fig. 17.



Fig. 18.



Fig. 19.

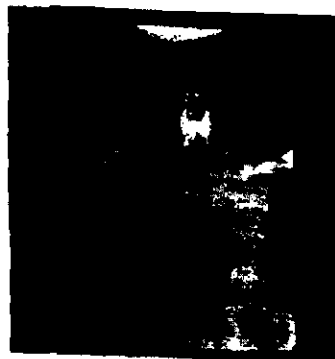


Fig. 20.

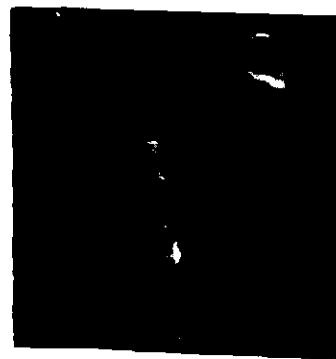


Fig. 21.

Figs. 17, 18, 19 & 20. All these are cases of para-plegia showing evidence of mechanical pressure on the cord as revealed in the Myelogram.

Fig. 21. Shows relief of obstruction of sub-arachnoid pressure following costo-transversectomy. This is the same case as of Fig. 20.



Fig. 22.

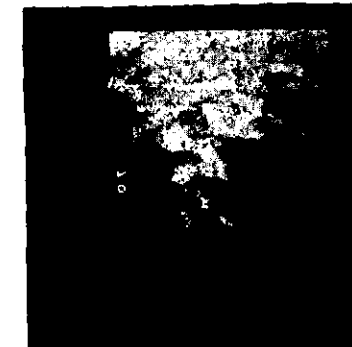


Fig. 23.

Figs. 22 & 23. A. P. and Lateral X-ray Dorsi Lumbar Spine showing pathological dislocation as a cause of para-plegia.

these causes we have encountered in our patients. That vascular catastrophe may explain sudden onset paraplegia on rare occasions is admitted by most authorities but we have not come across a single such case.

Treatment :

Experience in the management of these cases lead us to believe that there is a great deal of misunderstanding as to the proper treatment of this most threatening complication and this has led to undue conservatism in the past, whereby many patients have needlessly been allowed to suffer permanent paralysis with its distressing and ultimately fatal sequelae. It is even now widely regarded as correct to persist with conservative treatment for 6 months despite increasing damage to the cord with its associated dangers and discomforts. It is high time that a true balance should everywhere replace the dangerous bias in favour of conservatism. It is true that disastrous results may follow operations carried out without adequate orthopaedic precautions. It is also right to condemn decompression in Potts paraplegia unless it is done by surgeons experienced in the management of spinal

tuberculosis and one who is acquainted with the problems and methods of the maintenance of effective and uninterrupted immobilization of the spine before, during and after operation. When faced with a case of Potts paraplegia, we should ask ourselves two questions —

- (a) What degree and duration of compression can the cord bear without undergoing permanent degenerative changes ?
- (b) Is it essential to prolong the suffering of the patient or can something be done to relieve him of his distressing symptoms rapidly without adding any further risks to his life ?

It is extremely hard to answer the first question in an individual case with any degree of certainty as miraculous recoveries without any surgery following months or even years of complete paraplegia are reported in the literature from time to time. It is, however, very necessary to enquire critically into the quality of such reported cases of recovery. Many surgeons are apt to consider even partial

recovery as proof of the success of conservative therapy. However, there are certain signs which strongly suggest that either permanent degenerative changes are impending or have already set in. Such signs, in our opinion, strongly indicate the urgent need of surgical decompression. These signs are:—

- (i) Complete motor paralysis of more than 12 weeks duration.
- (ii) Complete motor paraplegia in flexion of any duration.
- (iii) Flaccid paraplegia.
- (iv) Repeated and frequent painful flexor spasms specially if there is interference with sleep.
- (v) Complete motor, sensory and visceral paralysis.
- (vi) Appearance of bed sores or ascending urinary infection.

As to the second question, our experience with the surgical treatment of uncomplicated cases of caries spine leads us to believe that it is quite unnecessary to prolong the suffering of these patients. Provided adequate precautions are observed, surgery can be performed on these patients with complete safety. Surgery in these patients require excellent pre and post operative care, good anaesthesia administered by an experienced and competent anaesthetist, close collaboration and co-operation between the surgeon and the anaesthetist in the handling of the patient at operation, meticulous attention to the details of nursing care specially after operation, adequate arrangements for combating surgical shock and a free supply of properly matched blood for transfusion.

