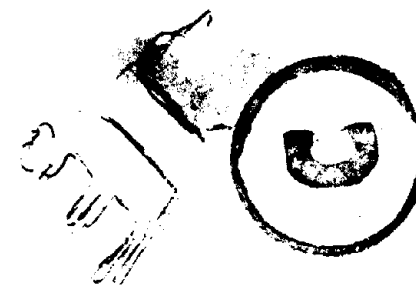


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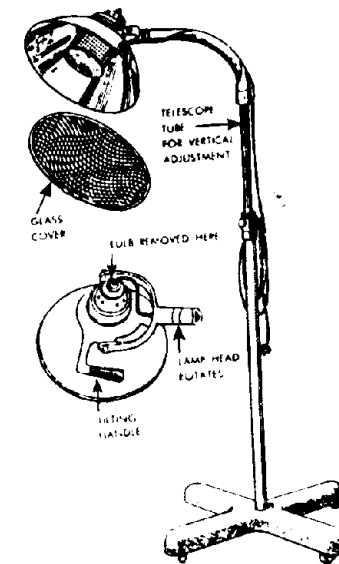
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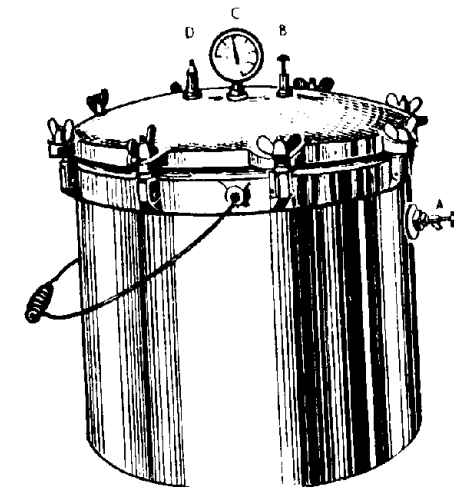
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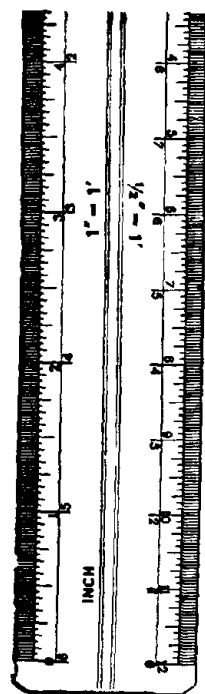
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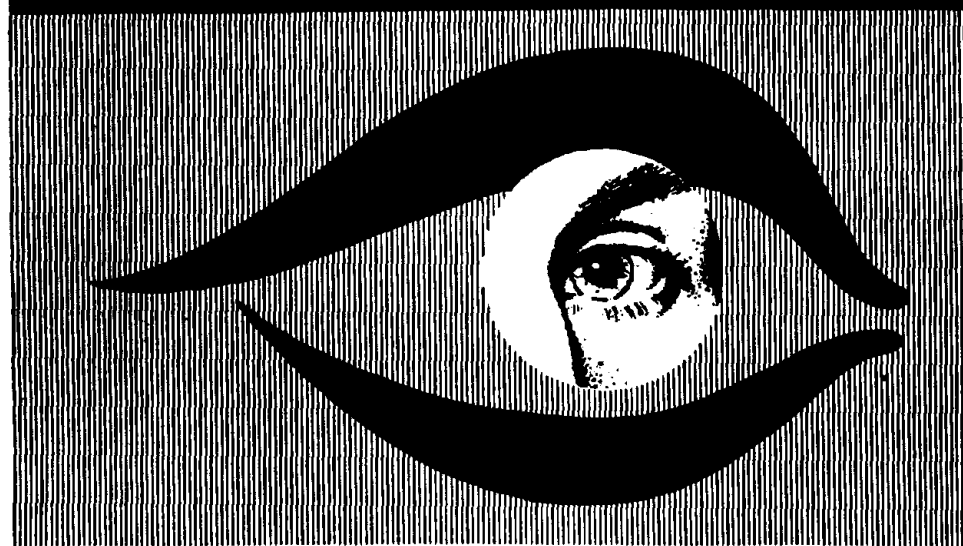
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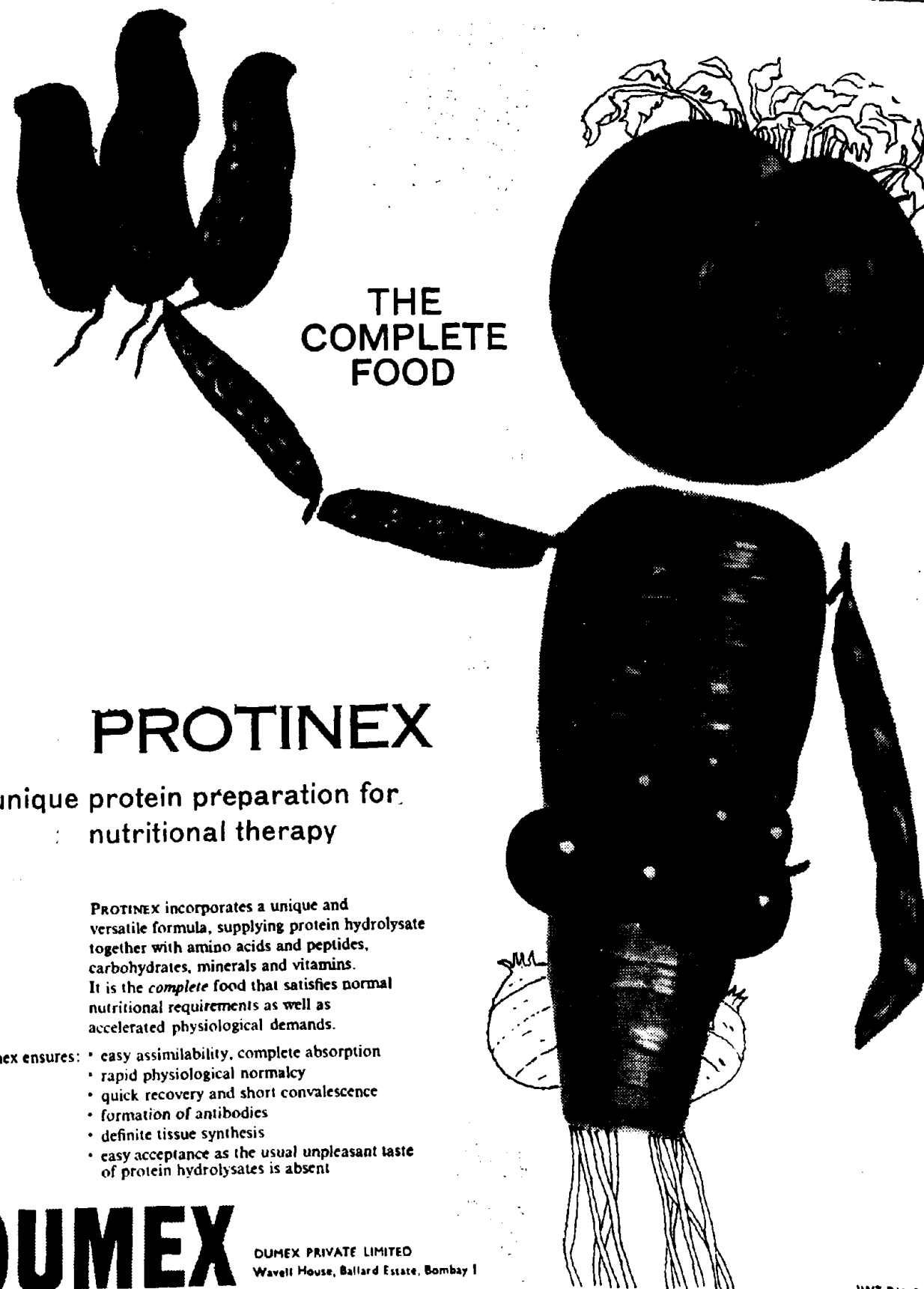
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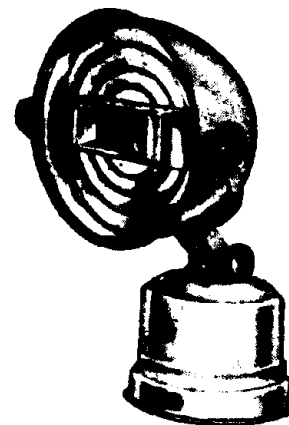


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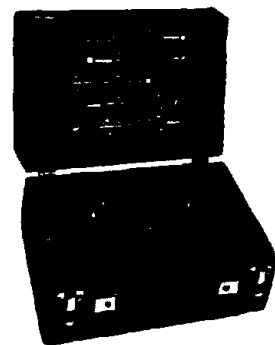
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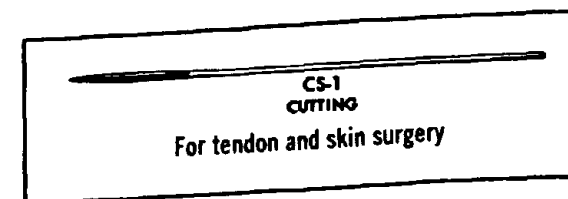
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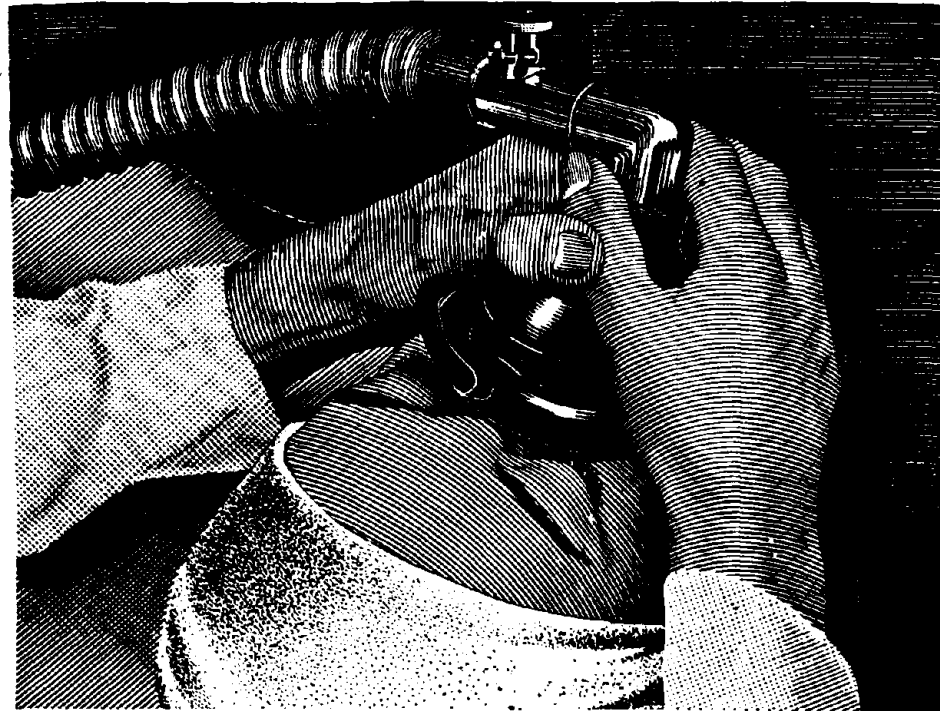
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No. 3

EXPERIMENTAL TRIAL WITH BLADDER MUCOUS MEMBRANE, IN THE RECONSTRUCTION OF TRACHEAL DEFECTS

BY

TARA CHANDRA and P. N. SATSANGI, Lucknow.

The problems involved in the tracheal reconstruction, have already been pointed out in earlier communications.² Basically, these are two, one to provide a semirigid and elastic tube and second to provide an uninterrupted epithelial lining preferably ciliated. Huggins' ⁴ work seemed to offer a hope in this direction, he produced osseous tissue by embedding bladder mucous membrane of the dog in its abdominal wall. If the same were to happen when the bladder mucous membrane is grafted to the tracheal defect, the problem of a semirigid tube would be solved. Again, the trachea and greater part of the bladder are developed primarily from the same entodermal tube of the embryo, so is it possible that the bladder mucosa, when grafted into the trachea, is capable of undergoing metaplasia into a ciliated epithelium? If so, the problem of a lining epithelium would be solved. With these objectives the present series of experiments were done.

Methods and Material

The general pre and post-operative regime was the same as has been described in an earlier communication.² Penicillin and sulphonamide powder were used locally,

while parenterally penicillin was used in earlier series but later on changed to terramycin to reduce the incidence of urinary tract infection. The following operative procedures were carried out :—

1. Wedge resection of the cervical trachea and repair with auto-genous grafts of Bladder mucosa ... 9 dogs
2. Wedge resection of the cervical trachea and repair with homologous grafts of Bladder mucosa ... 3 dogs
3. Wedge resection of the cervical trachea and repair with skin graft lined with Bladder mucous membrane... 11 dogs
4. Wedge resection of the cervical trachea and repair with wire reinforced skin graft lined with Bladder mucosa ... 2 dogs

Preparation of the graft.—Abdomen was opened with a low midline incision. Attempts to expose the bladder extra-peritoneally resulted invariably in a tear of the peritoneum and therefore a deliberate intra-peritoneal approach was adopted as a routine. Bladder was exposed, isolated and opened between two stay sutures. Sub-mucous saline was injected in the fundal

area to lift up the mucous membrane, a suitable piece of which was taken out, dusted with penicillin powder and wrapped in moist saline sponge. The raw area in the mucous membrane was closed with a continuous 3/0 plain catgut. The bladder was closed. The abdomen was closed with a drainage tube in the cave of Retzius and another in the peritoneum, both of these were removed after 48 hours.

Wedge resection of the cervical trachea and repair with auto-genous bladder mucous membrane.—1-2 rings of tracheal cartilages were removed, a suitable piece of the bladder mucous membrane was sutured in place with interrupted sutures of 2/0 silk, keeping the epithelial surface inside. 2-3 approximating sutures passing through the marginal cartilages were passed to take the excessive tension off the graft. Airtightness of the sutures having been tested, the wound was closed.

Wedge resection of the cervical trachea and repair with homologous bladder mucous membrane.—The procedure was similar to the previous group with the difference that the bladder mucous membrane graft obtained from one dog was stitched to another and not to the same one.

Wedge resection of the cervical trachea and repair with skin graft lined with bladder mucous membrane.—Two rings of tracheal cartilages were removed. A suitable piece of full thickness skin graft was sutured in the defect, with interrupted sutures of 2/0 silk keeping the epidermal side towards the lumen, the bladder mucosa was sutured over the graft keeping the epithelial surface on the outer side. Departures from these details are indicated in the table.

Wedge resection of the cervical trachea and repair with wire reinforced skin graft lined with bladder mucous membrane.—A piece of skin was

obtained from the least hairy part of the abdomen and reinforced with wire in the form of a spiral.² Two rings of tracheal cartilages were removed, a suitable of the prepared skin was sutured in place keeping the epidermal side towards the lumen, then the bladder mucosa was laid over it keeping the epithelial surface on the outer side.

Results and Analysis

A summary of the experiments and results is given in the accompanying table.

Wedge resection of the cervical trachea and repair with auto-genous bladder mucosa grafts.—This procedure was carried out in 9 dogs, two dogs died during or just after the operation, of the remaining seven, two (Dog Nos. A30 and A31) died in the first week, three (Dog Nos. A29, A33 and A41) died in the second week, one (Dog No. A35) died in the third week and one (Dog No. A40) died in the fourth week. All the dogs showed evidence of urinary tract infection, one dog (Dog No. A35) developed generalised pyaemia, while one (Dog No. A33) had local infection in the neck wound resulting in an abscess, and one (Dog No. A30) developed subcutaneous emphysema.

The remarkable feature is that the thin bladder mucous membrane is capable of forming an airtight closure of the tracheal defect and maintain the patency of the lumen. The inflammatory response initiated by it is much more intense than that stimulated by the skin graft. Within two weeks (Dog Nos. A29 and A41) *vide* Fig. Nos. 1 (a), (b) & (c); the mucosa is replaced by a thick fibrous membrane, microscopically it is seen to consist of newly formed blood vessels, fibroblasts, collagen bundles and inflammatory cells, the submucous and the adventitial layers of the adjacent trachea are grossly hypertrophied. By the end of

Table Showing the Summary of Experiments and the Results

Experiment No.	Procedure	Dog No.	No. of days survived	Experimental details	Post-operative complications if any	Pos-MORTEM Trachea, Gross and Microscopic	Elsewhere	Remarks
1	Wedge Resection of cervical Trachea and repair with Autogenous grafts of bladder mucosa	A 29	9	1 ring, Epithelium in side	—	Taken well, no leakage, Micros.—Mucosa replaced by fibrous tissue. Numerous newly formed blood vessels, collagen fibres and inflammatory cells. No epithelialisation. The submucous and adventitious layers of trachea markedly hypertrophy. Cartilage shows attempts at growth.	Bladder infected. Kidneys congested.	—
2	—	A 30	5	do	Subcutaneous emphysema	Graft taken well at periphery, Gap in the centre. Micros.—Granulation tissue. Inflammatory signs in submucous and adventitious layers.	Cystitis and pyelonephritis.	—
3	—	A 31	14	do	Haematuria	Abscess in front of graft. Graft not taken.	No abnormality seen in urinary tract.	—
4	—	A 32	Died	During	the	Operation.	Cystitis	Anaesthetic over dose.
5	—	A 33	14	2 rings, Epithelium in side	Collection in neck wound on third day. Aspirated	Abscess in front of graft. Fibrous membrane at the periphery of defect. Micros.—This membrane showed features of granulation tissue. The submucosa and adventitia hypertrophied.	—	—
6	—	A 35	20	do	Pyæmic abscesses on the 12th day	Graft taken well. Lumen narrowed. Graft replaced by fibrous membrane. No epithelialisation.	Pyæmic abscesses in kidneys. Cystitis.	—
7	—	A 38	Died	A few	hours	after operation.	—	—
8	—	A 40	24	2 rings, Epithelium in side	—	Graft taken well. Stenosis. Graft converted into a dense mass of granulation tissue on the inner aspect of which, a lining epithelium of flattened cells seen growing from the periphery. Multilayered at the periphery and single layered towards the centre. Cartilage cells at junctional sites show evidence of mitosis.	Cystitis. Kidneys congested.	—
9	—	A 41	9	do	—	Leakage at left lower end. Graft replaced by a mass of granulation tissue.	Cystitis and Bilateral pleural effusion.	—

Table Showing the Summary of Experiments and the Results—(Contd.).

Experiment No.	Procedure	Dog No.	No. of days survived	Experimental details	Post-operative complications if any	Post-Mortem		Remarks
						Trachea, Gross and Microscopic	Elsewhere	
10	Wedge Resection of the Cervical Trachea and repair with Homologous graft of bladder mucous membrane.	A 39	34	2 rings. Epithelium in side	—	No leakage. Graft converted into a mass of granulation tissue and in the centre shows necrosis.	—	—
11	—	A 42	6	do	Collection in the wound on the 3rd day. Aspirated.	Abscess in front of the grafted area. Graft sloughed out.	Two lobes on the right side and one on the left consolidated.	—
12	—	A 44	15	do	Collection in the neck wound on the 3rd day. Aspirated. Dog improved for a week.	Abscess in front of the grafted area. Graft sloughed out.	Bilateral lobar consolidation.	—
13	Wedge Resection of the Cervical Trachea and repair with skin graft lined with bladder mucous membrane.	A 34	26	2 rings removed. Skin kept in side with the dermal surface towards the lumen. Graft stitched over the skin with epithelial surface facing outwards.	Dog ran away.	—	—	—
14	—	A 46	—	do	Dog expired	a few hours	after operation.	—
15	—	A 47	—	do	Dog expired	just after	operation.	—
16	—	A 48	—	do	Dog expired	a few hours	after operation.	—
17	—	A 49	—	do	—	An abscess in front of the trachea. Thick wall of granulation tissue covering certain parts of tracheal defect present. Micros.—No features of skin or bladder mucous membrane recognizable in the granulation tissue.	—	—
18	—	A 50	8	do	Subcutaneous emphysema on the 2nd post-operative day. Multiple incisions made.	Abscess in front of the trachea. No evidence of skin or bladder mucosa.	—	—
19	—	B 8	15	2 rings. Epidermal surface of skin kept in side and epithelial surface of bladder mucosa out side.	Respiratory obstruction in last few days.	Graft taken well. Lumen stenosed. Whole graft replaced by a mass of granulation tissue; fibres predominating feature in the part contributed by skin and inflammatory cells in part contributed by bladder mucosa.	Left lower lobe consolidated.	—
20	—	B 11	4	do	—	No leakage. Skin and mucosa grafts firmly adherent, could not be separated. Microscopic examination showed dense collection of inflammatory cells at the junctional area between the two grafts.	—	—
21	—	B 13	3	do	—	No leakage at suture line. Other features same as in dog No. B 11.	—	—
22	—	B 14	6	do	Collection in the neck wound on the 3rd day. Aspirated.	An abscess in front of the grafted area. Grafts sloughed out.	Two lobes on the right side consolidated.	—
23	—	B 17	11	do	—	No leakage. Taken well. Stenosis not very marked. Whole of the graft replaced by fibrous tissue. All normal structures of skin lost, but evidence of the transitional cell epithelium of bladder mucosa still present though cellular details lost.	Bilateral lobar consolidation.	—
24	Wedge Resection of Cervical Trachea and repair with wire reinforced skin graft lined with bladder mucosa.	B 10	3	do	—	No leakage.	—	—
25	—	B 16	38	do	—	No leakage. Graft replaced by fibrous tissue. Bundles of collagen fibres with few inflammatory cells. No evidence of epithelium. Normal structures of skin and bladder mucosa lost.	—	—

the fourth week (Dog No. A40) *vide*, Fig. No. 2 (a) & (b) evidences of mitosis in the cartilages cells are seen and the tracheal epithelium also multiplies and tends to grow over the graft. No evidence of the transitional cell of the bladder mucosa is seen.

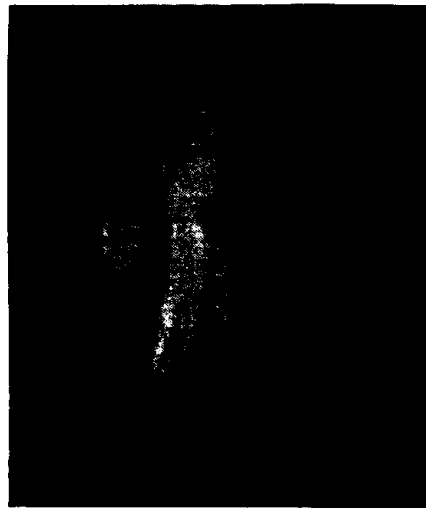


Fig. 1a

Anastomotic site in Dog No. A-29, showing the formation of a thick fibrous membrane.