In our opinion conservative treatment should not be persisted with for more than 6 weeks unless definite and unequivocal signs of improvement appear. In the presence of certain signs, even this 6 weeks

observation period may be too long. Such signs are —

- (a) Repeated and frequent painful flexor spasms rendering it impossible to give rest to the spine.
- (b) Where paraplegia is total and complete specially if there are bed sores or urinary infection.
- (c) Where the onset is sudden and complete and no improvement occurs with one or two weeks of strict immobilization.

Once operation is decided upon, myelograms should be routinely performed in these cases except in cervical disease. This should be done through a cistern puncture using one of the modern, non-irritating contrast media. The risks and dangers of causing subarachnoid extension of the disease is more theoretical than real as long as it is not performed in cases of cervical disease. By this method one can be sure of avoiding any tuberculous epidural abscesses extending beyond the radiologically recognizable limits of the disease. Myelograms are of great value in deciding the upper limits of decompression. In an occasional case, where double lesions are present, it gives an accurate idea of the situation of the offending lesion, when this cannot be fully determined by clinical means. Post-operative X-rays reveal relief or otherwise of the obstruction and thus can be used to check the thoroughness of the operative procedure. This happened in one of our cases in whom post-operative X-rays showed persistence of spinal block with failure of improvement in the clinical condition. At a second operation, the true cause of obstruction was found and recovery followed the second procedure.

Surgical decompression of the spine can be performed in these cases by one of several methods. The available procedures are —

- (i) Laminectomy.

- (ii) Lateral rachotomy or Capener's procedure.
- (iii) Costo-transversectomy — This can only relieve fluid pressure.
- (iv) Antero-lateral decompression.
- (v) Aspiration.

Laminectomy :

It is one of the basic mechanical principles of spinal surgery that stability of the column can be maintained or provided as long as at least the anterior or the posterior elements of the vertebrae remain intact. Laminectomy, in the presence of disease of the vertebral bodies, seriously and permanently impairs the stability of the spinal column, even when the articular facets are maintained intact. Where articular facets are sacrificed, even unilaterally, subluxation or dislocation of the spine is almost inevitable. Removal of the laminae removes the only elements around which a fusion operation can be performed with comparative ease. Para-spinal fusion using the transverse processes and the costal elements is a comparatively major and hazardous procedure and carries a high percentage of failures due to pseudoarthrosis. Failure to appreciate these facts and the indiscriminate performance of wide laminectomies in Potts paraplegia brought discredit to operative decompression. Laminectomy should be limited to cases of spinal tumour syndrome and cases of paraplegia due to disease of the posterior elements of the spine.

Rachotomy :

We have no experience of Rachotomy operation.

Costo-Transversectomy :

It is the oldest of the operative measures used for the relief of Potts' paraplegia. Where pressure on the cord is being caused

by a fluid para-spinal abscess communicating with the spinal canal, this operation is likely to bring about quick relief of symptoms. Potts' original method of introducing a cannula into the para-spinal abscess with a view to create a draining sinus amounted to a type of costo-transversectomy. Menard first used it as a method of election but in the absence of specific anti-tuberculous drugs, the operation often led to the formation of a sinus. Now the operation can be combined with a thorough removal of all the tuberculous tissues locally, thus not only relieving compression but also favouring rapid healing of the disease.

Costo-transversectomy is a relatively minor operation and can be performed with safety even in the seriously ill patient. It does not interfere with the stability of the column. It can be performed easily in children. Its greatest use is in dorsal spinal disease where at operation a tense para-spinal abscess is encountered. If the operation fails to relieve paraplegia, an antero-lateral decompression can be performed as a secondary procedure, when the general condition of the patient improves. In the absence of an abscess, the operation cannot be expected to relieve paraplegia.

Antero-lateral decompression :

This operation combines costo-transversectomy with direct visualization of the cord at the time of operation from the antero-lateral aspect by the removal of portions of the postero-lateral elements of the vertebral bodies and the corresponding pedicles. It is the only operation in which decompression of the cord is performed by removing the actual cause of compression. It is, therefore, the most rational and scientific procedure for the relief of Potts' paraplegia. During its performance it is usual to combine removal of the local tuberculous tissues. In fact, it was the rapid healing of the local disease following this type of decompression which first drew our attention to the possibilities of surgical attack in spinal tuberculosis.

The operation is a major surgical hazard specially in cases of cervico-dorsal and upper dorsal disease and should not be undertaken lightly. However, in some late neglected cases, it is the only operation which holds out any prospect for relief from paraplegia.

When operation is indicated for Potts' paraplegia, it is our practice to have everything ready to go ahead with an adequate antero-lateral decompression of the cord, provided the patient can withstand the operation. If on performing costo-transversectomy, we come across a tense paraspinal abscess, we do not attempt to expose the canal. If the patient's general condition is satisfactory, we go ahead with clearing of the tuberculous debris from the site of the lesion. If no abscess is met with, a full antero-lateral decompression of the cord is performed. The operation interferes with the stability of the spine. Hence special precautions are to be observed with regard to anaesthesia and post-operative nursing care.

Of the 100 cases of paraplegia in this series —

34 were children below the age of 16 years,

66 were above 16 years.

60 cases were treated by orthodox conservative measures,

40 cases were submitted to operation.

Of the 34 cases below the age of 16 years, —

6 cases were operated upon,

28 cases were treated conservatively.

The 6 cases submitted to operation were all cases of complete paraplegia — 5 cases of more than 4 months duration of which one case had paraplegia of 7 months duration with multiple bed sores and urinary incontinence with hectic temperature and flexion contracture of the lower limb. One

case was a sudden onset paraplegia following slight injury who started to deteriorate rapidly under conservative care, developing many pressure sores and urinary infection.

4 cases had costo-transversectomy.

The two severest cases had antero-lateral decompression.

Paraplegia recovered in all these cases.

5 of these cases recovered not only from the paraplegia completely but also from the disease and are quite well upto-date. The sixth case, who had sudden onset paraplegia, recovered from the paraplegia but died 3 weeks after the operation from a massive pulmonary embolism.

Of the 28 cases treated on conservative lines, 5 cases failed to recover. These patients were admitted in the very late stages of paraplegia prior to 1952 and at that time we were reluctant to take up such cases for antero-lateral decompression. 6 cases of cervico-dorsal disease recovered after very prolonged conservative care — one case recovering after 3 years immobilization on a Jones' frame. In each of these cases there was very extensive destruction of vertebral bodies, in one case 10 vertebral bodies, being completely destroyed with extremely gross deformities of the spine and chest, a very reduced vital capacity and a rather precarious stability of the spine. 5 of these cases had a second attack of paraplegia following varying periods of recovery. One of these cases died during the period of relapse, 3 cases recovered after a second period of prolonged conservative care while one case failed to improve with conservative care and recovered rapidly following costo-transversectomy and drainage of a tense superior mediastinal paraspinal abscess. Thus the results of conservative care in this group of patients has not been altogether satisfactory and it is our impression upto-date that a judicious combination of conservative therapy and timely surgery would have saved some

of these patients and almost certainly reduced the mortality among the others. The period of time required for recovery from paraplegia varied from a few weeks to a few months, the shortest being 6 weeks and the longest being 3 years as already stated.

Of the 66 cases of paraplegia above 16 years of age, it is necessary to divide them into 2 groups, —

(a) Treated before 1952 . . . 23 cases.

(b) " after 1952 . . . 43 "

Of the 23 cases treated before 1952, 6 were submitted to operation and 17 treated conservatively. 3 cases had antero-lateral decompression and 3 cases had costo-transversectomy performed. All the 3 cases of antero-lateral decompression and 2 cases of costo-transversectomy recovered completely from paraplegia while in one case of costo-transversectomy there was very little improvement. This case had antero-lateral decompression 3 months after costo-transversectomy and recovered almost completely with only slight residual spasticity. Among the 17 adults treated conservatively, there were 6 cases of complete failure of recovery and these patients died a painful lingering death — the result of complications consequent on paraplegia. Among the other 11 cases, 8 cases had complete recovery while 3 cases had only partial recovery. These 3 cases have residual spasticity but they can move about and are not willing to have any operative treatment. The 8 recoveries were in milder cases of paraplegia, none of whom had sensory loss or loss of visceral reflexes but 3 had complete motor paraplegia. The 6 cases of complete failure were all cases of flaccid paraplegia.