Fig. 1b

Microscopic Section of the graft under lower magnification showing granulation tissue.

Wedge resection of the cervical trachea and repair with homologous bladder mucous membrane graft.—It was carried out in three dogs, one (Dog No. A39) died on the 4th day, another (Dog No. A42) died on the 6th day and the last one (Dog No. A44) died after 15 days. The graft sloughed out in the latter two cases while in the first one (Dog No. A39) the graft was converted into a mass of granulation tissue with a central area of necrosis. These observations suggest that the homograft probably would not succeed.

Wedge resection of the cervical trachea and repair with skin graft lined with bladder mucous membrane.—This procedure was carried out in 11 dogs, 3 dogs died during or shortly after operation, 5 dogs (Dog Nos. A49, A50, B11, B13 and B14), died during the first week, two dogs (Dog Nos. B8 and B17) died during the second week, while one dog (No. A34) was alive upto the fourth week, when it ran away.

All the dogs dying during the first week showed evidence of local infection leading

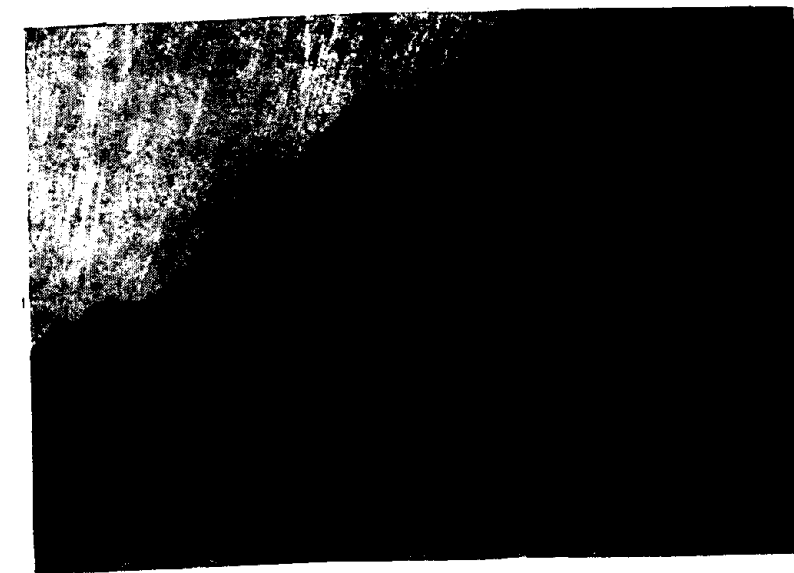
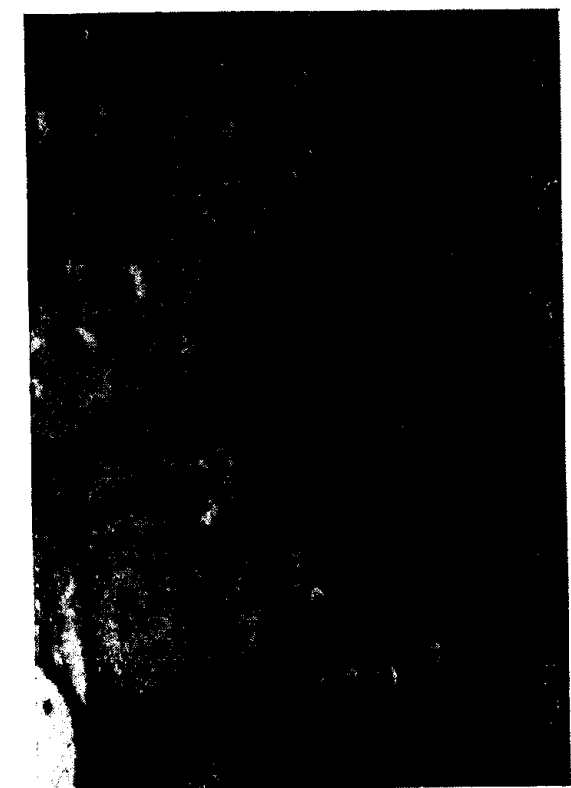


Fig. 1c

Microscopic Section under higher magnification. Graft 9 days old.



a



(b)

Fig. 2

Changes the graft after 24 days.

(a) Microscopic Section of the graft in Dog No. A-40. Granulation tissue replacing the graft. An epithelium is tending to grow over it.

(b) Changes in the marginal cartilage. The cartilage cells showing attempts at mitosis.

to sloughing of the grafts. In Dog No. B17 which died after 11 days, the whole of the graft was replaced by fibrous tissue, no evidence of normal skin structures was seen, but the transitional cell epithelium of the bladder mucosa was discernible though the cellular details were lost. In Dog No. B8, *vide* Fig. No. 3, which died after 15 days even this was lost. Both the grafts were converted into a single fibrous mass consisting of collagen fibres, fibroblasts and newly formed blood vessels. The collagen fibres were greater in number in parts contributed by the skin, while the cellular structures were greater at the peripheral part contributed by the bladder mucosa. There was no evidence of a lining epithelium and the lumen was stenosed.

Wedge resection of the cervical trachea and repair with wire reinforced skin graft lined with bladder mucosa.—It was carried out in two dogs, one (dog No. B10) died after three days and the other (dog No. B16) died after five weeks.

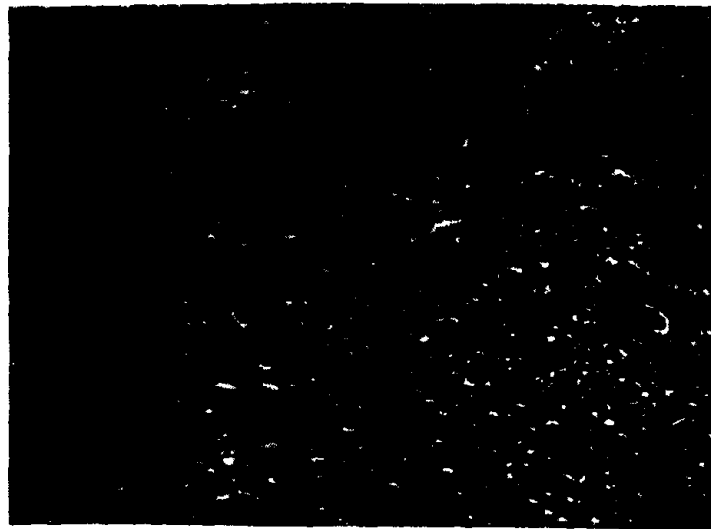


Fig. 3

Changes in the composite graft after 15 days.

Microscopic Section of the graft in Dog No. B-8. Individual characters of skin and bladder mucosa lost. Fibres predominant in parts contributed by skin and inflammatory cells in the part contributed by bladder mucosa.

The grafts in B16 were replaced by a fibrous membrane, the lumen was stenosed. Histologically the fibrous membrane was a homogeneous structure consisting of bundles of collagen fibres and few inflammatory cells. Individual characters of skin and bladder mucosa could not be recognised.

Discussion and Conclusions

The results of auto-and homo-grafts of bladder mucous membrane point to the fact that it is the autografts which survive and the homografts usually die off. The reaction is so severe that they do not form even a temporary scaffolding, the grafts slough off within two weeks.

The autografts of the bladder mucosa invoke an inflammatory response much more severe than the skin grafts. This difference is not easy to explain. Experiments with homografts have demonstrated that the severity of the response varies according to the cellularity of the grafts, more cellular the graft greater the antibody it is likely to

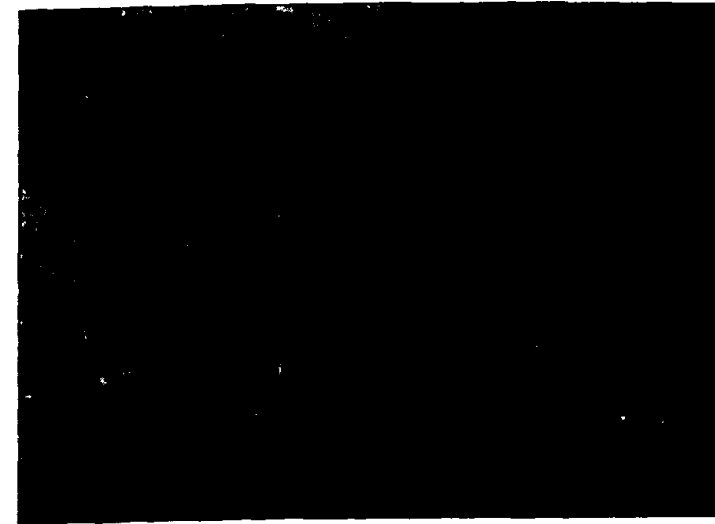


Fig. 4

Fate of the composite graft after 5 weeks.

Microscopic Section of the graft in Dog No. B-16. A homogeneous fibrous membrane. Individual characters of skin and bladder mucosa lost.

produce and consequently they have been divided into homovital and homostatic grafts (Longmire et al)². Does a similar mechanism operates here, it is difficult to say, because the autograft so far have not been shown to produce antibodies.

The results with the simple grafts of the bladder mucosa show that it is capable of providing a reasonably thick fibrous membrane but even by the end of the 4th week there was no evidence of any metaplastic ciliated epithelium nor any evidence of change into cartilaginous or osseous tissue. It was observed (dog No. A40) that the tracheal epithelium at the margin showed regenerating activity and a tendency to grow over the graft which suggest that the growth of an epithelium, would occur, if at all, by transmigration of the cells from the normal epithelium and not by any process of metaplasia of the grafts. This observation conforms with the similar fate observed with skin grafts.

Again, the inflammatory response of the graft was intense enough to stimulate the mitotic activity in the tracheal cartilage which showed a tendency to grow into the graft but the graft itself showed no evidence of formation of cartilage cells. There was no difference when composite grafts of skin and bladder mucosa were used (dog No. B16).

Huggins⁴ produced bone in the abdominal wall of the dog by implanting the mucous membrane of the urinary bladder. Theoretically, this change can be supposed to occur in the bladder mucosa or in the abdominal muscle. That, the renal system is capable of forming bone on its own, is recognized by certain workers (Harris)³. But the bladder mucosa in our series produced only a fibrous membrane and no bony tissue and as such do not provide a weight to this theory. The second possibility is that bladder mucosa might be capable of inducing hetero-plastic bone formation. Lacroix^{5,6} has been able to produce bone by the injecting cell free

extracts of bone in soft tissue whether or not the bladder mucosa is capable of providing the hypothetical inductive stimuli or osteogenins only further work will decide. The present studies only demonstrate the fact that the bladder mucosa, used in the repair of the tracheal defects, whether alone or supported on skin graft, do not produce the bony tissue.

These observations lead to the conclusion that there is no advantage gained by using the bladder mucous membrane as a graft in the repair of tracheo-bronchial defects.

Summary

1. Experiences with bladder mucous membrane graft alone and supported with skin graft, in the repair of tracheal defects in 25 dogs have been described.
2. Both auto-and homo-grafts were used, homografts did not succeed. The auto-grafts both simple and composite did

take up but were converted into a fibrous membrane.

3. The results did not show any advantage of bladder mucous membrane graft over others.
4. The behaviour of the graft in the light of present knowledge has been discussed.

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EXPERIMENTAL PRODUCTION OF ACUTE PANCREATITIS IN DOGS BY DUCT OBSTRUCTION

BY

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Obstruction to the free drainage of pancreatic juice into the duodenum in the presence of continued secretion by the pancreas suggested by Rich and Duff in 1936, after an elaborate study of human autopsy material, is the most widely accepted view of causation of pancreatitis. This was not an entirely new concept put forth by Rich and Duff. As early as 1907 Hess had found that acute pancreatitis could be produced by ligation of pancreatic ducts in dogs at the height of digestion. Wangenstein et al. (1931) after conducting an exhaustive experimental study on cats came to the conclusion that the essential factor for the production of acute pancreatitis is the obstruction to the pancreatic ducts in the presence of a secreting gland.

The diagnostic value of determination of serum amylase levels in acute pancreatitis demonstrated by Elman in 1942 has become well established now and for all practical purposes an elevated serum amylase level is considered as diagnostic of acute pancreatitis provided the estimations are done at the height of the attack or soon after it (Anand et al. 1956).

To evaluate the role of obstruction of pancreatic duct or ducts in the production of acute pancreatitis and the period for which obstruction of the duct was necessary to produce demonstrable changes in the pancreas, an experimental study was carried out in 29 mongrel dogs by obstructing the flow of pancreatic juice in the pancreatic duct or ducts either temporarily or permanently by clamping or by ligation and the results of the work assessed from the study

of serum amylase levels, microscopic and macroscopic changes produced in the pancreas.

Material and Method

Street dogs were used for the experiments. The animals selected were healthy and free from skin infections. Both male and female animals were used. Their weight ranged from 14 lbs. to 25 lbs. The animals were brought to the laboratory two days before operation and in this pre-operative period they were fed and any deviation from normal regarding their bowel habit, urination etc. were observed.

A total of 29 dogs were studied in which 5 dogs acted as controls in which the major and accessory pancreatic ducts were exposed only. Rest of the 24 dogs were divided into 8 groups of 3 each. The following experimental study was carried out in the eight groups:—

- Group I - Major pancreatic duct clamped for 15 minutes.
- Group II - Major pancreatic duct clamped for 30 minutes.
- Group III - Major pancreatic duct clamped for 1 hour.
- Group IV - Major pancreatic duct clamped for 2 hours.
- Group V - Major pancreatic duct clamped for 3 hours.
- Group VI - Major pancreatic duct permanently ligated.
- Group VII - Accessory pancreatic duct permanently ligated.
- Group VIII - Both major and accessory pancreatic ducts were permanently ligated.

To conduct serum amylase studies, two pre-operative specimens of blood were withdrawn. One specimen was obtained two hours after meals to find out the normal average for that dog, and the second specimen was taken before giving the incision after anaesthetising the dog so that the effect to anaesthesia on serum amylase value is judged. A third specimen was taken at the end of the surgical procedure and the fourth half an hour afterwards. Specimens were also taken daily, in the morning 2 hours after meals for 3 consecutive days before the dog was sacrificed and postmortem examination performed. Serum amylase estimation was done by King's modification of Somogyi's method. It may be pointed out that the operation was performed two hours after meals, producing obstruction of the pancreatic duct, when the gland was actively secreting.

Anaesthetic agent used was Sodium Nembutal. It was used in a 2.5% solution, given intravenously, at a calculated dosage of 30 mgm./Kgm. body weight. One half of the required dose was injected rapidly and at least 2 minutes were allowed for it to take effect before administering more, until the desired depth of anaesthesia was achieved in 5-10 minutes.

Operative Technique

Under proper aseptic technique the peritoneal cavity was opened through an upper midline 7-10 cms. long incision extending down from the xiphoid process. The pancreas was delivered into the wound by pulling out the duodenum which is mobile in dogs. The body of the pancreas is found attached to the duodenum. The pancreatic duct in dogs is usually fine and is therefore called Accessory pancreatic duct. It drains the left limb of the gland mainly and opens into the duodenum generally in

common with the bile duct or may open independently into the duodenum. It is visualized by turning over the duodenum. The other pancreatic duct is quite large in size and therefore is the major pancreatic duct. It opens directly into the duodenum a little caudal to the bile duct.

Straight Pott's coarctation clamp was used to clamp the major pancreatic duct temporarily. Permanent ligation was carried out by dividing the ducts between haemostats and ligating each end with silk.

In the post-operative period no antibiotics were used. The dogs were kept for 3 days after the operation and then sacrificed by intravenous injection of Chloroform.

Postmortem was performed on all dogs and the pancreas was examined for macroscopic abnormalities. Omentum and mesentery were examined for fat necrosis. The whole of the pancreas was then removed for histopathological examination.

Results of Experimental Study

Group I.—The study of control group of 5 dogs was carried out to rule out the role of operative trauma. In these 5 dogs the pancreatic ducts were dissected out only and the abdomen was closed 15 minutes, half an hour, one hour, 2 hours and 3 hours after defining the ducts. The serum amylase studies were carried out in the usual manner. All these dogs were sacrificed on 3rd post-operative day and the pancreas was subjected to microscopic examination.

No change in serum amylase levels or abnormality in the pancreas was detected in this group of 5 dogs.

Group II.—In a series of 3 dogs, the major pancreatic duct was obstructed for 15 minutes. No rise in serum amylase levels occurred nor any change was detected in the pancreas except slight congestion.

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Group III.—In this series of 3 dogs, the major pancreatic duct was clamped for half an hour. In 2 dogs no change in serum amylase or pancreas was detected. In one dog there was a transient rise in serum amylase levels on the day of the operation. The pancreas of this dog showed slight leucocytic infiltration at the periphery with congestion and some fibroblastic proliferation.

Group IV.—Following temporary obstruction of the major pancreatic duct for 1 hour in 3 dogs (Table 1), no change in serum amylase levels or pancreas was observed in 2 dogs. In the 3rd dog a slight rise in serum amylase was observed on the day of operation. The pancreas showed extensive round cell infiltration.

Group V.—In this group of 3 dogs, after clamping the major pancreatic duct for 2 hours, increased serum amylase values

(Table 2) were observed. These were especially high in 2 dogs. Microscopically one pancreas showed slight fatty change. The 2nd showed round cell infiltration with congestion while the third showed no abnormality.

Group VI.—Temporary occlusion of the major pancreatic duct for 3 hours in this group of 3 dogs resulted in rise in serum amylase levels after the release of clamp and reached its peak on the following day and in 2 dogs came to base level on the 3rd postoperative day (Table 3). One pancreas revealed oedematous patches (Fig. 1). Microscopic examination of the pancreas revealed disappearance of acinar tissue at places leaving behind empty spaces. Areas of necrosis with round cell infiltration were also detected. The other 2 pancreases revealed congestion with round cell infiltration.



Fig. 1

Microphotograph of transverse section from right limb of pancreas showing distortion of lobules, parenchymal necrosis, fibrosis and leucocytic infiltration.

Table No. 1
(1 hour clamping)

PARTICULARS	Dog No. 1	Dog No. 2	Dog No. 3
Weight of the dog	6.2 Kgm.	8.2 Kgm.	7.2 Kgm.
Sex	Male	Female	Male
Total amount of Nembutal	200 mg.	250 mg.	250 mg.
Serum amylase :			
1. Pre-operative	914 S. units	1067 S. units	1280 S. units
2. Under anaesthesia	914 "	1067 "	1280 "
3. Just after the release of the clamp	914 "	1280 "	1280 "
4. Half an hour after operation	914 "	1280 "	1280 "
5. 1st post-operative day	914 "	1067 "	1280 "
6. 2nd post-operative day	914 "	1067 "	1280 "
7. 3rd post-operative day	914 "	1067 "	1280 "
Postmortem Exam :	N.A.D.	N.A.D.	N.A.D.
Microscopic picture of pancreas	N.A.D.	In the Rt. limb round cell infiltration in surrounding areas. N.A.D. in Lt. limb.	N.A.D.

Table No. 2
(2 hours clamping)

PARTICULARS	Dog No. 1	Dog No. 2	Dog No. 3
Weight of the dog	8.2 Kgm.	9.2 Kgm.	6.2 Kgm.
Sex	Male	Male	Female
Total amount of Nembutal	250 mg.	300 mg.	200 mg.
Serum Amylase :			
1. Pre-operative	800 S. units	1280 S. units	914 S. units
2. Under anaesthesia	800 "	1280 "	914 "
3. Just after the release of the clamp	914 "	1280 "	914 "
4. Half an hour	914 "	1280 "	914 "
5. 1st post-operative day	914 "	1600 "	1280 "
6. 2nd post-operative day	800 "	1600 "	1280 "
7. 3rd post-operative day	800 "	1280 "	1280 "
Postmortem Exam :	N.A.D.	N.A.D.	About 20 cc. peritoneal exudate with amylase value 3200 S.U.
Microscopic picture of pancreas	N.A.D.	Rt. limb : Shows fatty degeneration.	Rt. limb : Shows marked congestion with leucocytic infiltration.

Table No. 3
(3 hours clamping)

PARTICULARS	Dog No. 1	Dog No. 2	Dog No. 3
Weight of the dog	6.2 Kgm.	11.2 Kgm.	8.2 Kgm.
Sex	Female	Female	Male
Total amount of Nembutal	200 mg.	450 mg.	350 mg.
Serum Amylase :			
1. Pre-operative	1600 S. units	1600 S. units	914 S. units
2. Under anaesthesia	1600 "	1600 "	914 "
3. Just after the release of the clamp	2133 "	1830 "	1280 "
4. Half an hour after operation	2133 "	1830 "	1280 "
5. 1st post-operative day	6400 "	2133 "	1280 "
6. 2nd post-operative day	3200 "	1830 "	1280 "
7. 3rd post operative day	1830 "	1600 "	914 "
Postmortem Examination :	Pancreas show patches of pallor and oedema.	N.A.D.	N.A.D.
Microscopic picture of pancreas	Rt. limb : Complete disappearance of acinar tissue leaving behind empty spaces and at other places fibrosis with areas of necrosis, round cell infiltration with distortion of lobules. Lt. limb : Round cell infiltration in septa and at periphery.	Rt. limb : Congestion with round cell infiltration. Lt. limb : N.A.D.	Rt. limb : Round cell infiltration. Lt. limb : N.A.D.

Group VII.—The major pancreatic duct was permanently obstructed in this group of 3 dogs. Serum amylase levels (Table 4) reached a high peak on the 1st post-operative day in 2 dogs and on the 2nd postoperative day in the 3rd dog. Later a gradual fall occurred. Pancreas was found to be oedematous and pale. Histologically (Fig. 2) there was marked leucocytic infiltration, areas of necrosis and distortion of lobules with fibroblastic proliferation.

Group VIII.—In this group of 3 dogs, ligation of accessory pancreatic duct produced no change (Table 5) in the serum amylase or pancreas in 2 dogs. However one dog gave slightly high serum amylase levels for first 2 post-operative days, and marked changes in the pancreas specially in the left limb showing evidence of necrosis, leucocytic infiltration, fibrosis and disruption of acinar structure (Fig. 3).

Table No. 4

(Major pancreatic duct ligation)

PARTICULARS	Dog No. 1	Dog No. 2	Dog No. 3
Weight of the dog	9.2 Kgm.	8.0 Kgm.	8.0 Kgm.
Sex	Male	Female	Male
Total amount of Nembutal	250 mg.	225 mg.	225 mg.
Serum Amylase :			
1. Pre-operative	800 S. units	1067 S. units	1067 S. units
2. Under anaesthesia	800 "	1067 "	1067 "
3. Half an hour after operation	800 "	1067 "	1067 "
4. 1st post-operative day	4364 "	6400 "	6400 "
5. 2nd post-operative day	3200 "	4267 "	12800 "
6. 3rd post-operative day	2133 "	4267 "	3660 "
Postmortem Examination :	Oedematous pancreas. About 20 cc. peritoneal exudate with amylase value 17800 S. U.	Oedematous pancreas.	Oedematous pancreas. About 15 cc. peritoneal exudate with amylase value 25600 S. U.
Microscopic picture of pancreas			
	<i>Rt. limb :</i> Diffuse leucocytic infiltration with fibrosis, necrosis and distortion of acini. <i>Lt. limb :</i> Leucocytic infiltration particularly along widened septa.	<i>Rt. limb :</i> Fibrosis and leucocytic infiltration invading pancreatic tissue. <i>Lt. limb :</i> N.A.D.	<i>Rt. limb :</i> Necrosis with round cell infiltration, congestion and fibrosis. <i>Lt. limb :</i> Leucocytic infiltration, distorting lobules and fibrosis.

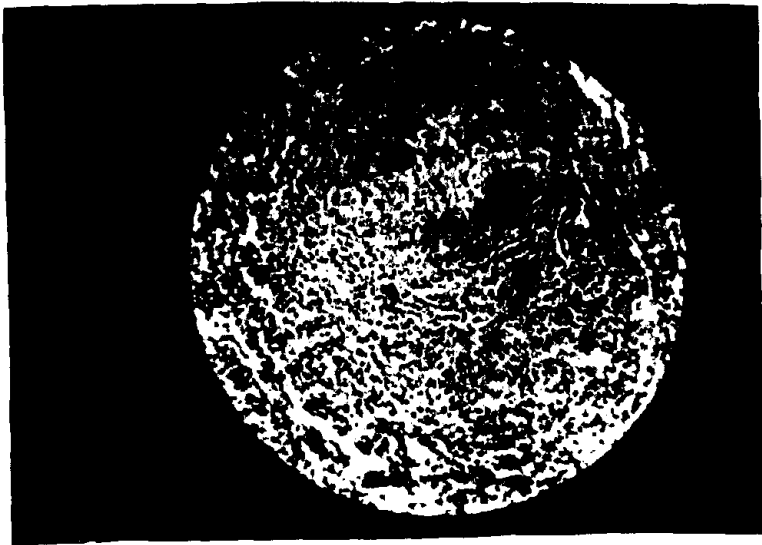


Fig. 2

Left limb (High Power) : Eosinophilic infiltration with a macrophage in the centre.

Table No. 5

(Accessory pancreatic duct ligation)

PARTICULARS	Dog No. 1	Dog No. 2	Dog No. 3
Weight of the dog	6.2 Kgm.	7.0 Kgm.	7.0 Kgm.
Sex	Male	Male	Male
Total amount of Nembutal	200 mg.	200 mg.	200 mg.
Serum Amylase :			
1. Pre-operative	1067 S. units	1067 S. units	914 S. units
2. Under anaesthesia	1067 "	1067 "	914 "
3. Half an hour after operation	1067 "	1067 "	914 "
4. 1st post-operative day	1067 "	1280 "	914 "
5. 2nd post-operative day	1067 "	1280 "	914 "
6. 3rd post-operative day	1067 "	1067 "	914 "
Post-mortem Examination :	N.A.D.	Pancreas left limb - oedematous.	N.A.D.
Microscopic picture of pancreas			
	<i>Lt. limb :</i> Mild fibrosis, necrosis, disruption of acini tissue and round cell infiltration. <i>Rt. limb :</i> N.A.D.	<i>Lt. limb :</i> Necrosis, Fibrosis, leucocytic infiltration and distortion of acinar pattern. <i>Rt. limb :</i> N.A.D.	N.A.D.

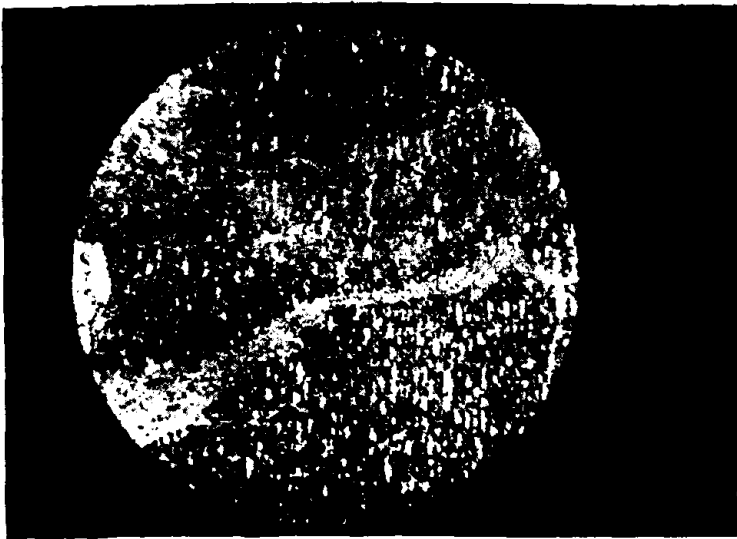


Fig. 3

Microphotograph of transverse section of left limb showing necrosis, fibrosis, distortion of acinar structure and leucocytic infiltration.

Group IX.—In this group, both major and accessory pancreatic ducts were permanently obstructed in 3 dogs. Marked changes in serum amylase levels were noted (Table 6). Amylase values went on increasing for first two post-operative days and then a gradual fall occurred. Microscopically (Figs. No. 4 & 5) there was increased thickening of septal tissue, widespread areas of fibrosis, round cell infiltration and necrosis with partial or complete atrophy of acinar structure.

The present experimental study shows that obstruction of the major pancreatic duct for one hour or less, produces no significant changes in serum amylase level or pancreas. By prolonging the obstruction to 2 or 3 hours,

a transitory elevation in serum amylase levels occurred for 48 hours or more with slight degree of inflammation of pancreas. After accessory duct ligation, only one animal showed evidence of elevated serum amylase with gross and microscopic pancreatic inflammation. Animals in whom both the major and accessory pancreatic ducts were permanently ligated showed high serum amylase levels and marked inflammatory changes in the pancreas. The correlation between histological changes in the pancreas and serum amylase levels during first 24 hours after pancreatic duct ligation has been studied on mongrel dogs by Gibbs and Ivy (1951). They found that the pancreas at the end of 24 hours in these

Table No. 6
(Both ducts ligation)

PARTICULARS	Dog No. 1	Dog No. 2	Dog No. 3
Weight of the dog	10.5 Kgm.	7.0 Kgm.	8.0 Kgm.
Sex	Male	Female	Female
Total amount of Nembutal	300 mg.	200 mg.	225 mg.
Serum Amylase :			
1. Preoperative	1600 S. units	914 S. units	1280 S. units
2. Under anaesthesia	1600 "	914 "	1280 "
3. Half an hour operation	1600 "	914 "	1280 "
4. 1st post-operative day	8534 "	12800 "	12800 "
5. 2nd post-operative day	12800 "	12800 "	17066 "
6. 3rd post-operative day	3534 "	6400 "	12800 "
Postmortem Examination :	Oedematous pancreas. About 10 cc. peritoneal exudate with amylase value 35600 S.U.	Oedematous pancreas.	Oedematous pancreas.
Microscopic picture of pancreas	<i>Rt. limb :</i> Widespread fibrosis, leucocytic infiltration and disrupted acini.	<i>Rt. limb :</i> Extensive fibrosis, round cell infiltration with acinar disruption.	<i>Rt. limb :</i> Fibrosis, leucocytic infiltration and necrosis at places.
	<i>Lt. limb :</i> Thickened septa and round cell infiltration.	<i>Lt. limb :</i> Diffuse leucocytic infiltration and acinar disruption.	<i>Lt. limb :</i> Mild round cell infiltration, especially at the periphery.



Fig. 4
Right limb (Low Power) : Marked fibrosis, distorted lobules, necrosis and leucocytic infiltration.



Fig. 5
Right limb (High Power) : Areas of necrosis with lymphocytic infiltration.

animals showed definite oedema and microscopic evidence of widening of the interlobular septas and leucocytic infiltration. Serum amylase levels reached 2.8 times the preoperative values.

The present study has revealed that in animals in whom both the pancreatic ducts were ligated, the serum amylase figures ranged from 5-14 times the preoperative values after 24 hours. With major pancreatic duct ligation alone they were 5 to 6 times the original level.

The results of Byrd and Sawyers (1957) following brief periods of obstruction to the pancreatic ducts on serum amylase values in a series of mongrel dogs are comparable with ours.

Conclusions

Acute interstitial pancreatitis can be produced in dogs by temporary obstruction to the flow of pancreatic juice for 2 hours or more than 2 hours or after permanent ligation in the presence of a normal

dietary stimulus. The high serum amylase values with patchy distribution of lesions in pancreas reveals that the changes in the experimental animals are the same as those of acute pancreatitis in human beings.

Summary

An experimental study evaluating the role of temporary or permanent obstruction of the pancreatic duct or ducts in the presence of a normal dietary stimulus in the production of acute pancreatitis has been carried out in 29 mongrel dogs.

Acknowledgements

We are deeply indebted to Dr. N. L. Chitkara, M.D., Professor of Pathology, Medical College, Amritsar for his constant help in connection with the histological studies and providing facilities for studies in serum amylase in his department. We are also grateful to the Registrar, Punjab University, for permission to publish the data from the thesis for M.S. Examination by Dr. Sotantar Rai.

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MALIGNANT MELANOMA OF THE RECTUM

BY

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Introduction

Laennec¹ in 1806 gave a good description of melanotic tumours as they affect men. "Black Tumour" of white and grey horses however was known, even before that year. Malignant Melanoma of the rectum and anal canal is a rare tumour.

From 1941 to 1951, 20 cases of malignant melanoma of skin were seen in the Tata Memorial Hospital. 4 Cases of mouth, 2 of tonsil, one of pharynx, one of nasal mucosa, one of vagina were other malignant melanomas.

From 1941 to 1958, 5 cases of malignant melanoma of rectum were seen which forms the basis of this paper.

Dr. Khanolkar emphasises low incidence of skin cancer and melanoma in Indians and attributed it to the presence of pigment in the epidermis which probably protects the skin from solar radiation. Although melanoma of mucosa is uncommon; in a study by Dr. Shroff, 5% of Indians showed pigmentation in oral mucosa which is considered to be premalignant.

History

Melanoma of rectum was first reported by Moore in 1857 and Sigesis reviewed 20 cases in 1898. In 1912-13, Chaliar and Bonnet reviewed 63 cases reported upto that time. Braastad, Dockery and Dixon² in 1949 reviewed 103 cases in all. Melanoma of the rectum, accounts for 0.25% of all types of lesions in this location. The average age of patients in this report was between 60 and 70 years, and the duration of symptoms

about 9.2 months. The chief complaints were anal pain, urgency of stools, tenesmus, rectal discharge and occasionally, prolapse of the rectum. Out of 94 cases, 74% had undergone surgical treatment. Twenty-three cases being treated by radical excision. Only 3 patients were ultimately labelled as cured. Col. V. R. Mirajkar and Y. V. Sachdeva³ were the first to report melanoma of the rectum from India, in 1945. The patient was a male of 35 years, who had extensive disease. He died on the 4th day after exploration. Prof. A. K. Basu⁴ published one more case of malignant melanoma of rectum in 1950. The patient was a male, 44 years of age, who was operated on in two stages; first colostomy was made and then perineal excision was carried out. A few months later, the patient developed metastases in inguinal nodes and in the hilar region in the chest.

Pathology

Malignant melanoma of the rectum usually originates at the anorectal junction, and may then spread upwards or downwards. Chaliar and Bonnet consider this tumour to be an epithelioma arising from the malpighian layer of the lining of the anal canal.

Characteristically, the tumour protrudes into the lumen of the bowel as a sessile or a pedunculated polypoid growth without showing any tendency to spread in an annular fashion. This melanoma is the most malignant tumour of the rectum. It spreads both by lymphatics to regional nodes, and by blood stream to liver and lungs. Finally it may spread all over the body.

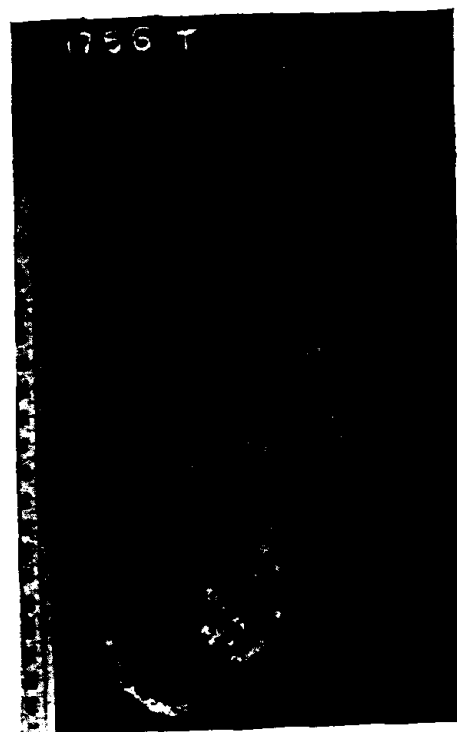


Fig. 2

Operation specimen showing polypoid growth in the lower rectum and anal canal.

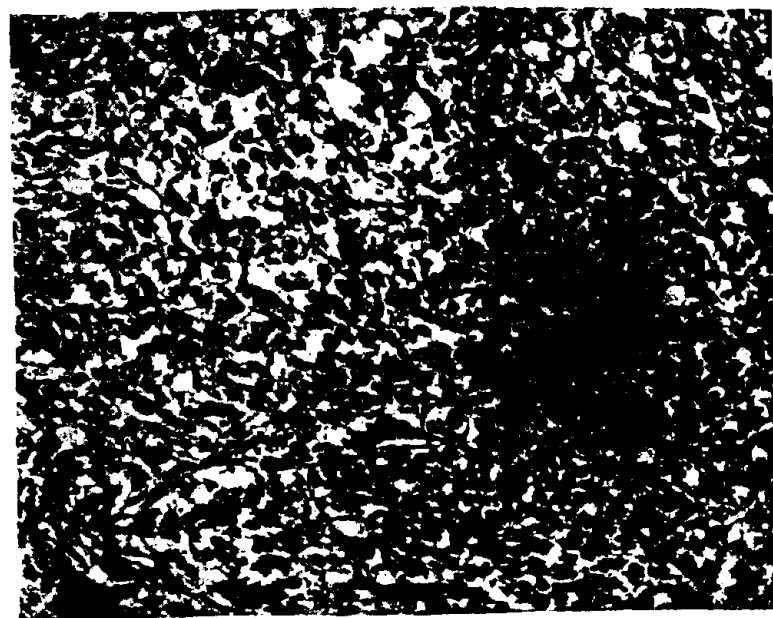


Fig. 3

Histological photomicrograph of the operation specimen. Magnification X 220 showing the sheets of oval and spindle shaped cells having round and oval nuclei with prominent nucleoli. Pigment is also seen in some areas—Case No. 1.

2. Inj. of penicillin crystalline 5 lakhs and streptomycin Gm. $\frac{1}{4}$ daily for 6 days were given.

3. Continuous catheter drainage of the urinary bladder was maintained for 48 hours. Three hourly releasing and clamping the catheter was done for the next 5 days.

The catheter was removed on the 7th post-operative day, which was followed by normal micturition.

4. Colostomy was opened after 48 hours.

5. Diet: Oral feeds were started after four days. On the 9th day soft diet was given.

6. Pack: The perineal pack was removed after four days, followed by daily irrigation of the wound (Fig. No. 6).

7. Alternate sutures were removed on the 10th day and the rest on the 12th post-operative day (Fig. Nos. 4 & 5).

Complications

1. Urinary infection: The patient developed fever with rigors from the 15th to 19th days. Antibiotics were given to control it.

2. Patient used to develop distension off and on. Thirtythree round worms came out through the colostomy on the 20th post-operative day.

The recovery was good.

The patient was discharged on 18th July, 1957.



Fig. 4

Photograph of the patient a few weeks after operation. The patient is wearing a colostomy bag—(Case 1).

Follow-up.—On 12th December, 1957 a letter was received from the relative of the patient saying that the patient suddenly died on a farm about seven months after the operation. He had no complaints upto the end.

Comments

Melanoma is uncommon in very old patients. Even with advanced age and a frail physique our patient stood the operation well and was working on the farm after the operation. Patient developed subacute type of obstruction, post-operatively, probably because of round worms. Patient passed 33 round worms on the 20th post-operative day. It is wise, in our opinion, to give anti-helminthic treatment to Indian patients in the preparation of the bowel, before surgery. The sudden death of the patient on the farm suggests death from coronary thrombosis and not from the melanoma. An autopsy was not performed.

Case Report No. 2

Mrs. I. O. T. Female aged 60 years residing in Bombay was seen in the outdoor clinic on 10-9-47.

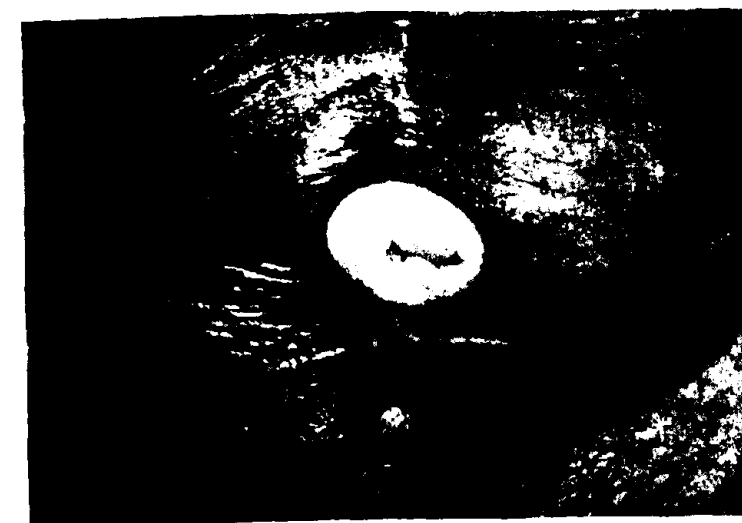


Fig. 5

Colostomy in the centre of transrectal incision which healed by primary intention.



Fig. 6

Perineal wound healing by granulation—(Case 1).

The patient complained of something coming down during defecation which was painful over a period of ten months. There was no history of bleeding per rectum.

There was no history of malignant disease in the family. The patient had not suffered from any serious or significant illness. Personal history did not reveal any significant point.

On examination, the patient was a fairly built and nourished old lady. Her nails, conjunctivae and skin were pink and healthy. Tonsils and pharynx were normal.

Cardiovascular, respiratory and central nervous systems were normal.

On digital examination of rectum a big pedunculated growth 2.5 cm. above the anal margin was felt, which was attached to its posterior wall and was freely mobile. There was no mass in the abdomen, free fluid was absent, liver and spleen were not enlarged.

Investigations.—(1) A punch biopsy from the growth was taken which was reported to be malignant melanoma by the pathologist. (2) (i) Blood H.B. 76%, R.B.C. 4.03 m. W.B.C. 11700 per annum. (ii) Blood sugar 95.2 mg%, proteins, 5.69 mg%, N.P.N. 26 mg%. (iii) Kahn Test Negative. (iv) Urine N.A.D. (v) Chest screening was normal.

On 29-9-47, an exploratory laparotomy was performed under general anaesthesia through a low left paramedian incision firm nodes were felt in the sacral hollow. As the patient appeared feeble for one stage resection colostomy was performed.

On 31-10-47, perineal resection of the growth was done under general anaesthesia.

Pathology report of the excision specimen was.—An excised cauliflower like growth measuring 6 × 4 × 3 cm. It was densely black in colour. The cut surface showed few homogenous areas. The tumour was clear of the cut edge.

Microscopic.—Histological examination showed mucous membrane of the large bowel. Beneath this area ovoid or fusiform cells with cytoplasm closely packed with melanin pigment were seen. Nuclei were either round or ovoid in shape.

Diagnosis.—Malignant Melanoma.

On 24-12-48, Excision of local recurrence was done under general anaesthesia.

Follow-up examination.—(1) 27-12-49. There was induration on the left lateral wall of rectum. No evidence of metastasis elsewhere. Colostomy was functioning well.

(According to the letter from a patient's relative), the patient expired in 1951. Post mortem was not performed.

Comments

It is interesting to note that the patient with malignant melanoma of rectum was alive for four years inspite of conservative surgical treatment.

Case Report No. 3

Mr. M. S. Male aged 56 years residing in Bombay, was seen in the outdoor clinic on 18-3-48.

The patient was operated on for a growth in the anal region three years back, probably excision of the growth was done. Patient complained of constipation on and off and passage of blood and mucous in the stool for 15 days. The patient had not suffered from any significant illness previously. On examination, the patient was a fairly built and nourished man, his nails, conjunctivae and skin were pale; teeth, tonsils, tongue were normal. Lymph nodes were not enlarged.

Cardiovascular, respiratory and central nervous systems were normal.

On digital examination of the rectum, pigmented ulcerative growth was felt in the lower rectum, involving all the walls of anal canal and part of the perineum. The growth was irregular and very friable. Proctoscopy confirmed the palpatory findings.

In the abdomen, no mass was felt, there was no free fluid and liver and spleen were not enlarged.

Investigations.—(i) Biopsy Malignant Melanoma. (ii) Blood studies were normal. (iii) Chest screening was normal.

Treatment.—As the local disease was advanced only palliative colostomy followed by radiation was advised which the patient refused and was not seen since then.

Comments

In this case the local disease was very advanced but there were no metastasis clinically and radiologically.

Case Report No. 4

Mr. M. K. S. male aged 44 years residing in Anand was seen in the outdoor clinic on 17-1-52. The patient complained of painful growth in the anal

region for about 2 months, which was excised, in an outside hospital. The pathology report was malignant melanoma. There was no history of familial disease and personal history did not reveal any significant point.