Of the 43 cases treated since 1952, 28 patients had operative treatment. These were all advanced cases of paraplegia. All of them had complete motor paralysis of some duration. 18 cases had either sensory or sensory and visceral reflex paralysis.

None of them improved with 6 weeks conservative care.

2 cases had laminectomies —

One was a case of laminar disease — this case had complete recovery.

The second was a case of spinal tumour syndrome — this case failed to recover and is still alive with complete paralysis 15 months after the operation.

11 cases had costo-transversectomy — In all these cases an abscess was met with at operation. 8 cases recovered completely from paraplegia while 3 cases failed to recover. Of these, 2 cases were later submitted to antero-lateral decompression and recovered completely. One case refused to have a second operation.

17 antero-lateral decompressions were performed among the remaining 15 cases, two patients requiring a second operation. In our opinion a decompression operation should be considered a failure if well-marked recovery does not take place within 3 to 4 weeks of the operation. It is useless to wait for more than 6 weeks in the hope of ultimate recovery.

Among these cases —

2 cases remained unrelieved,

2 cases had incomplete recovery,

11 cases obtained complete recovery —

8 cases had rapid recovery,

3 cases had slow recovery.

Of the two cases of incomplete recovery, one had two attempts at antero-lateral decompression. In this case it is impossible to judge whether the second operation helped or hindered recovery as no improvement followed the second procedure. In the other case where a second antero-lateral decompression was attempted it was found at operation that although the

diseased area of the spine was thoroughly evacuated at the first operation, the posterior margin of the lower vertebra was encroaching on the cord and caused an acute kinking of the cord. Resection of this projecting portion of the body brought about rapid recovery from the paraplegia.

In judging the results of antero-lateral decompression of the cord, certain considerations must be borne in mind. This operation was performed only in the severest and most resistant cases and thus the results can hardly be compared with milder cases. In our earlier cases of operation, it is likely that the operation was not sufficiently extensive due to lack of experience in the performance of this type of surgery. Thus inadequate operation may explain a few of the failures. The majority of cases submitted to antero-lateral decompression could legitimately be considered "Salvage" cases.

Thus we find that carefully selected operative measures hold out hope of success in the vast majority of even the most advanced cases of Potts' paraplegia. We have been so far lucky in having no operative mortality in our hands. These results are certainly a great improvement over the results of prolonged conservative care. 15 cases were treated on conservative lines since 1952. Two cases died as they were admitted in a stage when they were completely unfit for any surgery at all. These were cases with advanced bilateral pulmonary disease and cardiac decompensation. The remaining 13 cases were mild ones, none of them having any sensory loss or flaccid paraplegia. All of these made complete recovery.

In conclusion I would like to say that the discussion of any subject pertaining to newly developed medical or surgical treatment, in this era of rapid change, is fought with considerable danger. It is certain that tremendous advances have been made in the care of patients suffering from tuberculous lesion of the spine. It is equally certain that further beneficial ad-

vances in the treatment of such lesions, as well as in their diagnosis are but around the corner. Therefore, this paper must be accepted factually as for the present and not projected into the future.

ACKNOWLEDGEMENT

I wish to express my deep-felt thanks to Lt.-Col. D. P. Nath, Director of Health Services, Bihar, and the authorities of the Patna Medical College Hospital, who have so kindly permitted me to use the Hospital records in the preparation of this Paper. My thanks are also due to Principal Gaya Prasad, Professor of Pathology, Prince of Wales Medical College, Patna, without whose help certain portions of the paper could not be prepared. I wish also to thank my successive House Surgeons during the period under review who have been painstaking in their efforts to collect all the records of the cases properly.