On examination, the patient was fairly built and nourished; nails, conjunctivae and skin were pink; teeth, tonsils, tongue were healthy. No lymph nodes were palpable.

Cardiovascular, respiratory and central nervous systems were normal.

On digital rectal examination, an ulcerative growth was felt on the left lateral wall of anal canal. On proctoscopic examination the growth was found to be pigmented. In abdomen, no mass was felt, liver and spleen were not palpable, free fluid was absent.

Investigations.—(i) Biopsy malignant melanoma. (ii) Chest screening normal.

The patient was advised abdomino-perineal resection of rectum. But he did not want surgical treatment and was not seen since then.

Comments

It is not uncommon to find the adamant behaviour on the part of patients to refuse surgery early in the disease.

Case Report No. 5

Mr. B. B. P. male 50 years of age residing in Ratnagiri District, was seen in the outdoor clinic on 1-6-53. The patient complained of bleeding per rectum on and off after defaecation, for one year. There was no history of Familial disease and of any significant illness before. The patient was habituated to smoking beedies, about 20 per day.

Personal history revealed no significant point. On examination, the patient was fairly built and nourished, nails conjunctivae and skin were pale; teeth, tonsils, tongue were normal. Lymph nodes were not palpable. Cardiovascular, respiratory and central nervous systems were normal.

On digital examination of the rectum a large ulcerative growth was felt involving the whole of anal canal. On proctoscopic examination large fungating growth was seen in lower rectum and anal canal, which was pink and partly covered with slough (Fig. No. 7).



Fig. 7

Photograph of the growth seen in the perineum region—(Case 5).

In abdomen, no mass was felt, free fluid was absent, liver and spleen were not palpable.

Investigations.—(i) Biopsy malignant melanoma.
(ii) X-ray chest Bilateral pulmonary metastasis were seen.

Treatment.—No treatment was offered because the patient had extensive bilateral pulmonary metastasis.

Comments

It was interesting to note that clinically there were no metastasis in the liver, which is the more common site, but lungs were studded with metastasis.

Summary

1. A brief survey of the history of melanoma of rectum is made.
2. Diagnosis and treatment of the disease is discussed in short.
3. Five case reports and comments are presented.

Acknowledgements

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CIRSOID ANEURYSM OF THE SCALP

(With a report of 3 cases)

BY

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Abnormal arterio-venous communications in the scalp have been thought to lead to the condition described as 'Cirroid Aneurysm of the Scalp'. This is the name applied to a pulsatile subcutaneous swelling consisting of a number of dilated and tortuous blood vessels; these give it an appearance and feel of 'a writhing bag of worms' and have possibly given rise to the legend of the 'serpents on the head of Medusa'. The condition is usually characterised by a systolic thrill, and a continuous bruit at one or more points which overlie the abnormal communication(s), and the diagnosis is rarely in doubt. However, great interest attaches to its pathogenesis and treatment,

and these are the two aspects that will be particularly discussed in the present paper on the basis of a review of the literature and on three personal cases in which the results of treatment have been gratifying.

Case Reports

Case 1.—S. R. male aged 25 years, was admitted in hospital on 24-8-'57. He complained of a left frontal swelling noticed soon after birth; it had been steadily increasing in size and giving rise to pain, throbbing and buzzing in the ear during the last one year; these symptoms were aggravated on lying down. The swelling on examination was found to be a pulsatile 'bag of worms'; it was $9 \times 5 \times 2$ cm. in size and extended over the left frontal and temporal regions from the left eyebrow (Fig. 1 & 2). A number of pulsatile vessels could be seen to converge on it



Fig. 1 & 2

Pre-operative photographs of Case 1 with line of incisions marked off.

from the right temporal, and left temporal, parietal and occipital regions. The mass was expansile, increased in volume on recumbency and was partially compressible against the skull. A thrill could be felt most markedly at two points, one over the left orbital margin, and the other over the left zygomatic arch. At these points a loud systolo-diastolic murmur could be heard; elsewhere over the swelling there was a soft systolic murmur. No systemic abnormalities were detected. His Blood pressure was 120/80 mm. Hg.; the fundi were normal and radiography of the skull revealed nothing unusual.

A diagnosis of cirroid aneurysm of the scalp was easily made, but two special investigations were carried out with a view to elucidate some points in its pathogenesis, namely arteriography and ultra violet fluoroscopy. Ultraviolet fluoroscopy was performed on 2-9-'57 by injecting 5 c.c. of a 20% solution of Fluoresoin intravenously and observing for fluorescence of the scalp under ultraviolet light; the intensity of the fluorescence being a measure of the capillary circulation of the part being examined. It was observed that the skin overlying the aneurysm was relatively dark while the rest of the scalp was brilliantly fluorescent; this was recorded photographically. It could thus be inferred that the capillary circulation and hence the nutrition of the tissues overlying the cirroid aneurysm was poor, no doubt due to the shunting of the arterial blood proximal to the capillary bed.



Fig. 3
External Carotid arteriogram of Case 1.

Arteriography was next performed on 6-9-'57 by injecting 70% di-iodine into the exposed left external carotid artery. Pooling of the dye was seen at the site of the aneurysm with a number of dilated tortuous vessels converging on it from the posterolateral aspects (Fig. 3). Following arteriography, the external carotid artery was ligated in continuity; as a result the cirroid mass became much smaller and much less pulsatile; the thrill over the zygoma disappeared, but that over the orbital margin, persisted, due no doubt to a communication with the ophthalmic artery.

The main operation was performed on 11-9-'57 under general anaesthesia. The proposed lines of incision were traced out with triple dye as shown (Fig. 1), and infiltrated with Adrenaline solution (1 in 200,000). Three small incisions were first made over the pulsatile vessels at the periphery of the mass, corresponding to the right superficial temporal, left superficial temporal and left posterior auricular vessels. These were divided between ligatures and the wounds closed. The main incision was next begun and made in short segments, haemostasis of one segment being secured before the next segment was incised. At the lower end, the superficial temporal vessels were carefully exposed at the upper pole of the parotid gland and both anterior and posterior divisions were divided between ligatures. Haemostasis was particularly difficult along the orbital margin and great big tortuous pulsatile vessels were met with. Fortunately the larger vessels could all be ligated

prior to division and the smaller ones coagulated with diathermy. The midline incision was easier and bleeding could be controlled by everting the galea. After all marginal vessels had been dealt with, the mass appeared much smaller and pulsation had practically disappeared. The scalp flap containing the mass was then lifted up little by little from the pericranium. Numerous connecting vessels were encountered between this and the deep aspect of the cirroid mass; these were dealt with by ligature and diathermy. A small subpericranial cirroid was found and left alone. The scalp flap was finally reflected up beyond the posterior and lateral margins of the cirroid; it was now very much smaller and no longer pulsatile. It was left alone; the flap was replaced and sutured in two layers with a drain. One pint of blood was transfused during the operation.

The immediate postoperative course was uneventful; later there was superficial necrosis of the skin over the lower part of the flap; this necessitated a split thickness skin graft on 12-10-'57. The mass had by now completely disappeared and there was no abnormal pulsation anywhere in the scalp. However, on 30-9-'57, a swelling was noticed in the neck at the site of the external carotid exposure, it increased in size and showed expansile pulsation. Exploration revealed a traumatic aneurysm of the external carotid artery, and haemorrhage from it could only be controlled by ligation of the common carotid artery, under local anaesthesia on 17-10-'57. After this he made an uneventful recovery (Fig. 4) and in course of time resumed his duties. He returned in February 1958 with a small recurrence of the pulsation over the swelling; this was treated by injection of a local sclerosing solution (ethamoline). The injection brought about a syncopal attack but the condition has been kept under excellent control since and there has been no recurrence.

Case II.—L. D. a woman aged 20 years, was admitted on 6-3-'58, with a swelling in the occipital region, present for four years, but painful and progressively increasing in size for the last three months. On careful examination through her long hair, a pulsatile partially compressible swelling about $10 \times 7 \times 2$ cm. with a bag of worms feel and a systolic murmur was found in the left occipital region. A thrill was felt and a systolodiastolic murmur heard most prominently at the inferolateral aspect of the swelling, and the mass was found to diminish in size when pressure was maintained over the site of maximum thrill (Fig. 5 & 6). No other abnormality was detected. A left external carotid arteriogram done on 14-3-'58 as in the previous case revealed dilated tortuous channels

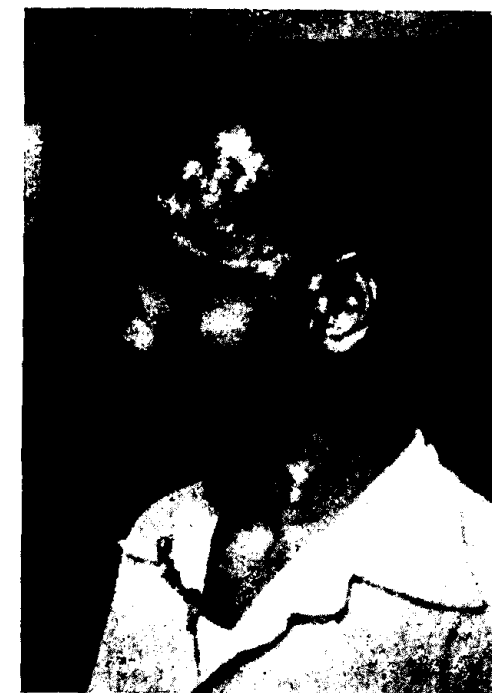


Fig. 4
Post-operative photograph of Case 1.

corresponding to the branches of the occipital artery (Fig. 7). The external carotid was not ligated at the end of this. It was not possible to perform ultraviolet fluoroscopy in this case.

She was operated upon on 26-3-'58, under general anaesthesia, in the prone position. The main incision which was sickle shaped (Fig. 5) was marked off and infiltrated with adrenaline solution. The stem of the sickle was incised and the occipital vessels ligated and divided proximal to the site of the thrill; the thrill disappeared and the mass diminished in size. Two small incisions were next made lateral to the convexity of the sickle over prominent pulsatile vessels (corresponding to the posterior auricular and posterior division of the superficial temporal vessels), and these were ligated and divided. The main incision was then continued in segments and haemostasis secured as in the previous case. The scalp flap was slowly lifted up and back and feeding vessels on the deep aspect of the mass dealt with; these were fewer than in the previous case. After the flap was completely freed, a further step was performed prior to its replacement; the galea was incised from its deep aspect over the inferomedial quadrant, thus giving



Fig. 5 & 6

Pre-operative photograph of Case 2 showing line of incisions.



Fig. 7

External Carotid arteriogram of Case 2.

access to feeding vessels in the subcutaneous layer underlying the pedicle of the scalp flap. After these had been controlled the flap was replaced and sutured in layers with a drain; the cirroid mass had almost completely disappeared and was non-pulsatile. One pint of blood was transfused during the operation.

Her convalescence was entirely uneventful and the wounds healed soundly. She was discharged on 7-4-58; when seen at follow-ups there were no symptoms or signs other than a scar (Fig. 8).

Case III.—A. K. D. male aged 22, presented with a small swelling over the middle of his left eyebrow; this was first noticed shortly after a closed injury at that site two years ago and it has been progressively increasing in size. It was $4 \times 2 \text{ cm.} \times 1 \text{ cm.}$ in size (Fig. 9), soft, pulsatile, compressible and again with a 'bag of worms' feel and a systolic murmur; the presence of a thrill could not be positively established. Pulsation and volume diminished when the superficial temporal artery was compressed over the zygoma; compression of the supra-orbital artery was without effect. A prominent vessel led to the swelling from the posterolateral aspect.

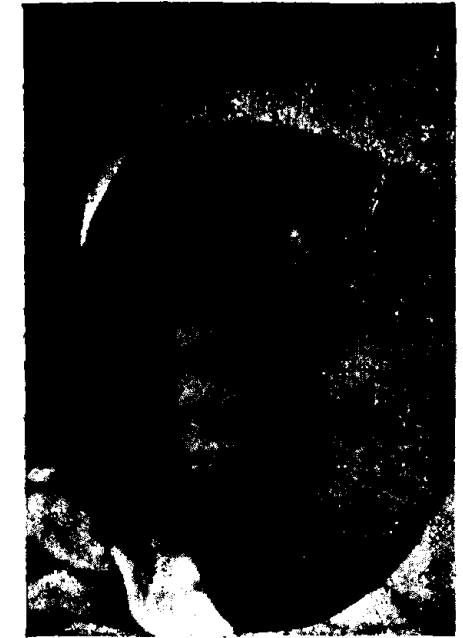


Fig. 9

Pre-operative photograph of Case 3 showing line of incisions.



Fig. 8

Post-operative photograph of Case 2.

He was operated upon without further investigation under local anaesthesia on 20-12-58. The anterior branch of the superficial temporal artery was first ligated and divided; pulsation in the swelling almost ceased. A convex incision was then made above the swelling and the flap turned down in the usual way after controlling the feeding vessels. In this case however in view of the small size of the mass, excision was decided upon and the mass was stripped off the skin flap and the vessels leading to it from its superficial aspect dealt with. The flap was then replaced and sutured. Convalescence was uneventful. The cirroid mass was submitted to histological examination; this revealed the presence of thickwalled blood vessels with partially organised thrombus in the lumen (Fig. 10 & 11).

Review of the literature

The subject of cirroid aneurysm of the scalp has, on the whole, received rather a cursory attention in the various text books of surgery, surgical pathology and operative surgery, both current and obsolete. There are several excellent reviews on arteriovenous communications in general in some of which



Fig. 10

Showing thick walled blood vessels.



Fig. 11

Showing partially organised thrombus in blood space.

Fig. 10 & 11 Photomicrographs of resected tissue of Case 3.

(Pemberton, Ried, Dandy, Adams) the problems peculiar to the scalp have been elaborated, supported by case reports. Papers restricted to the scalp consist almost entirely of reports either of a solitary case or of a series not exceeding four. Thus no clear idea emerges regarding the overall incidence, prognosis or comparative results of alternative methods of treatment. In the absence of an easily available comprehensive review on the subject, it has been thought worthwhile to summarise the salient features of such reported cases in the last 30 years accessible to us in a tabular form (Table I.)

Pathogenesis

The earlier writers on the subject were much concerned about the differential diagnosis of various types of pulsatile vascular masses in the scalp and a multitude of names were in vogue (cirroid aneurysm, aneurysm by anastomosis, racemose aneurysm, plexiform angioma, arterial angioma, pulsating angioma) to distinguish between congenital malformations, neoplasms and post-traumatic lesions. The opinion of the majority was that it was in general neoplastic and consisted mainly of arteries (Matas, MacCallum, Ewing, Aschoff, Adami, Delafield and Padden). Nevertheless, as early as 1831, Wright declared on the basis of an autopsy study of a remarkable case of cirroid aneurysm of the head that the main mass of pulsatile vessels was veins. Berry, in 1906, wrote strongly to support this view point and explained the relation of the lesion to trauma by adding "an injury involving both artery and vein would readily allow arterial pressure to be transmitted to the interior of the vein. The increased pressure would naturally cause distension of the thin-walled veins and a tumour composed of dilated and tortuous veins would be formed". Reid in 1925, concluded from a study of his own and of reported cases that "there is no difference between this condition and arteriovenous

aneurysm, except that the term cirroid aneurysm has been applied to that condition which results where abnormal communications occur in the more peripheral and smaller vessels". Patey in 1942 attempted to show the arterial and venous phases of the lesion by serial arteriograms and described it as a conglomeration of veins. Our own findings, clinical and arteriographic also lend support to this view. Thus the pendulum of pathological and surgical opinion has now swung completely over and it is more or less universally accepted that single or multiple connections between the smaller arteries and veins result in cirroid aneurysms; arterial blood thus pours into the veins which become dilated tortuous and pulsatile, and later thickwalled and elastic (arterialised), and the lesion progressively enlarges in volume.

The origins of such arteriovenous communications are still a matter of some discussion. A few are the result of a pre-existing haemangio-endothelioma or other vascular neoplasm as described by Rogers (1936). In others the relation of trauma, either a single severe injury or a long continued series of slight injuries closed more often than open, to the cirroid aneurysm is too intimate to be ignored. While many believed that it was necessary for the trauma to be inflicted over a pre-existing vascular anomaly, it is now becoming increasingly obvious that trauma to normal blood vessels can initiate the aneurysm. Indeed an anatomical explanation has been offered for the production of cirroid aneurysm as a result of closed injury to the scalp in preference to other regions. The haematoma here is enclosed in a small space and the open venous channels offer the line of least resistance to the blood under arterial pressure, rather than the areolar tissues as in other sites Frandsen (1958). Many of these lesions are noted

TABLE-I

Year	Author	Sex	Age	Site	History	Investigation Complication	Treatment and Result
1929	Patel	F	39	L Scalp	15 years. No injury	Hge	Excision, thrice recurred, finally cured.
1929	Roche	M	27	R. Temp. 1" diam.	4 years incr. 20 mts. No injury	—	Lig. R. S. Temp. a. and Excision with overlying scalp; partial closure-C.
1931	Scarby	M	48	R. Scalp-L. Massive; Exophth.	10 yrs. incr. 2 yrs. repea- ted occupational injuries to head	—	Two stage excision of 2/3 with scalp tourniquet and clamp for scalp flap, with 72 hrs. interval-C.
1933	Kerr	M	26	Frontal 3" 2"	Swelling from birth, incr. 1 year	—	Lig. B. S. Temp. and other feeders, no effect; Excision with scalp tourniquet-C.
1935	Swinton	F	23	L. mastoid, large walnut	Closed injury at 15, swelling at 20	Arteriogram (Lipoidol)	Lig. S. Temp. and Occip. a. and excision after continuous interlocking sutures-C.
1936	Rogers	M	21	L. Frontal plura	Swelling at birth incr. 2 mts.	—	Excision with interrupted interlocking suture removed after 1 week; some wound breakdown-C. Biopsy-Haemangio endothelium.
1936	Rogers	M	20	R. scalp, diffuse	?	—	Same treatment-C.
1936	Clunie	F	25	L. Temp. and Occip.	Closed injury	—	Electrolysis and multiple ligations failed; two stage excision as by Scarby-C.
1937	Marshall	M	22	E. Pariet 2 1/4" diam.	2 years incr. 3 mts. no injury	—	Scalp tourniquet ineffective; multiple ligations and injections (Sod. morrh.) followed by excision-C.
1937	Rundle	M	45	R. Temp. and Front 2 1/2"	Swelling from 23, injury 10 days before adm. c pain and incr.	Arteriogram (Thorotrast) R. S. Temp.	Lig. R. S. Temp. a.; Excision with clamp for scalp flap; slight necrosis-C. Biopsy: arterial degeneration and venous thrombosis.
1942	Pauv	F	43	R. and L. Temp. and Occip. diffuse	Closed injury at age 9; small bump; incr. from age 18—Ra Tr., ineffective	Hges. and Uter Arteriogram Uro-electan; R. & L. Ext. Carot.	Lig. B. Ext. Carot. and Inj. Quinine urethane. Trismus, alveolar sepsis wound infection-C.
1946	Elkins	M	33	R. Pariet and Temp. small	Wound at 22, swelling at 32	—	Lig S. Temp. and Excision-C.
1946	Elkins	M	27	R. Temp. small	Wound, swelling after 6 mts.	—	Same.
1946	Elkins	M	25	R. Pariet whole scalp, diffuse	Closed injury at 17, haem- atoma second injury at 24 with incr.	—	Lig. R. Ext. Carot. and L. S. Temp. and Occip. and Excision-C.
1946	Elkins	M	20	R. Ear and frontal	From birth	—	Lig. R. S. Temp. and Excision of fron- tal C. A.; later excision of angioma ear.
1949	Grimes	M	25	R. frontopariet	Wound at 20, Swelling at 22	Arteriogram Ext. Carot.	Lig. Ext. Carot. and S. Temp. and Excision-C.
1956	Greeley	F	24	R. frontopariet 6 x 4 x 2 cm.	Wound at 3, Swelling at 9, incr.	Hges. with thinning of skin. Arteriogram Ext. Carot.	Lig. R. Ext. Carot. Lig. and Excision of AV fistula. Excision with overlying skin, skin graft-C.
1958	Frandsen	M	21	L. Temp. V. small	Closed injury 4 mts. ago immediate swelling	—	Lig. and Excision of AV fistula L. S. Temp. vs.-C.
1959	Chatterjee	M	25	L. Frontal and Temp. 9 x 5 x 2 cm.	Swelling from birth	Arteriogram L. Ext. C. U. V. Fluoroscopy	Lig. L. Ext. C. Devascularisation-small recurrence, infected-C (Ethamoline).
1959	Chatterjee	F	20	L. Occip. 10 x 7 x 2 cm.	Swelling—4 yrs. No injury	Arteriogram L. Ext. C.	Devascularisation-C.
1959	Chatterjee	M	22	L. Frontal 4 x 2 x 1	Closed injury 2 years ago with immediate swelling	—	Excision-C. Biopsy.

soon after birth; while some of these are truly congenital, others are probably the result of trauma to the head during delivery.

The vast majority of the cases described in the past as well as our own do not show any significant extension into the skull or intracranial tissues. The case of Muller (1891) in which a huge frontal cirroid was complicated by an equally large intracranial lesion, and the experience of Dandy (1946) appear to be unique. In all the seven cases of cirroid aneurysm of the scalp that Dandy has described, the arterial supply was traced to the middle meningeal arteries and not to the arteries of the scalp; in most of these, there was direct or indirect evidence, clinical or operative, of intracranial extension.

As the fistulae in all these types occur between relatively small vessels no systemic effects of arteriovenous shunt have ever been noticed in connection with cirroid aneurysm of the scalp. The nutrition of the tissues and the circulation in the capillaries bypassed by the shunt were both expected to be poor on theoretical grounds; that this was a fact despite the excess of arterial blood in the neighbourhood was conclusively demonstrated in one case by ultraviolet fluoroscopy.

Treatment

Cirroid aneurysm of the scalp is a progressive condition and apart from the disfigurement and the throbbing and buzzing sensations experienced, there is the ever present danger of massive haemorrhage as a result of trauma and ulceration and infection. Moreover while surgical treatment for the small lesion is both simple and sure, operative difficulties increase in direct proportion to size, and with it, morbidity and mortality; the really massive lesions being virtually incurable. Surgery should therefore be undertaken at the earliest opportunity; its result will depend to very large

extent on how efficiently blood loss can be minimised and replaced. A variety of methods have been suggested for the reduction of haemorrhage.

(i) A scalp tourniquet (Kerr, Marshall) could be used for lesions near the vertex but would probably be more a hindrance than a help in the majority of cases.

(ii) The aneurysm could be encircled by a series of interlocking sutures along the proposed line of incision, and the incision then made through a fairly bloodless field. (Rogers, Grey Turner).

(iii) The main feeding arteries, usually the superficial temporal or occipital, or if the occasion demands, the external or even the common carotid artery could be ligated either a few days or just prior to the main operation. This has been done by most surgeons and also by us.

(iv) Single or multiple preliminary injection of sclerosing solutions into the feeding vessels might be helpful (Marshall) but the consensus of opinion seems to be to reserve this for recurrences or where radical surgery could not be safe.

(v) The operative field could be most usefully infiltrated with a solution of adrenaline (1 in 200,000), as we discovered in our first two cases.

(vi) Segmental incision, of diathermy coagulation and maintenance of adequate venous drainage during the operation would all help in reducing haemorrhage.

(vii) A staged operation for an aneurysm of some size has many advocates particularly among those not favoured with adequate blood transfusion facilities. The first stage has either terminated with ligation of feeding vessels with or without injection or with the reflection of the scalp flap together with the aneurysm; the second

stage being the excision (Searby); according to Clunie, a gap of less than 72 hours might not allow easy stripping, while a gap of over 96 hours might cause necrosis of the flap edges.

(viii) There appears to be an excellent indication here for the use of hypotensive drugs which in experienced hands would safely create a bloodless field and render most of the above procedures redundant.

The definitive operation that has been carried out in the majority of reported cases has been excision of the aneurysmal mass after reflecting it together with a scalp flap, and subsequent replacement of the flap. The results have been on the whole gratifying but in the absence of statistical evidence it is doubtful whether these reported cases form an accurate cross section of the actual state of affairs. In fact the difficulties in connection with inadequate vascular control, infection and necrosis of the flap, and recurrence have been outlined more prominently in the text-books than in these papers. Anxiety for the nutrition of the flap after the cirroid mass has been stripped off, particularly when it is already the seat of ulceration, has prompted some surgeons to plan a more radical procedure—excision of the overlying scalp tissue together with the cirroid and partial closure (Roche) or replacement by skin grafting (Greeley). Our own approach in the more extensive cases has been more conservative. Except in our third case where the lesion was small and easily excised, we have contented ourselves with severing all the vascular connections from the circumference and deep surface of the cirroid and with suturing the scalp flap containing the collapsed vessels

back in place. This devascularisation was carried out to our satisfaction in the second case and the result has been excellent. In the first case the vessels at the posterosuperior aspect or base of the flap which could have been reached by incising the galea from its deep aspect had been left, and an injection of a sclerosing solution was necessary to control a small recurrence some months after. At the present moment however both cases are entirely symptom-free and without any visible or palpable mass at the site of the original cirroid, and this would appear to justify perseverance with this technique.

Summary

The literature concerning cirroid aneurysm of the scalp is briefly reviewed and 3 cases are described. Its pathogenesis is discussed in the light of clinical, arteriographic, fluoroscopic and histological data. Problems in connection with its treatment are outlined; while excision has been advocated for smaller lesions, a planned devascularisation has been suggested as the line most suitable for large cirroids.

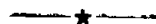
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INTERSEXUALITY

BY

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The final determination of the sex of an individual into male or female is through the development of gonads and external genitalia. This development occurs in the early months of foetal life and at a time when the endocrines are also developing. The baneful effect of the latter may bring about total or partial reversal in the development of the gonads and external genitalia. Such an effect may result in masculinisation of the female or feminisation of the male.

A hermaphrodite may be true and false. In a true hermaphrodite, there is complete fusion of the two sexes, with bilateral ovotestis and a primitive ovary and testis on either side. This condition is extremely rare and diagnosis is not possible without laparotomy and histological examination of the gonads. The opposite condition is false hermoproditism, which is much more common. The development of the sex is both internal and external. In the very early foetal life there is no distinction between the sexes, either in the internal or external sex organs. Hence rudiments of the opposite sex organs persist in all individuals throughout life.

External sex organs.—The male external genitalia are merely a further development of the female external genital organs. The penis is a large clitoris enclosing urethra and the scrotum, is the result of fusion of the labia majora. In the male the testicles descend into the scrotal pouch before birth. In the female the clitoris remains rudimentary and the labia majora do not fuse. The

descent of the testis may be simulated in the female by the descent of the ovaries into the canal of Nuck. The female breast is represented in the male by the rudimentary breast.

Internal sex organs, of generation.—In the female the fallopian tubes, uterus and vagina are developed by the fusion of the Mullerian ducts and the ovaries come to lie, close to the open end of the fallopian tubes. In the male the uterus masculinus, in the prostate, represents, the fallopian tubes, uterus and vagina and has its development also, from the Mullerian ducts. The Wolffian duct in the male becomes the vas deferens for the discharge of external testicular secretion, while in the female it remains rudimentary as the duct of Gartner.

There are individuals in whom the rudiments of the opposite sex become more developed than normal, resulting in a condition in which sex determination is difficult without microscopical examination of the gonads. Such an individual is a pseudo, hermaphrodite (False). Ninety percent or more have a testis and are therefore males.

Cryptorchid

In this condition the testicles fail to descend and are retained in the abdomen. The external genitalia may be normal or the urethra may fail to canalise the penis and the scrotum may remain empty and cleft. In the latter case the individual is mistaken for a female.

Intersex.—The uterus is absent or undeveloped, and immature testis is placed in the

position of the ovaries. The external genitals conform to that of a female. At the time of puberty the secondary sexual characteristics fail to develop in these and sex determination remains obscure.

The pseudo hermaphroditism may be internal or external. In Internal pseudo hermaphroditism opposite internal sex organ is well developed. In these the external genitalia are developed normally, and secondary sexual characteristics, like change of voice, distribution of pubic hair, and breast development appear at puberty. But the testis fails to descend or descends only imperfectly. The individual however possesses a large uterus and fallopian tube. The testis in these cases is attached to the fallopian tube. In this condition the opposite internal sex organ is not rudimentary but well developed. The condition is recognised only on laparotomy or postmortem. In this variety of intersex, a male has the internal female sex organ the uterus and fallopian tubes well developed to that of a female instead of remaining rudimentary.

External variety.—The external genitalia correspond to that of a female. The testes are not descended, the folds of the scrotum are ununited, the clitoris is not canalised by the urethra, and is represented by a small genital eminence. The vagina is represented by a short culdesac below the urethra. In these the testis may descend later along with a hernia and the true sex becomes known on removal of the testis and histological examination. These patients resemble females externally and are brought up as females. In these, at puberty the secondary sex characters may develop in some and thus lead to correct sex determination. In the majority however this does not occur and the sexual instinct, remains perverted and sexual determination is impossible. The opposite condition, where there are ovaries

inside, but the external genitals continue to grow to that of a male is unknown.

Case Reports

Yamuna aged 40 years and a worker in a cashew factory was referred for bilateral swellings in the groins since birth and pain in these swellings since two months.

She is a hindu, resides in Mangalore and is one of six sisters of a family. All of them are married, the eldest was divorced by her husband some time after marriage, another one lost her husband soon after marriage, and the youngest was married only a year ago.

Lakshmi, the eldest is 49 years, Yamuna the second is 43 years, Radha, the third is 33 years, Meenakshi, the fourth is 30 years, Janaki the fifth is 28 years and Jayanthi the sixth is 21 years. Radha the third and Janaki the fifth have normal menstruation and have borne children. The first, second, fourth and sixth have not menstruated. All excepting the first and fourth are living with their husbands.

Yamuna, the second, has noticed two small inguinal swellings since birth. Since two months the swellings are giving rise to attacks of pain.



Fig. 1
Yamuna—(Pseudo hermaphrodite)



Fig. 2
Yamuna—Pseudo hermaphrodite.



Fig. 3
Yamuna with her sister Lakshmi.

She was married at the age of eight, and is living with her husband. She has not menstruated, at all. She is well built and healthy. On examination, there is absence of pubic and axillary hair, the breasts are undeveloped, with absence of areola, but the external genitalia appear normal. The vagina is short and measures one inch in length. The cervix and uterus are both absent. The two swellings in the inguinal canals are firm, move up and down the canal freely, palpation is painful and resented. On coughing, there is a suspicion of an expansile impulse.

On 25-7-'58 laparotomy was done, the uterus and fallopian tubes were found absent. The two oval swellings were brought into the abdominal cavity and excised. The internal abdominal rings were closed.

The two ovoid bodies resembled the testis externally. They were submitted to histological examination. The report was as follows:

Pathological Report

Gross appearance of the specimen.—(1) Two ovoid bodies looking externally like testes. One of the ovoid bodies measures 5 × 3.5 × 4.2 cms., while the other



Fig. 4
Section of Epididymal ridge and Vas.



Fig. 5
Section of Testis.

measures $5.2 \times 3.7 \times 1.5$ cms. Both are similar and present the following features. Externally, there are globular areas on their flattened aspects measuring 4×1.5 cms. continuous as a single mass forming the convex border of the entire body. The surface over these is smooth. The remaining areas appear shaggy and appear to be formed mainly by white glistening wrinkled tissue. From the lower pole of the globular mass, on one of the surfaces, a ridge-like projection can be seen which appears to be a thickened and folded

part of the wrinkled tissue continuous with the globular area. On cutting, the surface presents a variegated appearance, being characterised by two yellowish-brown, well demarcated rounded nodular areas, 1 cm. in diameter, present in the central part, surrounded by white fibrous looking tissue interspersed with brownish muscle like tissue. Here and there small clumps of yellowish fatty tissues can also be seen. Sections taken from the entire two masses by slab technique, covering the entire area,

Microscopic Appearances.—(1) Histological appearances show both ovoid bodies are testes, with formation of well defined testicular tubules showing immature developing stages of spermatozoa. No mature spermatozoa can be seen in any of the tubules. The stroma separating these tubules is abundant and fibromuscular in character. Around some of the tubules the connective tissue stroma is markedly condensed and the spindle cells in each area have dense and compact, spindle nuclei. In certain other tubules such condensation is not observed. These condensed areas with spindle cells having dense spindle nuclei resemble at a glance the ovarian stroma but no ovarian follicles, mature or immature could be seen anywhere in the section. The stroma shows Leydig's cells in large numbers and in places small islands of Leydig cells can be well seen. In another part of the section, corresponding to the ridge like projection on gross examination, (*vide supra*), appearances suggest features of *vas deferens*

showing the epithelial lining thrown into small papillary folds. On the whole, appearances, are immature testicular pattern, in both bodies.

A case of external Pseudo Hermaphroditism is reported.

Yamuna's sister Lakshmi when examined showed that, her external genitalia, are similar to that of Yamuna. She too has no uterus, or cervix, and her vagina is a short pouch.

Meenakshi, the fourth and Jayanthi the sixth have external features similar to Yamuna and Lakshmi.

I wish to express my thanks for the pathological report by Dr. Banerjea of Kasturba Medical College, Mangalore, and to Dr. A. Thimmapayya, the Superintendent of the Govt. Wenlock Hospital for permission to publish this case.

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CONGENITAL ATRESIA OF EXTRAHEPATIC BILE DUCTS

BY

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and S. C. TYAGI, Patiala.

Although Thompson in 1891, for the first time, drew attention to this relatively uncommon group of malformations, the credit for directing the interest of the profession towards this rare and hitherto completely neglected congenital anomaly goes to Holmes who, in 1916, in an excellent review on congenital obliteration of bile ducts, observed that a surgical cure was possible in at least 16% of the 120 cases recorded in the literature. A strong plea was made for early exploration of such cases. His view was confirmed 12 years later when Ladd (1928) performed the first successful operation on a case of congenital biliary tract atresia. Since then many reports of this congenital malformation, successfully treated by surgery, have appeared, nearly all of them consisting of isolated cases. During the 20 year period upto 1948, Gray et al. could collect from the literature only 15 cases of surgical success to which they added 2 cases of their own. A short series of 6 cases of congenital biliary atresia successfully treated by surgery was reported by Strauss (1951). Moore (1953) in a review of the subject has recorded his experience of 31 proved cases of extrahepatic biliary tract atresia. Unfortunately the malformation was found to be surgically correctable in only 8 cases and of these the operation was completely successful in but one case. In an almost identical series of 33 cases, Greaney et al. (1954) have had a successful operation on 3 cases out of 9 in whom the surgical correction was possible. Prior to this report and upto June 1953, Koop et al. (1954) were able to collect only

35 cases of congenital atresia of extrahepatic bile ducts successfully treated by surgery and to this they added 2 cases of their own treated by anastomosis between the biliary tract and jejunum.

From Great Britain, the first case successfully treated by cholecystogastrostomy was reported by Durell and Halliwell (1952) and by cholecystojejunostomy by Maingot (1955). A case is recorded here of extrahepatic biliary tract atresia treated successfully by cholecystoduodenostomy. To the best of our knowledge no such case has been published from our country so far.

Embryology

It has not yet been decided whether this particular malformation occurs due to some gross embryonic aberration or it is just an arrest of maturation at some stage of embryonic development. Ladd and Gross favour the latter view and think that the malformation represents an arrest at the so called "solid" stage of embryonic development. This "solid" stage, it may be remembered is also seen in other segments of the alimentary tube, and is due to the piling up of epithelium supposedly in preparation for a phase of rapid growth and elongation.

Clinical Features

Jaundice is the constant physical finding either present at birth or making its appearance shortly thereafter. And what is more,

it tends to become progressively more intense. Alongwith it there is some abdominal enlargement due probably to an increase in the size of the liver. If the condition has been present for sometime, the extrahepatic biliary obstruction may lead to cirrhosis and secondarily to splenomegaly and oesophageal varices. The presence of ascitic fluid in the later stage tends to lead to a steady abdominal enlargement.

Although this condition is seldom associated with prematurity and even though the early growth of these children may be normal, they fail to gain weight at the normal rate in the later stage, and suffer ultimately from physical retardation and malnutrition. As is to be expected, the urine is dark in colour and the stools light or clay coloured.

There are no marked changes in the bleeding or coagulation time, although bleeding time in excess of 35 minutes has been recorded in one case (Moore).

Diagnosis

The main or the important conditions to be considered in differential diagnosis are as follows:—

- Icterus neonatorum
- Erythroblastosis Foetalis
- Hepatitis
- Intra-luminal bile duct obstruction from inspissated bile or mucous plugs, and less frequently—
- Intrahepatic atresia or annular pancreas
- Choledochal cysts
- Enlarged lymph nodes
- Tumour and
- Choledocholithiasis.

We need not go into detail regarding the differential diagnosis. The few points that guided us in our own case will be mentioned at the appropriate place. We would only like to stress in common with all other authorities that every attempt should be made to arrive at a diagnosis as early as possible and preferably within the first 4 or 5 months of life. As is self evident, the dangers of delay with the associated secondary changes in the liver are so great that they do not need any emphasis. Exploratory laparotomy should, if possible, not be delayed beyond the second month "as the majority of the patients will die of liver failure within 5 months if the blockage is not relieved" (Maingot 1955).

Case Report

D. C. a 5 months old male baby was admitted in the Pediatric Unit on 14-4-58 with history of jaundice which was noticed soon after birth and had been persisting and progressing since then. He used to have occasional vomiting and was passing a very high coloured urine and pale stools.

A full time normal delivery, he was fourth in birth order. Of the other three children in the family two had died when 8 days and 15 days old due to some obscure febrile illness; the other child (boy) was alive and well.

There was no other illness during this brief period of infancy.

On physical examination at the time of admission he was a poorly nourished, ill looking somewhat dehydrated infant, weighing 8½ lbs. and deeply jaundiced. Temperature 100 F. Liver was palpable by 3 fingers breadth below the costal margin and was firm with a smooth surface and sharp edge. Spleen was just palpable. There was no ascites. No abnormality was detected on physical examination of other systems.

Investigations.—Hb. 10.5 G., T. L. C. 3.9 M/cmm. Normocytic orthochromic, Urine showed bile pigments ++, Urobilinogen and bile salts were absent. Stools did not show any increased amount of stercobilinogen. Blood: V. D. R. L. and Khan test-negative. Plain x-ray of the abdomen was normal.

Liver Function Tests.—Serum bilirubin 9 mg. %, Van den Bergh was immediate direct positive, Thymol turbidity 6 units, Serum alkaline phosphatase 33 units (Bodansky), Total blood proteins 6.8 gm. %.

A liver biopsy by Vim Silverman needle was performed on 20-4-1958 and showed.

Gross appearance.—Received a needle biopsy piece 1.1 cm. long.

Microscopic examination.—Shows fair degree of destruction of the liver parenchyma. The periportal connective tissue is slightly increased. The liver cells showed a marked degree of vacuolation and contain considerable amount of yellowish brown pigment besides occasional clumps of inspissated bile.

Only a small amount of the pigment shows the positive reaction for Perl's stain. No bile ducts could be identified. The picture is consistent with that of biliary atresia" (See Fig. 1).

The child was first treated conservatively with parenteral fluids, proper feeding and other symptomatic measures and was finally operated on.

Details of Operation and Post operative Care.—The operation was undertaken hesitatingly for 2 reasons; one the general condition of the child was so poor that it was realized that any operative interference would be an extremely hazardous procedure. And

secondly the Pathologist had his doubts after examining the specimen removed at the first liver biopsy on 20-4-58 that the cause of jaundice may not be congenital absence of development of the biliary duct system (intra-hepatic and/or extrahepatic?) Still as the child appeared to be doomed otherwise, it was decided to take the risk however great.

The operation was done on 10-5-58. The peritoneal cavity was opened through a right upper para-median incision. The gall bladder was slightly distended, but appeared to be otherwise normal. The bile duct system was next exposed and again appeared to be normally developed though slightly dilated in its supra-duodenal portion. The only possible explanation of the jaundice could then be atresia or some other congenital cause of obstruction in the distal part of the common bile duct. Due to the extremely poor condition of the patient, it was not considered advisable to prolong the operation and thus increase the risk by opening the C. B. D. and thus making sure of the possible cause of obstruction, although the temptation was overwhelming. But taking the fact of obstruction for granted, cholecystoduodenostomy was performed and the abdomen closed in layers. And the ultimate result proved the probable correctness of our diagnosis.

The post-operative course was rather eventful. The child was with us for only 2 days after the operation during which time, although his temperature remained at 100° F., he was otherwise comfortable. And



Fig. 1

then on the 12th May, his father, as he was coming to the hospital to see his child was run over by a bus and killed. Because of this tragedy, the relations, inspite of our best persuasion, took the child home. Because of the serious nature of the case, and the absence of proper care at home, we expected the worst. We were, therefore, agreeably surprised when the child was brought to the O.P.D. after about a week for removal of the stitches. These were removed and the operation wound was found to be quite nicely healed.

He has been keeping well since then. For the first few weeks after operation, jaundice persisted though it was much less than before the operation. When last examined in October, 1958 (nearly six months after operation) the child weighed 20 lbs. and looked the picture of health. Jaundice had completely cleared. Liver was still palpable by 1½ fingers but spleen was not palpable. Urine was completely normal. Liver function tests revealed serum bilirubin 0.8 mgm.%; Van den Bergh was weak indirect positive; Thymol turbidity 2 units; Serum alkaline phosphatase 20 units.

A liver biopsy was repeated and showed "Gross Appearance"—Received needle biopsy piece together 0.7 cm. long.

Microscopic Examination.—The small tests of liver tissue present show a few thin bands of connective tissue traversing the liver parenchyma. The liver cells show only slightly foamy appearance. There is no

evidence of biliary retention or biliary duct proliferation. No pigment seen in the liver cells.

The young fibrous bands are infiltrated with a few round cells.

The biopsy shows marked improvement as compared to the previous biopsy (See Fig. 2).

Discussion

The case is of interest for a number of reasons.

Firstly it is probably the first case recorded of this rare congenital anomaly in our country. Extra hepatic biliary atresia is supposed to occur approximately only once in every 20 to 30 thousand births (Moore). Secondly, it well illustrates the point stressed by many workers that ultimately it is laparotomy alone that clinches the diagnosis. Amongst the conditions mentioned under the head of differential diagnosis, some could be ruled out straight away, on clinical examination e.g. Icterus neonatorum, erythroblastosis foetalis, hepatitis etc. while some others e.g. annular pancreas, choledochal cysts enlarged lymph nodes, tumour or



Fig. 2

cholecho-lithiasis were easily eliminated on opening the abdomen. In view of the findings at operation, the only other condition which could still cause confusion could have been inspissated bile or mucous plugs. But the fact that the jaundice was persisting, nay progressive in a child 5 months old inspite of treatment including that with Mag. sulph etc. would tend to rule this out. Our case was probably of type C as described by Greaney et al. (1954). The third point of interest is the successful outcome of the operative interference in the only case attempted. We were lucky that we met with a case which was amenable to correction by operation as these constitute only 20% of

such cases. And lastly the apparently excellent result, as far as it goes, even though the operation was undertaken at the late age of 5 months.

Summary

The literature concerning congenital atresia of extrahepatic bile ducts is very briefly reviewed.

A case, probably the first of its kind to be reported in this country, and treated successfully with cholecystoduodenostomy is described.

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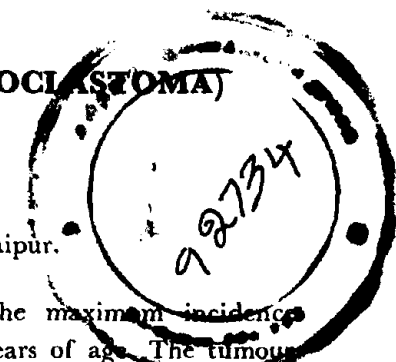


GIANT CELL TUMOUR OF BONE (OSTEOCLASTOMA)

(A Study of twenty four cases)

BY

D. P. GUPTA and H. S. ANDLEIGH, Jaipur.



During the last ten years, we had opportunity of studying 24 cases of giant cell tumour of bone amongst the surgical material referred for histopathological examination from the S. M. S. Hospital, Jaipur. A review of literature on osteoclastoma showed that various workers had presented different data on the various aspects of this tumour. The present study was, therefore, undertaken to evaluate the incidence, location, clinical history and microscopic features of giant cell tumour of bone as it is encountered in this part of the country.