BIBLIOGRAPHY

1. Butler, R. W.: Paraplegia in Pott's disease, with special reference to pathology and etiology. *Brit. J. Surg.* 22: 738, 1935.
2. Capener, N.: The evolution of lateral rhacotomy. *J. Bone & Joint Surg.* 36-B: 173, 1954.
3. Fellander, M.: Radical operation in tuberculosis of the spine. *Acta Orthopaedica Scandinavia, Supplementum No. 19*, 1955.
4. Girdlestone, G. R. and Somerville, E. W.: *Tuberculosis of Bone and Joint*, Second Edition. London. Oxford University Press, 1952.
5. Ito, H., Tsuchiya, J. and Asami, G.: New radical operation for Pott's disease. *J. Bone & Joint Surg.* 16: 499, 1934.
6. Pott, P.: Remarks on that kind of palsy of the lower limbs which is frequently found to accompany a curvature of the spine, and is frequently supposed to be caused by it. London, 1779.
7. Pott, P.: Further remarks on the useless state of the lower limbs in consequence of a curvature of the spine. London, 1782.
8. Roaf, R.: The modern treatment of skeletal tuberculosis. *Ind. Jour. Surg.* 16: 324, 1954.
9. Seddon, H. J.: Pott's paraplegia. Prognosis and Treatment. *Brit. J. Surg.* 22: 769, 1935.

10. Seddon, H. J.: The morbid anatomy of caries of the thoracic spine in relation to treatment. *Lancet*, 2: 355, 1935.
11. Seddon, H. J.: *Proc. Roy. Soc. Med.* 29: 1662, 1936.
12. Seddon, H. J.: Treatment of tuberculous disease of the spine in adults. *Proc. Roy. Soc. Med.* 31: 951, 1938.
13. Seddon, H. J.: *Proc. Roy. Soc. Med.* 39: 723, 1946.
14. Shancis-Olimos, V.: *Skeletal Tuberculosis*. Baltimore. The Williams & Wilkins Co., 1948.
15. Wilkinson, M. C.: Observations on the pathogenesis and treatment of skeletal tuberculosis. *Ann. Roy. College. Surg. (England)*. 4: 168, 1949.
16. Wilkinson, M. C.: Curettage of tuberculous vertebral disease in the treatment of spinal caries. *Proc. Roy. Soc. Med.* 43: 114, 1950.
17. Wilkinson, M. C.: The treatment of Pott's disease by curettage of the spinal lesion. *J. Bone & Joint Surg.* 34-B: 153, 1952.
18. Wilkinson, M. C.: Chemotherapy of tuberculosis of bone and joints. *J. Bone & Joint Surg.* 36-B: 23, 1954.

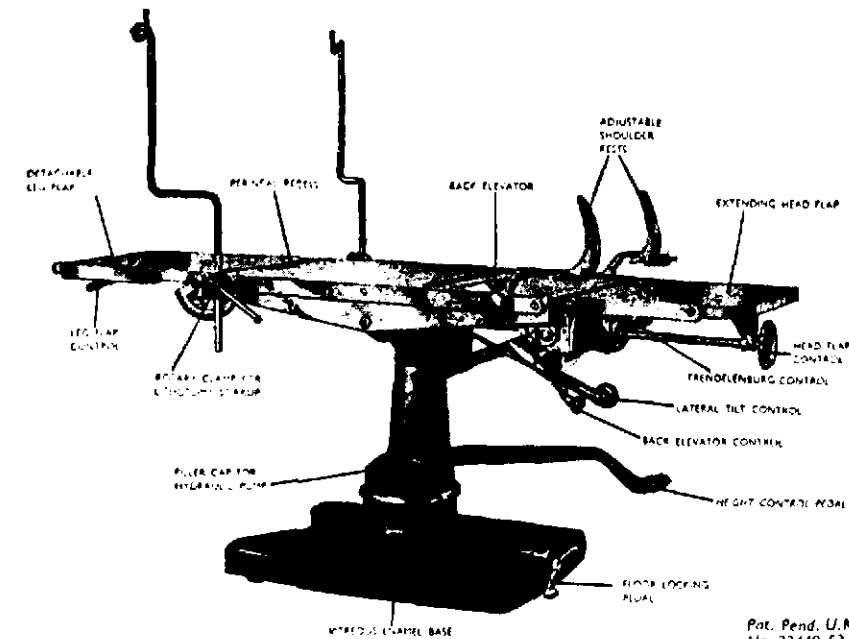
Received for publication on 19-1-'57.