A. Age incidence.—Majority of the tumours occur between 20-40 years of age (Jaffe⁴; Thomson and Turner-Warwick¹⁰; Williams et al¹¹). Geschickter and Copeland¹ in

160 cases, found the maximum incidence between 11-40 years of age. The tumour may appear at any age (Prossor⁹); it is, however, uncommon below 20 years of age (Jaffe⁴; Lichtenstein⁷). In 101 cases reviewed by Williams et al¹¹, 10.0% were below 20 years of age, whereas in 31 cases reported by Murphy and Ackerman², 5 patients (16.1%) were between the ages of 14-20 years. The youngest patient reported varies from 10 years (Jaffe⁴), 12 years (Williams et al¹¹) to 15 years (Thomson and Turner-Warwick¹⁰). Table I summarises some of these data

B. Sex incidence.—Anderson¹, Christensen², Lichtenstein⁷ and Thomson and Turner-Warwick¹⁰ found equal sex incidence or lack

Table I

(Showing the age incidence of giant cell tumour of bone).

S. No.	Author.	Total No. of cases.	0-10 years.		11-20 years.		21-30 years.		31-40 years.		41-50 years.		51 and above.	
			N	P	N	P	N	P	N	P	N	P	N	P
1	Geschickter and Copeland	160	5	3.1%	28	17.5%	70	43.7%	28	17.5%	15	9.4%	14	8.8%
2	Murphy and Ackerman	31	—	—	5	16.1%	8	25.8%	6	19.4%	5	16.1%	7	22.6%
3	Thomson and Turner-Warwick	34	—	—	3	8.8%	11	32.3%	10	29.4%	6	17.6%	4	11.9%
4	Present Study	24	—	—	8	33.3%	7	29.2%	8	33.3%	1	4.2%	—	—

N - Number of cases.

P - Percentage.

In our series of 24 cases, all except one occurred between 11-40 years of age; the youngest was a patient 11 years and the oldest 45 years of age.

of preponderance in either sex in their respective studies. Jaffe⁵ in a series of 60 cases found a slight preponderance of cases in females. Williams et al¹¹ in a series of 101 benign and malignant giant cell tumours, found 55 cases (54.4%) in females and 46 cases (45.6%) in males. Similarly out of 31 cases of benign and malignant giant cell tumours studied by Murphy and Ackerman⁸, 18 were in females (58.0%) and 13 in males (42.0%). A significant difference in the sex incidence, however, has been noted in our material. Out of 24 cases, 16 were in females (66.7%) and 8 in males (33.3%), thus giving a female to male ratio of 2 : 1.

C. Location.—The sites of election are the knee and wrist. Table II summarises

the location of giant cell tumours as reported in the literature. It will be seen that in our series of 24 cases, 19 (79.1%) occurred in the lower extremity; 12 cases (50.0%) occurring in the region of the knee.

D. Length of History.—The duration of illness before the patient sought advise in the hospital varied from 1 month to 3 years (Thomson and Turner-Warwick¹⁰—average duration, 7 months; Murphy and Ackerman⁸—average duration, 9 months; Williams et al¹¹). In 160 cases of giant cell tumours studied by Geschickter and Copeland³, the sequence of trauma, pain, tumour and fracture extended over a period of from 2-14 months. Table III shows the duration of symptoms prior to treatment in our cases.

Table II
(Showing the location of giant cell tumour of bone)

S. No.	Site		Ellis (21 cases)		Murphy and Ackerman (31 cases)		Thomson and Turner-Warwick (34 cases)		Williams et al. (101 cases)		Present Study (24 cases)	
			N	P	N	P	N	P	N	P	N	P
1. Lower Extremity.	Knee	Femur (L.W.)	5	23.8%	8	25.8%	10	29.4%	66	65.4%	2	8.3%
		Tibia (U.E.)			7	22.6%	5	14.6%			6	25.0%
		Fibula (U.E.)			—	—	5	14.6%			4	16.6%
		Patella			—	—	1	3.0%			—	—
	Ankle	Tibia (L.E.)	—	—	1	3.2%	1	3.0%			4	16.6%
	Foot	Fibula (L.E.)	—	—	—	—	1	3.0%			—	—
		Tarsus	1	4.7%	—	—	—	—			—	—
2. Upper Extremity.		Femur (U. E.)	—	—	3	9.7%	2	5.8%	21	20.8%	3	12.5%
	Elbow	Radius (U.E.)	—	—	—	—	—	—			—	—
		Humerus (L.E.)	—	—	3	9.7%	1	3.0%			—	—
		Ulna (U.E.)	—	—	1	3.2%	—	—			—	—
	Wrist	Radius (L.E.)	2	9.6%	3	9.7%	—	—			2	8.4%
3.	Hand	Carpus	—	—	1	3.2%	—	—	13	12.9%	1	4.2%
		Humerus (U.E.)	2	9.6%	—	—	3	8.8%			—	—
	Bones of Trunk	Clavicle	—	—	—	—	—	—			—	—
		Vertebrae	—	—	4	12.9%	1	3.0%			1	4.2%
		Scapula	—	—	—	—	1	3.0%			—	—
		Rib	—	—	—	—	—	—	1	0.9%	—	—
		Jaw	10	47.6%	—	—	1	3.0%			—	—
		Pelvis	1	4.7%	—	—	2	5.8%			1	4.2%

N - Number of cases. U.E. or UE - Upper end.
P - Percentage. L.E. or LE - Lower end.

Table III

(Showing the duration of symptoms before the institution of first treatment).

Duration in months	0-6	7-12	13-18	19-24	24-36
No. of cases	10	8	4	1	1

The average duration of symptoms was 4 months.

E. History of trauma.—In 101 cases reported by Williams et al,¹¹ a history of antecedent injury to the part could be elicited in 29 cases (28.7%). In our series of 24 cases, history of preceding trauma was present in 6 cases (25.0%).

F. Microscopic features.—Sections were taken from representative areas of the tumour mass in each case and classified into three grades as advocated by Jaffe et al¹ and stressed recently by Jaffe⁵ and Lichtenstein⁷ separately. The criteria for placing each case in a particular grade are mentioned in the discussion. The results are shown in Table IV.

It will be noted that tumours falling under Grades I and II (in our series) were equal in number and the percentage figures compare well with those reported by other workers. Osteoid trabeculae were present in two tumours belonging to Grade II.

Discussion

Jaffe⁵ maintained that the conventional giant cell tumour in the sense of the tumour known to him in relation to the end of long bones was rarely encountered in the jaw. It was, therefore, interesting to note the findings of Ellis (quoted by Anderson¹) who recorded 10 tumours (out of a total of 21 cases) occurring in the jaw. Lichtenstein⁷ denied having encountered an osteoclastoma in a rib, clavicle, ulna or bone of the calvarium. From a study of Table II, this statement, however, did not seem to be strictly true. Majority of the tumours occurred in the lower extremity, nearly 50.0% being in relation to knee. It was noteworthy that Williams et al¹¹ noted 13 cases (out of 101 cases) occurring in the pelvic bones.

The present system of classifying giant cell tumours of bone into three grades introduced by Jaffe et al¹ in 1940 has had a mixed reception by different workers. Williams et al¹¹ in their 101 cases of benign and malignant giant cell tumours could not discern pattern variations or cell changes that suggested grading or subtyping of these neoplasms. Likewise, Willis¹² in 1949 maintained that no sharp distinction could be made between innocent and malignant giant cell tumours. However, the studies of later workers, including Willis, have substantiated and left no doubt that there is a spectrum of malignancy and the grading

Table IV

S. No.	Author	Total No. of cases	Grade I		Grade II		Grade III	
			N	P	N	P	N	P
1.	Lichtenstein	—	—	50.0%	—	35.0%	—	15.0%
2.	Thomson and Turner-Warwick	34	11	32.3%	16	47.0%	7	20.7%
3.	Present Study	24	11	46.0%	11	46.0%	2	8.0%

N - Number of cases. P - Percentage.

system is now widely accepted (Anderson¹, Murphy and Ackerman²). Nearly all the writers (Anderson¹, Jaffe³, Lasser and Tetewsky⁴, Lichtenstein⁵, Murphy and Ackerman²) are unanimously agreed regarding

the criteria for grading which may be summarised as follows:

Grade I.—(Fig. 1 and 2). Tumours in this class constitute half of any representative series. Stromal cells and giant cells are

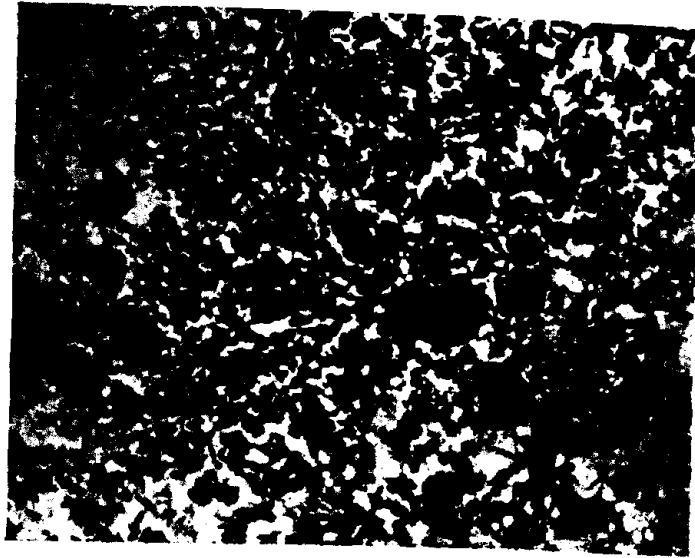


Fig. 1

Loosely arranged stromal and giant cells. Grade I (Haematoxyline and Eosin $\times 120$).

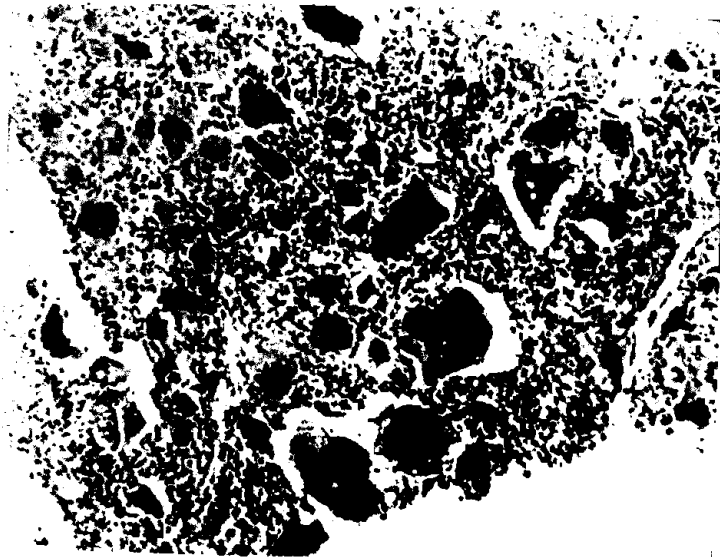


Fig. 2

Giant cells showing numerous nuclei similar to those of stromal cells. Some show vacuolations and shrinkage from the adjacent tumour mass. Grade I (H. & E. $\times 60$).

loosely arranged. Stromal cells may be spindle shaped or polygonal or ovoid. According to Lichtenstein, the shape does not seem to have any special significance. Mitotic figures are rare and those present are not abnormal *i.e.* there is no atypism of stromal cells. Fibrous or collagenous differentiation of the stroma is absent. Giant

cells are numerous in most of the fields. Their nuclei vary in number but each cell tends to have a good many of them; their nuclei bear a close resemblance to the nuclei of the stromal cells.

Grade II.—(Fig. 3 to 5). Tumours falling in this group are the most difficult to assess.

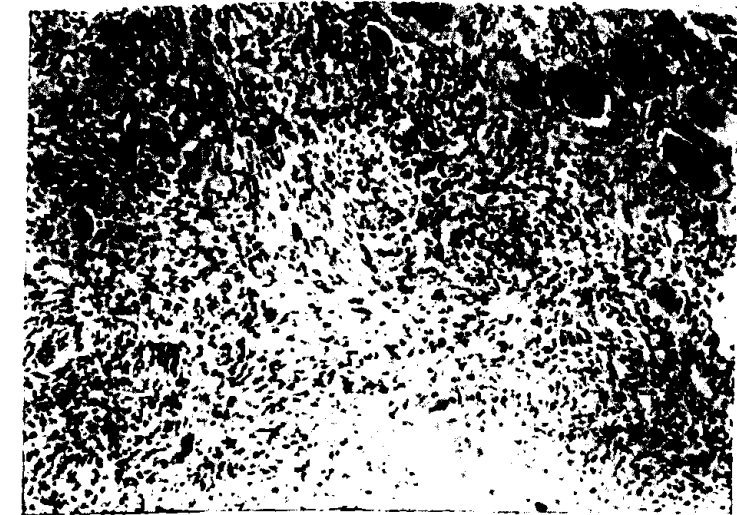


Fig. 3

Spindling and whorling of stromal cells. Crowding together of giant cells and slight collagenous differentiation of the stroma. Grade II (H. & E. $\times 60$).



Fig. 4

Few giant cells interspersed in the compactly arranged stromal cells showing an irregular whorled appearance. Grade II (H. & E. $\times 60$).

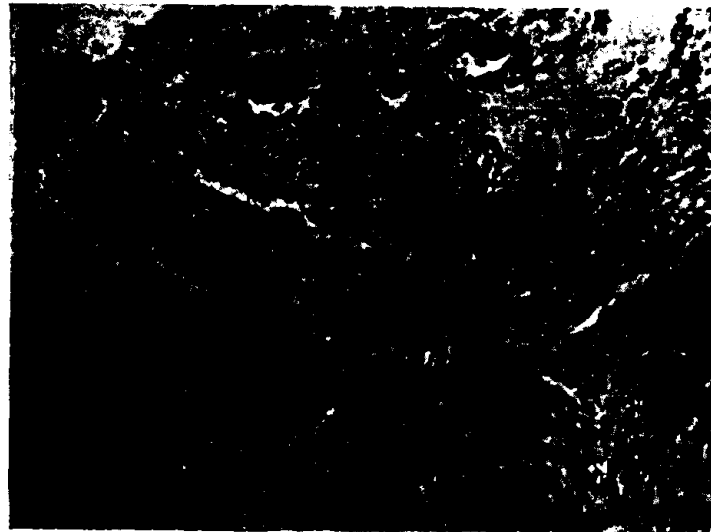


Fig. 5

Spindling and slight atypicality of stromal cells, collagenous differentiation of stroma, small and slightly atypical giant cells; an osteoid trabeculum also present. Grade II (H. & E. $\times 100$).

There is slight to striking and progressive atypicality of the stromal cells. Stromal cells are abundant, closely compacted and may even show an irregular whorled arrangement. In some areas, they tend to be spindle shaped though in other areas they may be plumper or ovoid. There is no appreciable tendency towards collagenous differentiation though it may be prominent in some areas. Giant cells are abundant in some areas (appearing to be crowded together) and sparse in others. Their nuclei follow those of stromal cells in their degree of atypicality. A few osteoid trabeculae may be encountered (Jaffe³, Lichtenstein⁷).

Grade III.—(Fig. 6 and 7). Tumours falling in this grade constitute the smallest group (approximately 15.0%—Lichtenstein⁷). These are frankly malignant, referred to as giant cell sarcoma. Stroma is obviously sarcomatous. Stromal cells are abundant and closely compacted, even in an irregular whorled arrangement. Giant cells are dwarfed and contain few nuclei which are

also likely to show atypism. Metastases are most commonly encountered in the lungs. Lasser and Tetewsky⁶ have described a patient with giant cell tumour of lower part of femur, who in addition to pulmonary metastases developed bony metastases that had the classic roentgenographic appearance and clinical behaviour of single benign giant cell tumours.

Summary

1. Twenty four cases of giant cell tumours of bone have been studied. Twenty two were benign (Grade I and II) and two were malignant (Grade III).

2. Except one, all cases were between 11-40 years of age. Twice as many females were affected as males. Nineteen cases (79.1%) were in the lower extremity; twelve (50.0%) being in relation to knee.

2. Osteoid trabeculae were noticed microscopically in two tumours belonging to Grade II.



Fig. 6

Hyperchromatism, variation in size and shape and abnormal mitotic figures in the stromal cells and giant cells; the latter are small in size. Grade III (H. & E. $\times 264$).



Fig. 7

Pulmonary metastases in a case of giant cell tumour, Grade III (H. & E. $\times 60$).

Acknowledgement

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**DUPLICATION OF THE DESCENDING COLON**

(A Case Report)

BY

R. S. GUPTA, Calcutta.

By duplication is meant a tube or cyst lined by gastro-intestinal mucosa intimately attached to the wall of the colon. The duplication has the same blood supply as the adjacent bowel and common muscular coats. Many names have been given to this malformation like enterogenous cysts, enteric cysts, ilium duplex, giant diverticulum, inclusion cysts etc. As all these have a common embryological derivation, these should be grouped together as similar anomalies and termed as duplications of the alimentary tract, as suggested by Gross. Out of 68 cases of duplication of the alimentary tract as seen at Boston Children's Hospital, only 3 cases were in the colon.

The origin of these duplications is debatable. The most plausible theory is that put forth by Lewis and Thyng, who frequently found diverticula in the foetal alimentary tracts of animals and humans. These out-pockets or diverticula normally regress, but if one of these is pinched off, it could give rise to an adjacent duplication. Bremer explains these as due to a developmental defect. As the solid intestinal tube is breaking up with vacuolization, the vacuoles may incompletely coalesce and leave a double lumened portion of colon. The duplication may have a small opening from the colon or be entirely separate.

These duplications are usually found in infancy and childhood, but may be discovered at any age. In the series of 68 cases at Boston Children's Hospital, 65% were found in the first year of life, 9% in

the second year and 8% in the third year, and only a few cases thereafter. The present case is of interest in that it was detected at 32 years. These duplications may present themselves by causing obstruction to the adjacent bowel; or pain due to distension; or by pressing on the mesenteric blood vessels, they may lead to necrosis, sloughing etc; or if these contain gastric mucosa, an ulcer may form, with subsequent bleeding. In the case under review the main complaint was of abdominal distension and pain.

The treatment of these malformations is essentially surgical. Since the duplication and the alimentary tract have a common wall, it is not possible to dissect one from the other without injuring the bowel. There is also a common blood supply to the duplication and the intestinal lumen, with the result that surgical treatment essentially involves resection of the contiguous alimentary tube together with the duplication, with reconstruction by end to end anastomosis.

Case Report

An adult female 32 years old, was admitted into the B. R. Singh Hospital complaining of distention of the abdomen off and on with pain for the past 2 years. She had been well till 2 years ago when she started noticing distention of the abdomen, especially after meals, associated with pain which was colicky in nature. Her bowels had been regular with no history of bleeding per rectum. The pain was not associated with nausea or vomiting. She was a mother of 3 children and her menstrual history was regular. She was operated on for this pain about 18 months ago in some outside hospital and according to her some gynaecological operation was done. Her pain became worse after the operation and she was sent to the Hospital for investigation and treatment.

On examination, the patient was thinly built. There was no evidence of anaemia. There was slight protuberance of her abdomen, specially around the umbilicus. A sub-umbilical midline scar 3" long was seen on her abdomen. There was no visible peristalsis. On palpation a longitudinal lump starting from the left lumbar region across to the right hypochondrium could be felt. This was not tender and could not be moved. The consistency was firm with a smooth surface. It was dull on percussion. The rectal and vaginal examination was essentially negative. Laboratory investigations showed — Hb. 70%, R. B. C. — 3.2 millions, Urine — N. A. D., E. S. R. — 10 m.m. 1st hour, Stools — N. A. D., Blood urea 24 mgm., X-ray chest N. A. D. Plain X-ray abdomen—showed the colon to be loaded with faeces. A barium meal and follow through did not reveal any valuable result. A barium enema showed the duplication of colon very beautifully. A diverticulum was seen arising near the splenic flexure coursing along the descending colon and then deviating upwards the liver. This is shown in Figure 1.

The patient was prepared for operation. The preparation of colon consisted of bowel washouts morning and evening 2 days previous to the operation with 1 oz. of Castor Oil orally on two preceding mornings. Sulphasucridine 2 tabs. every 3 hours was started 48 hours before operation. On the day of

operation the size of lump as seen on admission had markedly diminished due no doubt to the effective cleansing of the bowel.

Under light spinal anaesthesia, a R. paramedian incision was made and abdomen explored. A loop of bowel could be seen going from the pelvic colon upwards and to the right towards the duodenum. Dense adhesions were present between this lump and the surrounding structures. This was carefully dissected free on the right side. The descending colon was then mobilized and brought into view. This freed mass was then seen extending by the side of the descending colon right up to the splenic flexure. It was intimately adherent to the descending colon. A resection of the left side of the colon from the splenic end of transverse colon to the pelvic colon together with this duplication was carried out, and the continuity of bowel restored by end-to-end anastomosis. The post-operative course was uneventful and the patient was discharged from the hospital on the 16th post-operative day.

On opening the specimen, the duplication was found to be arising from the left colon just at the level of the splenic flexure by a wide opening. It was 18.5 inches in length. Its lumen was as wide as the descending colon and full of faeces. The wall of the duplication was thick. The other or distal end was blind. It was intimately fused with the descending colon and had the same blood supply. Figures 2 and 3 show the specimen. In figure 2, the unopened



Fig. 1

Barium enema showing the duplication lying along the descending colon and curving upwards towards the liver.



Fig. 2

Showing the resected specimen with the duplication.

duplication can be seen lying along the side of the descending colon with a blind end. Figure 3 shows the duplication opened, with a broad opening at the upper end of the descending colon. This is marked by a lead marker. Histopathology of the duplication is shown in Figures 4 and 5.

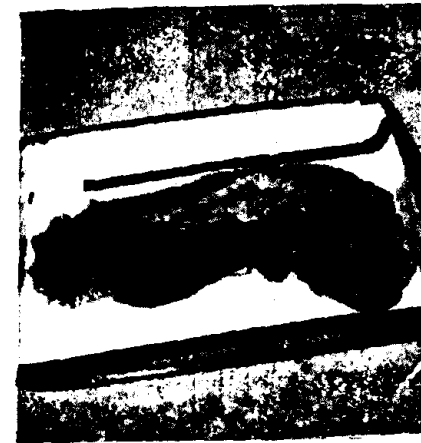


Fig. 3

The resected specimen opened with a lead marker showing the origin of the diverticulum from the descending colon.