CONTRIBUTORS—February, 1957

1. Dr. J. C. Paymaster, F.R.C.S., F.I.C.S., Chief Surgeon, Tata Memorial Hospital, Parel, Bombay.
2. Dr. L. B. Joshi, M.B.B.S., F.R.C.S., Surgeon, Joshi Hospital, 778, Shivaji Nagar, Poona-4.
3. Dr. A. K. Sen, F.R.C.S.,
Dr. Tapas Das Gupta, &
Dr. H. Pyne,
Dept. of Surgery, R. G. Kar Medical College, Calcutta.
4. Dr. S. L. Malhotra, M.B., B.Sc., M.R.C.P. (Lond.), R.C.P.&c, Fellow of the Nuffield Foundation, District Medical Officer, Central Railway, Bhusawal.
5. Dr. (Miss) Anjali Mukherji, M.B., M.S., 14, Congress Exhibition Road, Calcutta-17.
6. Dr. S. P. Srivastava, M.S., F.R.C.S. (Eng.), Surgeon, S. N. Hospital, Agra, &
Dr. K. S. Mathur, M.D., M.R.C.P., &c, Physician, S. N. Hospital, Agra.

7. Dr. A. R. Rao, M.S., Surgeon, General Hospital, Madras, &
Dr. V. Balasubramanian, M.S., Hony. Asst. Surgeon, General Hospital,
Madras, (Ranga Nursing Home, Mowbray's Road, Madras-18).
8. Dr. A. K. Dutta Gupta, M.B., F.R.C.S., 9, Chakrabere Road (South),
Calcutta-25.
9. Dr. H. W. Williams, F.R.C.S.E., Chief Medical Officer, The Salvation
Army, Emery Hospital, Anand, Dist. Kaira, Gujarat, India.
10. Dr. D. Bhaskara Reddy, M.D., Professor of Forensic Medicine, &
Dr. C. R. R. M. Reddy, M.D., Tutor in Pathology, Andhra Medical
College, Visakhapatnam.
11. Dr. B. Mukopadhaya, M.B., M.Ch.orth., F.R.C.S., Dept. of Orthopaedic
Surgery, P. W. Medical College, Patna.

THE NEW A&H OPERATION TABLE



Pat. Pend. U.K.
No. 32440/53

ADVANTAGES

HEAD-END CONTROL

All major controls easily accessible from head-end of table.

RIGIDITY

Complete rigidity in all positions.

BUILT-IN BACK ELEVATOR

Controlled from the head-end of the table.

PERINEAL RECESS

Maximal exposure of the perineum in the lithotomy position.

HEAD FLAP

Full-width extendable head flap.

LEG FLAP

Fully adjustable and removable.

POSITIVE FLOOR BRAKE

Single pedal control giving easy action and complete immobility.

TABLE TOP

Cast in corrosion-resistant aluminium alloy with satin finish.

BASE

The base and foot-pedal are finished in hard-wearing vitreous enamel.

ONE PEDAL ELEVATES AND LOWERS TABLE

ALL MAIN GEAR MECHANISM ENCLOSED

Literature on Application

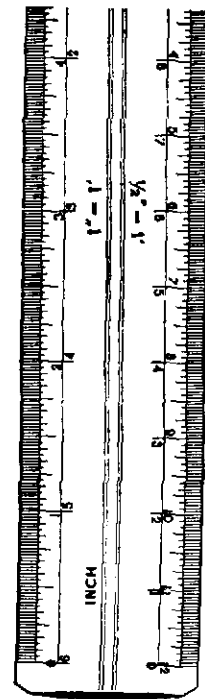
ALLEN & HANBURYS LTD

(Incorporated in England)

Makers of Quality Instruments

CALCUTTA

BOMBAY



by any measure
It's

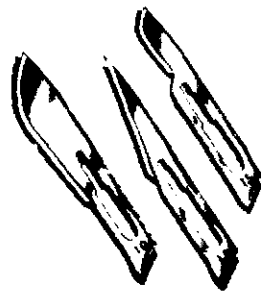
**BARD-PARKER
RIB-BACK
SURGICAL BLADES**

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

SHARP CUTTING EDGES • ENDURING
UNIFORMLY SHARP

CALRON

Iron-Glycerophosphates—Vitamins, A, D, B. Complex
in a palatable base

*Helps the Patient to
Recover Quicker*

For further particulars, please write to:—

EAST INDIA PHARMACEUTICAL WORKS LTD.,
CALCUTTA - 26.