The histopathology from the diverticulum resembles in all respects the large bowel showing tubular glands lined by goblet cells. There was no evidence of inflammation.

Summary

(1) A case of duplication of the descending colon near the splenic flexure measuring 18½" in length in a female aged 32, is presented.

(2) Resection of the duplication together with the descending colon was carried out with success.

(3) The aetiology and the nature of these duplications is briefly discussed.

Acknowledgments

I wish to thank Dr. K. P. Sen Gupta of the S. S. K. M. Hospital, Calcutta, for the Histopathology reports.

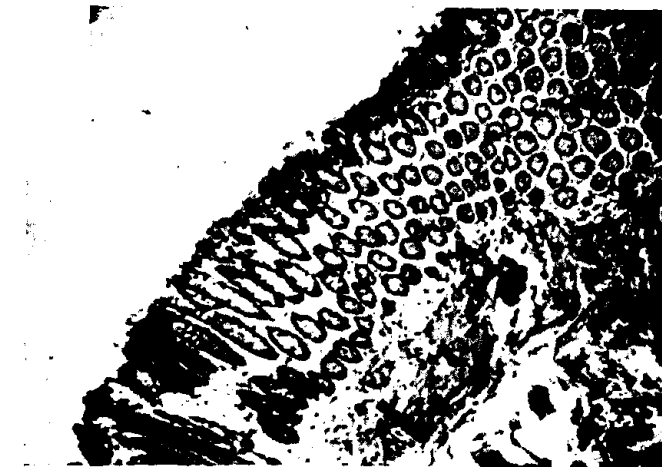


Fig. 4

Microphotograph showing the mucosa and the muscle with no evidence of inflammation (H. E. × 36).



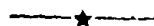
Fig. 5

Microphotograph showing tubular glands lined only by goblet cells (H. E. $\times 120$).

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CARCINOMA OF THE LOWER END OF THE OESOPHAGUS

(A report of two cases)

BY

R. S. GUPTA, Calcutta.

Carcinoma of the lower end of the oesophagus is an interesting entity. The first successful surgical removal of any part of the oesophagus was carried out by Czerny in 1877. This was of the cervical oesophagus. The next generally accepted successes were in 1908 when Boeleker resected the cardia by an abdominal approach, and in 1913 when Franz Torek did the trans-pleural resection. Although occurring in increasing frequency at the present time, it is considered worth while to document our experiences with 2 cases as seen at the Dinapore Railway Hospital during the years 1957-58.

Case Reports

Case 1.—A male patient aged 50 years was admitted with a history of inability to swallow solids for the past 2½ months. The patient gave the history that about 2½ months ago he swallowed a meat bone, following which his discomfort started. He could swallow liquids but was unable to swallow any solids. There had been some loss of weight. No previous history of any other complaint was available.

On examination, the patient was poorly nourished, thinly built, edentulous, showing evidence of having lost weight. There were no enlarged lymph nodes in the supra-clavicular and cervical regions. Laboratory investigations showed - Hb. 11.2 Gm., blood pressure 130/80, Kahn test - negative, and urine normal. Plain x-ray chest - N. A. D. Oesophagoscopy revealed an obstructing lesion of the lowermost part of the oesophagus: this was irregular and polypoidal and bled easily when touched with the end of the endoscope. Barium swallow showed filling defect with irregular margin of the lower end of the oesophagus. This is shown in figure 1, case 1.

The patient was built up for operation with vitamin 'B' Complex and liver extract 2 c.c. intramuscular injections on alternate days and milk feeds

by mouth with Promalon. 200 c.c. of 25% glucose I. V. was given daily for a week. After one week, the patient was put up for operation.

Under general endo-tracheal anaesthesia, the patient was put in the right lateral position and a thoraco-abdominal approach by excising the 8th rib was carried out. On exploration of the chest cavity, a well defined tumour mass was felt just above the oesophageal opening of the diaphragm and extending for about 2 cms. upwards in the oesophagus. There were no enlarged lymph nodes by the side of the oesophagus. The oesophagus was mobilised above the growth. The phrenic nerve was crushed. The diaphragm was then incised upto the oesophageal opening and the stomach was explored. On exploration of the stomach a hard nodular mass was felt along the lesser curvature at the site of the left gastric artery. This was adherent slightly to the inferior border of the liver. No lymph nodes were enlarged in the gastro-splenic ligament or along the



Fig. 1, Case 1

Pre-operative barium swallow showing a lesion at the lower end of the oesophagus.

greater curvature of the stomach. No secondaries were seen in the liver. The spleen was delivered into the wound and the gastro-splenic omentum cleared off the tail of the pancreas. The greater omentum was separated from the transverse colon along the whole length of the greater curvature of the stomach. The left gastric, right gastric and the right and left gastro-epiploic arteries were tied. The glandular mass along the lesser curvature could be separated off easily posteriorly. The stomach was cut just at the gastro-duodenal junction. Mobilisation of the stomach at the oesophago-gastric junction presented some difficulty as the pericardial lymph nodes were enlarged and there was excessive vascularity. The spleen, greater omentum and the whole of the stomach with the glandular mass were transferred to the left side of the chest. The duodenal stump was closed with a two layer anastomosis. A loop of the jejunum 5" beyond the duodeno-jejunal junction was then prepared for jejuno-oesophageal anastomosis. The vessels of the loop were carefully preserved and the jejunum cut. The distal end of jejunum was brought up through the transverse meso-colon posterior to the transverse colon into the thorax for the jejuno-oesophageal anastomosis. A posterior layer of interrupted stitches was first applied by 5/0 silk and the jejunum was approximated to the oesophagus. The posterior wall of the oesophagus was then cut and the mucosa of the oesophagus anastomosed to the posterior surface of the jejunum by interrupted 5/0 silk sutures. The oesophagus was then cut with the surgical cautery about $\frac{1}{2}$ " above the growth and the specimen of the whole of the stomach, greater omentum, spleen and the lower part of the oesophagus was removed *en-masse*. The anterior part of the anastomosis between the oesophagus and the jejunum was then carried out. A two-layer end-to-end anastomosis between the oesophagus and the jejunum was carried out by using interrupted 5/0 silk sutures. The proximal part of the jejunum was then anastomosed by Roux-Y technique to the distal part of the jejunum. The opening in mesentery of the transverse meso-colon was then closed around the jejunum which was passing through it. The diaphragm was then stitched around the jejunum and the opening between the thorax and the abdomen closed. An intra-thoracic drain connected to an under-water-seal was then put in the chest. Penicillin 5 lac units and Streptomycin 1 gm. were sprayed in the chest cavity. The abdomen and thorax were closed in layers. Post-operatively the patient's general condition on return to the ward was satisfactory with a blood pressure of 110/70. 500 c.c. of blood transfusion together with 2 bottles of plasmosan and 3 bottles of glucose were given intravenously during the operative

procedure which took 4 hours to complete. The appearance at completion of operation is shown in figure 3, case 1. At the completion of anastomosis a Ryle's tube was left in beyond the anastomosis into



Fig. 2, Case 2
Barium swallow 6 months after operation.

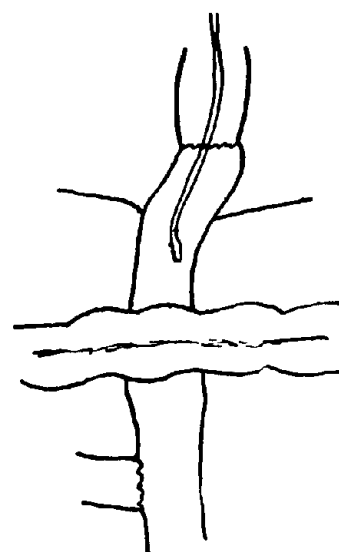


Fig. 3, Case 1
Appearance at completion of operation.
Restoration of continuity by oesophago-jejunal anastomosis end-to-end Roux technique.

the jejunum. Figure 4, case 1, shows the resected specimen. The spleen has not been shown in the photograph.



Fig. 4, Case 1
Resected specimen showing the lower end of oesophagus and whole stomach. The spleen is not shown in the diagram.

The post-operative course was uneventful. The intra-thoracic drain was removed on the 3rd post-operative day. For the first four days the patient's fluid requirements were made up by giving fluids intravenously and nothing was allowed by mouth. From 5th day onwards sips of water were given. On the 7th day the patient was taking 2 oz. water 1 hourly. From 9th day onwards fluids were allowed *ad lib*. The Ryle's tube was removed on the 5th post-operative day. Solids were allowed by mouth from 14th day onwards. Penicillin 5 lacs and Streptomycin 1 gm. was given daily for 7 days.

Three weeks after operation, the patient could eat solids comfortably without distress.

A histopathology of the tumour revealed it to be an ill-differentiated squamous celled carcinoma with secondary invasion of the lymph nodes along the lesser curvature. Micro-photographs of the histopathology specimen are shown in figures 5 & 6, case 1.

Follow-up.—At 9 months showed the patient to be well carrying out his normal duties. He can swallow solids comfortably and the barium swallow result is shown in figure 2, case 1.

Case No. 2.—A male patient aged 40 years was admitted with a history of inability to swallow solids for the past four months. Of late, the patient had noticed that he had lost weight and his appetite was poor.

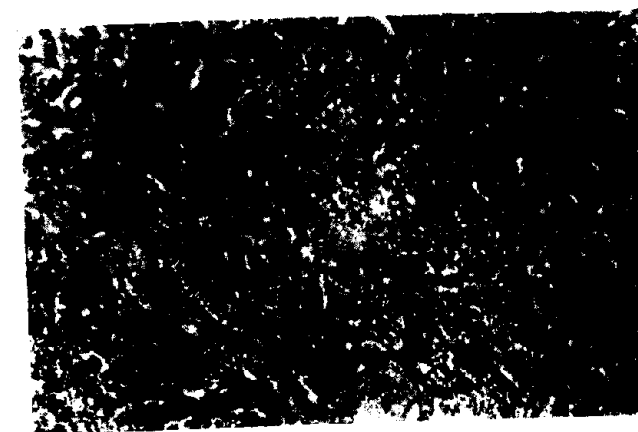


Fig. 5 (Case 1)—H. & E. $\times 175$



Fig. 6

Fig. 6, Case 1, H. & E. $\times 350$

On examination, the patient was obviously poorly nourished and anaemic. Laboratory investigations showed a Hb. 9.8 gm., B. P. 110/70 Kahn test—negative, urine—N. A. D. plain x-ray of the chest—N. A. D. Oesophagoscopy showed a narrowing of the lowermost end of the oesophagus. Barium swallow showed a filling defect with irregular margin of the lowermost end of the oesophagus. This is shown in figure 7, case 2.



Fig. 7, Case 2

Barium swallow showing lesion at the lower end of oesophagus.

The patient was operated on 10 days after admission, under general endotracheal anaesthesia. The patient was put in the right lateral position and standard left thoracotomy incision over the 9th rib was made. The 9th rib was excised and the chest opened. A growth was felt in the lowermost quarter of the oesophagus. The left phrenic nerve was then crushed. The diaphragm was incised and the abdomen explored. The growth was found extending into the fundus of the stomach and a mass of lymph nodes was felt along the left gastric artery and the upper part of the lesser curvature of the stomach, which was adherent posteriorly. The liver was normal. It was felt that the growth was reasonably resectable. The incision in the diaphragm was then enlarged to the oesophageal opening. The lower portion of the oesophagus was mobilised and the branches of the vagal nerve running along it were cut. The gastro-splenic omentum was then incised. The gastro-colic ligament along the greater curvature 3 cms. away from the stomach was then secured and the lesser sac entered. The spleen together with the tail of the pancreas was isolated. The gastro-hepatic omentum was then secured. The right gastric artery being caught, the stomach was then divided at the gastro-duodenal junction and the duodenum was closed. The greater curvature of the stomach was then shifted towards to the right side of the abdomen and the splenic artery and veins were ligated. The tail and part of body of the pancreas was then incised. The cut end of the pancreas being secured by interrupted mattress stitches of 2/0 silk. No attempt was made to separately ligate the pancreatic duct. The spleen together with the tail of the pancreas, the whole of

ach with part of the greater omentum was placed upwards. As the growth was adherent by some difficulty was experienced in mobilising oesophago-gastric region. The left gastric was then secured. A loop of the jejunum from the jejuno-duodenal junction was then up through the transverse meso-colon up to the thorax. It was necessary to incise the ry of this loop in order to lessen the tension the manner described by Sweet. A two-layer go-jejunostomy by interrupted 2/0 silk sutures n carried out, and an *en-bloc* removal of the the tail of the pancreas, the whole of the i, a part of the greater omentum and the ortion of the oesophagus was done. Anchoring between the pleura overlying the aorta and num were put. The diaphragm was reformed he jejunum and a few sutures were applied a the diaphragm and the jejunum at this level. nt in the transverse meso-colon was closed he loop of the jejunum. An entero-enterostomy rried out just below the transverse colon. 9, case 2, shows the reconstruction at the end ration. Figure 8, case 2, shows the resected en. Ryle's tube was passed beyond the anasto- into the efferent loop. An intra-thoracic drain sserted and connected to an under-water seal. ddomen was then closed in layers.

through the operation, the patient behaved satisfactorily. He had 5 bottles—1400 c.c.—of transfusion, together with 500 c.c. of plasmasan

and 1,000 c.c. of glucose saline during the operation which lasted for 4½ hours. Intra-venous Pethidine 130 mgm. and tubarine 1.5 mg. were given during the operation to supplement gas oxygen aether. At the close of the operation the patient's blood pressure was 90/70. His pulse was 90 per minute. The respiration was slow in the region of 10 to 12 per minute presumably due to the effect of intra-venous pethidine.

The post-operative course was uneventful. For the first four days, nothing was given by mouth, fluids being allowed gradually from the 5th day onwards. Ryle's tube was removed on the 6th post-operative day. Penicillin 5 lacs and Streptomycin 1 gm. were given daily for 7 days.

Three weeks after operation, the patient could eat solids comfortably without distress.

A histopathology of the specimen showed it to be an adeno-carcinoma arising from the lower end of the oesophagus with secondary metastases in the lymph nodes. This is shown in figures 10 & 11, Case 2. Follow up at 3 months showed the patient to be able to swallow solids comfortably.

Discussion

An ideal operation for the removal of Carcinoma of any organ would consist of



Fig. 8, Case 2

Resected specimen showing the lower end of the oesophagus, whole stomach, spleen and the body of the pancreas.

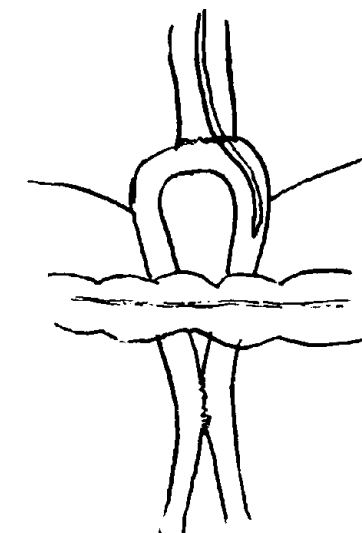


Fig. 9, Case 2

Appearance at completion. Restoration of end-to-side oesophago-jejunal anastomosis with distal entero-enterostomy.

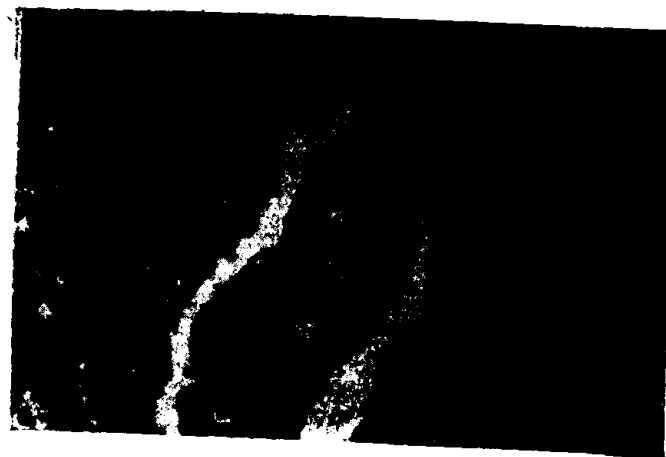
Fig. 10, H. & E. $\times 36$.Fig. 11, H. & E. $\times 120$.

Fig. 10 & 11, Case 2—Microphotographs.

complete removal of the primary lesion with a wide margin of surrounding normal tissues and an *en-bloc* removal of as many as possible of the regional lymph nodes. In cases of carcinoma involving the oesophagus,

the uniformly poor surgical results have been due to the fact that this ideal is difficult to achieve. However, the lowest quarter of the oesophagus is a site which offers the closest approximation to the ideal

cancer operation, as far as tumours of the oesophagus are concerned. To achieve this, it would be necessary to resect a portion of the normal oesophagus above the growth, a large part of the uninvolved stomach below, all the peri-oesophageal nodes below the level of arch of the aorta, paracardial and left gastric groups together with splenic and pancreatic nodes. To effectively remove the splenic and pancreatic group of lymph nodes, a splenectomy and a distal partial pancreatectomy must be carried out.

In case I, an extension of the growth into the left gastric lymph nodes had already occurred, yet it was possible to do a fairly wide resection, including the whole of the stomach and the spleen.

In case II an extension into the left gastric group of lymph nodes was also seen and to effectively remove the growth a total gastrectomy with a partial Pancreatectomy and splenectomy had to be carried out.

These two cases would, therefore, fall in the realm of "palliative resections". The follow up has shown gratifying results to date, case I being alive and well 16 months after operation and case II is alive and well 8 months after operation.

Sweet in an analysis of 90 cases of carcinoma of the lower oesophagus operated on by "Palliative Resection" showed a 70% 6 months survival and 2% 5 years survival rate, as compared to "Curative Resection" where, out of 68 cases operated on 32% had a 5 years cure-rate. Adams in a review of the experience of the Lahey Clinic with 393 cases of cancer oesophagus showed no

5 year survival rates in cases with a Positive lymph node biopsy. Their results go to show that radiotherapy is not suitable as a primary form of treatment for lesions of the Cardio-oesophageal region, and every attempt should be made to resect these.

It would, therefore, appear that carcinoma of the lowest quarter of the oesophagus has a relatively better prognosis and a radical policy of attempting removal of the growth appears justified even in cases where only a "Palliative Resection" is possible.

Summary

(1) Two cases of Carcinoma of the lowest quarter of Oesophagus in males aged 50 and 40 years are presented.

(2) The operative procedure which consisted of a total gastrectomy, splenectomy, partial pancreatectomy with a distal oesophagectomy is described in some detail.

(3) At a 16 month and a 9 month follow up, both patients are alive and well.

(4) A plea is made for adopting a radical policy in Carcinoma of the lowest quarter of the oesophagus even where the growth has extended to a stage where only "Palliative Resection" is possible.

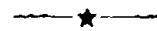
Acknowledgement

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ORTHOPAEDIC SECTION

MONTEGGIA FRACTURES

BY

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Monteggia fracture dislocation first described in 1814, is relatively an uncommon injury. In last 10 years, 43 such patients reported in the Orthopaedic Department. Out of this number only 9 cases occurred in females. Some authors believe that Monteggia fractures occur due to indirect violence. 10 out of the 43 cases had a compound fracture in this series, which were due to direct injury. The rest of the cases probably were due to indirect violence. Especially in children, indirect trauma plays more important part. In injuries due to indirect violence the mechanism described by Mervyn Evans (1949) *i.e.* forced pronation and longitudinal compression of the ulna, bends forwards the shaft of ulna levering out the head of the radius forwards. The orbicular ligament at the superior radioulnar joint is weak as compared to interosseous membrane and therefore gives way, allowing the dislocation of head of the radius. The usual type is anterior Monteggia as described above. Occasionally however the fracture may be of posterior type in which ulna fractures near its upper third, bends backward, and the head of the radius dislocates backwards. 7 cases in this series were of posterior type *i.e.* 16.3%. The head of the radius is commonly fractured in posterior Monteggia type but it is not an invariable finding. 7 patients showed fracture of the head of the radius in this series. The fracture of radial head was present only in 2 of the anterior and 5 of the posterior Monteggia fractures (Fig. 1).

A very unfortunate state of affairs exists in our country where bone-setters reign supreme especially in the rural areas. It is most interesting to note that out of 43 patients only 13 reported within a period of 10 days. (The rest all had indigenous treatment), making the already difficult treatment, most difficult. The treatment therefore is different in these two groups of patients.

Treatment of Fresh cases.—Closed reduction is successful in almost all children, both for



Fig. 1

A typical posterior Monteggia fracture with angulation of ulna and fracture of head of the radius. Note the site of ulnar fracture which is usually higher than anterior Monteggia fracture.

the fracture and the dislocation of the head of the radius. The fracture is reduced by a pull by grasping the hand and a counterpull above the bent elbow. The forearm is fully supinated and the ulnar angulation is reduced by pressure backward through the forearm muscles in front. The radial head gets reduced automatically. A pressure over the brachioradialis mass is however desirable to push the head back to its natural position. Lightly padded plaster of Paris cast is applied from the upper arm to the knuckles. Reduction is verified in accurately taken anteroposterior and lateral skiagrams. Plaster of Paris is removed after 6 weeks. In all the five cases this manoeuvre was successful and the results of the treatment were gratifying (Fig. 2-A and 2-B).



Fig. 2-A

This picture shows typical lateral displacement of head of the radius with lateral bending of ulna at the fracture site.



Fig. 2-B

This shows accurate reduction of radius of the same patient.

In adults manipulative reduction fails. It failed in all the eight cases. The treatment of choice therefore is open reduction and firm internal fixation of the fracture of ulnar shaft (Fig. 3-A and 3-B). The head of the



Fig. 3-A

Another picture of posterior Monteggia fracture. The head is intact though subluxated backwards and outwards.



Fig. 3-B

This shows accurate reduction of head of the radius and internal fixation with intramedullary guide-wire. The wire is rather weak for internal fixation, Steinman pin or Rush nail is much better.

radius may be reduced by manipulative pressure through the brachioradialis mass and the limb put in plaster of Paris cast from upper arm to the knuckles with elbow at right angle and forearm supinated. Sometimes the reduction of the head is impossible because the thick annular ligament falls back as a fold below the capitulum. Due to lack of space the head readily redislocates immediately after manipulation. In such cases the head of the radius has to be excised. It is always advisable to remove the head of the radius at least 3 weeks after the open reduction and internal fixation of the ulnar shaft. If head of the radius is openly reduced at the same sitting, there is danger of haematoma spreading from one site to the other and produces a cross-union. The plaster of Paris cast is removed after 6 weeks and renewed if the union of ulna is not sound. In adults, active movements of fingers and of the shoulder should be insisted upon throughout the period of the plaster fixation. Six or 75% of adult patients showed satisfactory results. Poor results in two cases were due to cross-union. In one case it resulted after plating of ulnar shaft (Fig. 4) and in the second it was after intramedullary fixation with Steinman's pin which got infected and the pin had to be removed (Fig. 5).