*Protein
Biscuits*

INTRODUCING
VITAL PROTEIN
AS DIETARY SUPPLEMENT
IN

AN EXCEEDINGLY PLEASING AND CONVENIENT FORM

THREPTIN BISCUITS

The Palatable

PROTEIN • CARBOHYDRATE • B-VITAMINS
FOOD

IN CRISP AND DELICIOUS BISCUITS
ACCESSIBLE EVEN TO LOWER INCOME GROUPS

CONTENTS PER OUNCE: (6 biscuits): Protein (intact casein) 50%, Carbo-
hydrate 30%, Thiamine & Riboflavine 1 mg. each, Fat 7.5%, Flavouring Agents q. s.

Particulars from:

Available in 1 lb. tins

RAPTAKOS, BRETT & CO., PRIVATE LTD. WORLI - BOMBAY.

'PAUL'S PLASTER'

THE IDEAL, DEPENDABLE, EXTRASUPERFINE WHITE
SURGICAL & DENTAL
PLASTER OF PARIS

BEING USED IN ALL THE GOVERNMENT & NON-
GOVERNMENT HOSPITALS OF
WEST BENGAL SINCE 1951 WITH UTMOST SATISFACTION

MANUFACTURER BY :

PHONE : 22-7417

The Bengal Dental Supply Co., Ltd.
275-4, BOWBAZAR STREET, CALCUTTA-12
DR. BIMAL PAUL

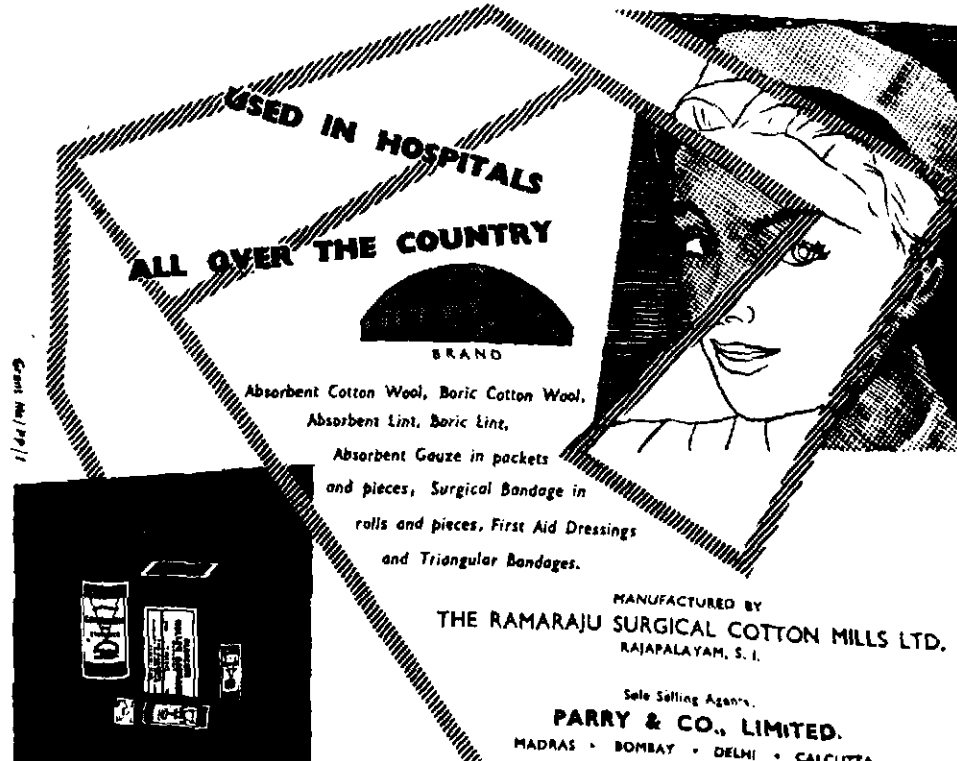
**USED IN HOSPITALS
ALL OVER THE COUNTRY**

BRAND

Absorbent Cotton Wool, Boric Cotton Wool,
Absorbent Lint, Boric Lint,
Absorbent Gauze in packets
and pieces, Surgical Bandage in
rolls and pieces, First Aid Dressings
and Triangular Bandages.

MANUFACTURED BY
THE RAMARAJU SURGICAL COTTON MILLS LTD.
RAJAPALAYAM, S. I.

Sole Selling Agents,
PARRY & CO., LIMITED.
MADRAS • BOMBAY • DELHI • CALCUTTA




Necessary for

MOTHERS DURING
**PREGNANCY
& LACTATION**

CHILDREN DURING
**GROWTH, RICKETS &
UNDERNOURISHMENT**

ADULTS DURING
**CONVALESCENCE
and ASTHENIA**

MALTOMIN

MALTOMIN combines necessary factors for nourishment and growth.
Supplies all requirements of Vitamins, Iron & Calcium.

COMPOSITION. Each fluid ounce contains:

Vitamin B₁ 10 mcg., Colloidal Iron 4 gr., Vitamin A 16,000 I.U.,
Vitamin D 3,600 I.U., Vitamin B₂ 2 mg., Vitamin B₆ 1 mg.,
Nicotinamide 20 mg., Calcium Gluconate 5 gr. and Malt Extract.

A PRODUCT OF *Cipla* BOMBAY-8.

LITERATURE SENT ON REQUEST.



Cipla's Sales Depot: 1/186, Mount Road, Madras

RAMACILLIN COMPOSITUM

1,200,000 I.U.

LONG ACTING PENICILLIN

FORMULA:

Cryst. Penicillin G. Sod.	...	3 lakhs
Procaine Penicillin G.	...	3 lakhs
Benzathine Penicillin	...	6 lakhs

PRICE: Rs. 1-8-0 per vial Ex-Godown

SPECIAL RATE FOR
HOSPITALS AND NURSING HOMES

Manufactured by:

Dr. B. S. LEVIN,
Pioneers of Antibiotics in Israel, JERUSALEM, (Israel)

Sole Distributors in India:

AMARCHAND SOBACHAND,
95, Nyalappa Naick Street, MADRAS-3



INDEX TO ADVERTISERS

	Page
Amarchand Sobachand Madras-3	xvii
Allen & Hanburys Ltd.	xiii
Bengal Chemical & Pharmaceutical Works, Ltd. ...	Outside back cover
Bengal Dental Supply Co., Ltd.	xvi
Bombay Surgical Co.	ii, v & xiv
Cipla, Ltd.	xvii
Danish United Medical Export (East Asiatic Co. (India) Private Ltd.)	vi
East India Pharmaceutical Works, Ltd.	xv
Imperial Chemical Industries (India) Private Ltd. ...	xii
May & Baker (India) Private Ltd.	iv
Mohanlal B. & Co.	vii
Mukerji H. & Banerjee Surgical Private Limited ...	i
Raptakos Brett & Co. Ltd.	xv
Parry & Co., Ltd.	viii & xvi
Union Drug Co.	xi

For safe anaesthesia

B. C. P. W.

ETHER ANAESTHETICUS

P. B.

is entirely dependable

It is free from peroxide, aldehyde
or other products liable to produce
untoward post-anaesthetic distress.

Bengal Chemical and Pharmaceutical Works, Ltd.
CALCUTTA :: :: BOMBAY :: :: KANPUR

B. C. P. W.

SURGICAL DRESSINGS

- ¶ We have the largest and most up-to-date plant in India
for manufacturing Surgical Dressings
- ¶ Only best and pure raw materials are used
- ¶ All B.C.P.W. Cotton & Gauzes are issued in sterile
condition

ABSORBENT COTTON

Plain and Medicated

ROLLED BANDAGE

On A.R.P. Basis

MOIST GAUZE

*Boric & Iodoform
Packed in Sterile Glass Jars*

ABSORBENT GAUZE

Plain and Medicated

COMPRESSED DRESSING

SURGICAL TOW

Plain and Medicated

Bengal Chemical and Pharmaceutical Works, Ltd.
CALCUTTA :: :: BOMBAY :: :: KANPUR

Printed by Mr. G. Raghavan at The Huxley Press, 114, Armenian St., G.T., Madras, and
Published by Dr. A. VENUGOPAL, Secretary, Association of Surgeons,
164, Poonamallee High Road, Madras 10. March 1957.