Fig. 4

This shows a cross-union after open reduction of the fracture of ulna. Radius was not tackled at the same sitting.



Fig. 5

This shows a cross-union following an infected Monteggia fracture.

Complications

1. The commonest complication reported is the injury to posterior interosseous nerve at the time of fracture. This nerve injury occurred in two of our cases but both recovered without any operative interference. In none of the old cases, posterior interosseous nerve injury was noticed. No undue alarm therefore should be struck when there is posterior interosseous nerve injury. In most cases it is just a traction injury and the recovery is expected. In very rare cases when recovery does not occur in three months' time, the best type of treatment is tendon transplantation, rather than try to suture the posterior interosseous nerve because it is very difficult to suture the posterior interosseous nerve due to its short course and retraction of its ends. Flexor carpi radialis is transplanted into the extensors and abductors of the thumb and palmaris longus into the extensors of the fingers. The results usually are good after the tendon transplantation.

2. *Stiffness of elbow and radioulnar joints.*—This complication is tackled on the lines described in old Monteggia fractures. In our series old fractures make a large number. It is a pity that the medical profession does not take interest in the treatment of fractures.

Well organised orthopaedic centres are far and few between, therefore the treatment of fresh fractures is neglected and unreduced fractures and dislocations make a large percentage of cases who present themselves for treatment in any orthopaedic hospital. In this series 30 cases came late with stiff elbow and marked restricted radio ulnar movements. Treatment of these cases is unsatisfactory but a useful range of movements is obtainable after appropriate operative treatment. Excision of head of the radius and osteotomy of the ulnar shaft and internal fixation preferably by intramedullary fixation with Steinman's pin or a Rush pin improves the function of the elbow and forearm considerably in comparatively fresh cases. 7 cases were treated with this type of treatment 3 or 42.9% showed satisfactory functional results.

7 cases were treated with excision of radial head only which was interfering with flexion of elbow joint. 4 or 57.1% showed satisfactory results.

Excision elbow was performed in 5 cases who had absolutely stiff elbows. All the 5 cases had useful range of movement at elbow joint but on the whole results were unsatisfactory in all cases.

3. Cross union as described in fresh cases.

4. *Non-union of ulnar fracture*.—2 patients came with non-union of ulnar shaft with dislocation forward of the head of the radius. Bone grafting of ulnar shaft and excision of radial head was performed in both these cases. Bony union of ulnar shaft

resulted in both cases but functional results were unsatisfactory.

5. *Volkman's ischaemic contracture*.—Max-Page's operation was performed in one case who came with well-developed Volkman's ischaemic contracture. Cosmetic results were satisfactory but functional results were poor.

8 patients refused operative treatment.

Whole purpose of the paper is to arouse the consciousness of the profession in this country to this not very uncommon fracture dislocation. As is seen from the results, the results are excellent in majority of early cases whereas they are had in neglected cases and the complications in the untreated cases are rather formidable and the results are uncertain. No stone therefore should be left unturned in educating the public and the profession in the early recognition and early treatment of Monteggia fracture dislocation so that the results improve and the patients are benefited to the maximum.

Summary

1. The clinical aspects of 43 cases of Monteggia fracture are discussed.
2. Closed reduction is possible in almost all cases in children giving excellent functional results.
3. Open reduction and internal fixation is necessary in almost all cases in adults.
4. Importance of early recognition and treatment is emphasised.
5. Delay in proper treatment leads to innumerable preventable complications.

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ANEURYSMAL BONE CYST

(A report of two cases)

BY

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In 1942 Jaffe and Lichtenstein while discussing unicameral bone cysts described a benign lesion of the skeleton with distinct pathological and clinical features which they designated as "aneurysmal bone cyst". The same authors independently in 1950 described the condition in more detail. Following these publications aneurysmal bone cyst has been increasingly recognised as a separate clinical and pathological entity (Lichtenstein 1953, 1957; Dahlin et al 1955; Cruz and Coley 1956; Barnes 1956; Taylor 1956). A few cases have already been reported in the Indian literature (Bhende and Kothare 1950; Hadley et al 1956; Sirsat 1958).

Two more cases of aneurysmal bone cyst occurring in Indians are being reported here.

Case Reports

Case 1.—A man aged twenty seven years complained of a swelling in his right forearm for five months. The onset was insidious and the swelling was gradually increasing in size. He complained of an aching pain in the swelling which he first noticed about two months before coming to the hospital. There was no history of injury. Examination revealed a fusiform swelling 7.5 × 5 cm. arising from the middle of the right radius. The swelling felt warm, had a smooth surface and was moderately tender. The consistency was mostly hard but felt soft at places. The skin was healthy. There was no pulsation or bruit in the swelling. The last few degrees of rotation of the forearm was restricted. Lymph nodes were not enlarged. The radiographs disclosed a cystic lesion arising from the anterior aspect of the shaft of right radius which projected eccentrically forwards. The anterior cortex of the bone was partially destroyed. The limits of the swelling were demarcated by thin lines of new bone formation (Fig. 1). X-ray of chest did not reveal any abnormality. The radiological

report of the right forearm was "primary malignant bone tumour in the midshaft of right radius". Total and differential W. B. C. count, the levels of haemoglobin and serum protein and the report of routine urinalysis were normal. Serum calcium was 10.8 mg. per cent and serum phosphorus 6.6 mg. per cent.

Biopsy.—The swelling was well capsulated and consisted of a thin shell of bone with very vascular tissue inside. In view of the vascularity and the eccentric cystic appearance in the radiograph the swelling at this stage was considered to be an aneurysmal bone cyst. However the tissues sent for histological examination were reported on as ossifying fibroma.



Fig. 1

Pre-operative skiagram of Case 1 showing the destruction of the anterior cortex of the radius and the eccentric expansion of the lesion.

Operation.—The affected part of the radius was resected and replaced by an autogenous cortical bone graft from the tibia. In addition blocks of cancellous bone from iliac crest were placed around the cortical graft. The limb was encased in a midarm plaster cast.



Fig. 2

Final post-operative skiagram of Case 1 showing incorporation of the bone grafts. There is subluxation of the inferior radio-ulnar joint.

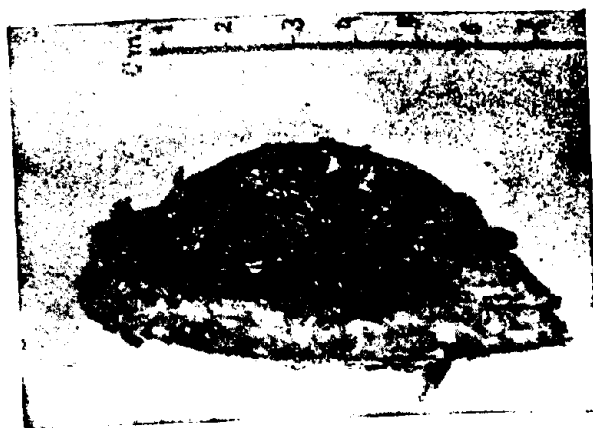


Fig. 3

The gross appearance of the swelling on the radius (Case 1) which has been cut open to show the appearance of the cut surface.

Progress.—The patient had temporary weakness of the thumb extensors and abductors post-operatively. Stainless steel screws used to fix the proximal end of the graft had to be removed after three months on account of the development of a small discharging sinus at the upper end of the skin incision. The graft was finally incorporated after immobilisation for seven months (Fig. 2). Two months after the final removal of plaster the patient had regained good function of the affected limb.

Pathological Specimen.—The specimen consisted of a spindle shaped bony mass (7.5 × 5 × 4 cm.) projecting from the anterior surface of the radius. The cut surface revealed numerous vascular spaces, some of them fairly large which resembled thin walled vessels (Fig. 3). Histopathology of tissues removed from the tumour showed large vascular spaces lined by endothelial cells and fibrous stroma, in which at places specially near the site of haemorrhage were a number of giant cells. At other sites there were osseous formation in the fibrous stroma. Apparently at the biopsy, tissue was taken from one such site. No thrombosis was detected in the vascular spaces. The appearance was typical of aneurysmal bone cyst (Fig. 4 and 5).

Case 2.—(Reported by the courtesy of Prof. A. K. Saha) - A young man of twenty complained of a painful swelling in his left foot for five months. The swelling was first noticed following an injury received while playing football. The pain initially was not marked and he managed to play football for some-time after the appearance of the swelling. However following minor traumata received at play the swelling

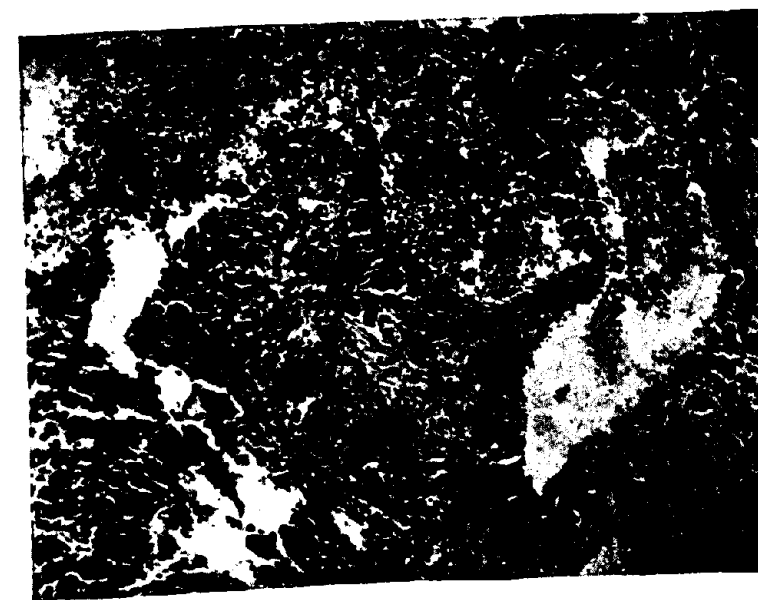


Fig. 4

Photomicrograph of the histological section from the specimen of Case 1. The large vascular spaces are well seen. There are a fair number of giant cells in the wall of the vascular spaces. Haematoxylin and Eosin × 240.



Fig. 5

Photomicrograph of the histological section from another area of specimen of Case 1. Haematoxylin and Eosin × 240.

became painful and increased in size. About two months after the onset of the swelling the patient was seen elsewhere when following a radiographic examination, the foot was immobilised in a plaster cast. On removal of the cast after a further period of two months the swelling was found to have grown bigger. On examination about a month later a tender oval swelling (4×2.5 cm.) arising from the neck of the fourth metatarsal bone was noted. It felt firm, warm and smooth. No pulsation was detected. The superficial inguinal lymph nodes were slightly enlarged. The first skiagrams revealed an expanded cystic lesion of the neck and the head of the affected metatarsal bone. The articular surface of the head was intact (Fig. 6). Skiagrams taken after removal of the plaster revealed practically complete destruction of the distal half of the affected metatarsal. The proximal half of the bone showed evidence of erosion and very fine radiating strands of new bone formation somewhat resembling the "sunray appearance" (Fig. 7). X-ray of chest, examination of blood, urine and stool did not reveal any abnormality. At this stage a provisional diagnosis of osteolytic type of osteogenic sarcoma was made even though such a lesion is extremely rare in the bones of the foot.

Operation.—The affected metatarsal together with the corresponding toe and the middle cuneiform bone was removed *en masse*. The small muscles and the long tendons were cut as far proximally as possible and the distal parts were left attached to the bones. The postoperative period was uneventful.



Fig. 6

Skiagram of Case 2 showing expanded cystic lesion of the neck and the head of the third metatarsal bone.



Fig. 7

Immediate pre-operative skiagram of Case 2 showing complete destruction of the distal half of the third metatarsal bone.

Pathological Specimen.—The cut surface showed the swelling to be made up of multiple vascular spaces of varying sizes. These were separated by fibrous wall with occasional areas of thin bony septa. A skiagram of the specimen using softer penetration X-rays revealed the extent of the expanded cyst and outlined clearly the multicystic nature of the swelling (Fig. 8). Histopathology revealed the swelling to be an aneurysmal bone cyst (Fig. 9).

Discussion

The credit of first recognising aneurysmal bone cyst as a separate entity goes to the pathologists. In the past this condition was confused with a typical giant cell tumour, ossifying subperiosteal haematoma, subperiosteal giant cell tumour, bone cyst, angioma and osteogenic sarcoma. Lichtenstein in 1950 very aptly described aneurysmal

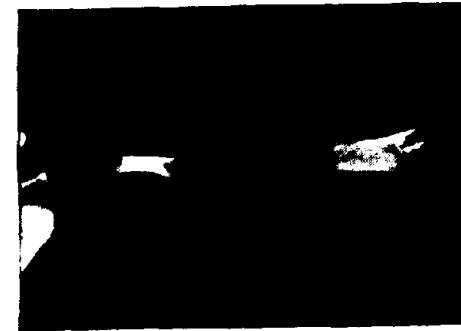


Fig. 8

Skiagram of the specimen in Case 2.

bone cyst as "essentially a solitary, localised and expanded fibrous lesion, honeycombed by an enormously dilated plexiform vascular bed which develops in the vertebral column and the flat bones, as well as the long bones". The condition is usually seen in children and young adults

of both sexes. Both the cases reported here occurred in young males. The long bones and the vertebral column, specially the neural arch, are the sites most frequently affected. In 60 per cent of cases the lesion was observed in these sites (Lichtenstein, 1957). However no part of the skeleton is exempt with the possible exception of the facial bones. The cases reported here occurred in the radius and metatarsal bone both of which appear to be uncommon sites. Lichtenstein (1957) reviewing fifty cases did not find any occurring in radius and noted only three cases in the bones of the foot. The skull bones also appear to be a very rare site. Bhende and Kothare (1950) reported a case in the temporal bone which they claimed to be the second reported case where the cranial bones were affected.



Fig. 9

Photomicrograph of histological section from specimen of Case 2. The empty vascular spaces are flanked by fibrous wall with areas of ossification. The giant cells are not prominent in this section. Haematoxylin and Eosin $\times 240$.

The commonest symptom, as noted in the cases here reported, is swelling which is very often painful. Pain is usually not very severe. Rarely a large swelling near a joint may restrict its movement. When vertebrae are effected stiffness, pain, neurological symptoms and rarely paraplegia are the presenting features.

The radiological picture is fairly distinctive in most cases. In case of long bones the diaphysis is usually involved and not the epiphysis. Characteristically the picture is that of an eccentric cystic lesion often bulging out in one direction. The peripheral limit may be demarcated by scanty new bone formation. In the presence of typical radiological picture the diagnosis may not be unduly difficult. In Case 1 the suggestive X-ray picture together with the extreme vascularity of the lesion at biopsy enabled to arrive at a correct diagnosis. In flat bones the swelling is symmetrical. In vertebrae the lesion has a blown out appearance—projecting beyond the limit of the vertebra. The vertebral arches and the transverse processes are more commonly affected than the body.

The common conditions which may be confused with aneurysmal bone cyst are osteoclastoma, simple bone cyst, haemangioma, fibrous dysplasia and osteolytic type of osteosarcoma. In osteoclastoma the age incidence is common in third and fourth decades, diaphysis is not the site of affection, the eccentric bulging is absent and finally the pathology and behaviour of the tumour is different (Barnes, 1956). The radiological appearance of simple bone cyst does not show any eccentric bulging. Spontaneous fracture occurs before the cyst attains a very large size and unless complicated by fracture the content is never haemorrhagic. Haemangioma has been confused with aneurysmal bone cyst. In fact Hadders and Oterdoom

(1956) considered the two conditions to be identical. However their arguments are not convincing. Haemangioma usually have distinctive radiological and histological pictures. Fibrous dysplasia may be considered in the diagnosis when the X-ray appearance is not very typical. The histology is usually distinctive. It is most important to distinguish aneurysmal bone cyst from osteogenic sarcoma to avoid unnecessary mutilating operation for a benign lesion. The absence of pain, the slow rate of growth and the non-involvement of the soft tissues help one to distinguish the lesion from osteogenic sarcoma. In difficult cases biopsy clinches the diagnosis.

The gross appearance of an aneurysmal bone cyst is often characteristic. There is a fleshy growth arising eccentrically from the cortical bone tissue. This is made up of large vascular spaces separated by connective tissue in which often thin trabeculae of bony spicules may be present. There may be a thin rim of subperiosteal bone formation. All these features were present in both the cases reported here. Histologically such lesions are characterised by dilated vascular spaces supported by fibrous septa. In these septa are found at places thin strands of osseous or osteoid tissue. Giant cells with few nuclei are found specially near the sites of old or recent haemorrhage. Since these vascular spaces are lined by fibrous tissue and not muscular or elastic fibres objection has been taken to the term aneurysmal which, strictly speaking, is formed by the dilatation or extension of the lumen of an artery (Taylor, 1956). But in the absence of a better substitute we feel that it describes the main features of the lesion though not its basic character.

It has been suggested that these giant cells compared to the giant cells in osteoclastoma have fewer nuclei. But it appears

that the chief differentiating point is the presence of the wide vascular spaces mentioned previously.

As the lesion is benign treatment has been by curettage or excision for accessible lesions and by radiotherapy when the site is deep seated. It has been claimed (Lichtenstein, 1953) that curettage even if incomplete or the simple procedure of taking a biopsy may arrest the condition. However cases have been reported to have recurred after curettage (James, 1957; Lichtenstein, 1957) and further, satisfactory curettage may be difficult in such a vascular lesion. Local excision wherever practicable should therefore be seriously considered. Radiotherapy is not without its hazards specially if large doses are employed. Doses exceeding 2000 r may lead to sarcomatous change after a latent period of several or many years (Lichtenstein, 1957). In addition radiotherapy without a biopsy fails to establish the diagnosis on a sound pathological basis. Early surgery should be advocated, as often the cyst may attain a large size causing gross destruction of the affected part necessitating an amputation or a mutilating operation. Case 2 is an example of such a case.

The pathogenesis of the lesion is still nebulous. Lichtenstein (1950, 1957) maintains that it results from local circulatory disturbances in the form of venous thrombosis or arteriovenous aneurysm which leads to increased venous pressure. As a result, the vascular bed in the affected bone

becomes dilated and engorged, ultimately forming cystic spaces. Jaffe (1950) considered the lesion to be a "haemorrhagic blow out" in a previously existing benign bone lesion. Hadders and Oterdoom (1956), as mentioned before, maintains that the lesion is identical with haemangioma, while Barnes (1956) suggests that it might be "a peculiar response to a circumscribed subperiosteal haemorrhage", as it often follows an injury. While the theories suggested by Jaffe and by Hadders and Oterdoom seem untenable, that of Lichtenstein still lacks confirmation. Traumatism though associated in some cases is by no means invariably present. The traumatic theory though attractive cannot therefore explain the origin of the lesion in every case.

Summary

1. The cases of aneurysmal bone cyst are reported.

2. The clinical features, the diagnosis and the treatment are discussed.

We are indebted to Prof. A. K. Saha for allowing us to publish the Case 2 which was under his care and for giving all possible help. We also record our thanks to the Superintendent of Nilratan Sircar Medical College Hospital and the Director of Health Services, West Bengal, for allowing us to publish Case 1. Thanks are also due to Dr. R. Das for assistance received in the preparation of this paper.

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PLASTIC SURGERY SECTION**PLASTIC RECONSTRUCTIVE, RESTORATIVE, REPARATIVE AND FACIO MAXILLARY SURGERY**

BY

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Plastic surgery is that speciality which deals with the restoration of defects. These defects may be congenital or acquired. It improves function and aesthetic effects. The boundary lines of this speciality are vague ; for example congenital defects like congenital dislocation of the hip or club foot are out of its scope. It encroaches upon almost every other Surgical domain and just how far should these extend into each allied field is a matter that depends upon the individual Surgeon, who is guided by his own inclination, training and conscience.

The basis of this branch of Surgery is transplantation of tissues, that has gained impetus during the last two Wars, when greater number of casualties were saved due to better methods of resuscitation like transfusion of blood and its substitutes, anaesthesia, transport and antibiotics. Having saved the mutilated soldiers the responsibility of reconstruction and thus rehabilitation felt heavily on the Plastic Surgeons. In that way one may believe that it is a newer speciality, but its origin goes back to the days of Charak and Sushruta and was originally practised in our Country.

There is an impression in the minds of some medical personnel and lay public alike that this art deals with cosmetic and beautifying operations only and for that matter is greatly patronised by Westerners. This aspect is but one small branch of this speciality but its application in the reconstructive field can cover any speciality in Surgery.

Modern Surgical pursuits are an example of coordinated team work and according to his inclination the Plastic Surgeon has a special advantage if he is essentially a General Surgeon with a special background of this speciality. Also he can fit in as a partner with any specialised surgical team ; where the General Surgeon or a specialist consults him for the plan of reconstruction after he has done the mutilation. The Plastic Surgeon studies the problem and plans either a combined approach at the same sitting or in stages, before, during or after the main operation. The plan can never be on a fixed pattern but varies with individual entities.

As the Plastic Surgeon devotes more towards his pursuits ; it is also desirable that any General Surgeon or the specialists should know the more common principles of this speciality which they themselves can practice either for common daily needs for temporising the stage of operation till the services of the specialists can be made available e.g., the E. N. & T. Surgeon can line the mastoid, cavities by free grafts of skin or flaps, Ophthalmic Surgeon can line the contracted eye sockets with free skin or mucus membrane, at the time or after enucleation of the eye. This is done so that an artificial eye may fit in well. Gynaecologists may need skin grafts to line the vagina where there are fibrous strictures with or without fistulae. The Dental Surgeon besides an important member of the team for facio-maxillary work may like to close small antro-oral fistulae that sometime result after tooth extraction or due to the pressure of badly

fitting dental plates. The Neuro-Surgeon may have to cover scalp or skull defects as a temporary measure. Genito-Urinary specialist may line the urethral defects after excision of fibrous strictures or otherwise. The Orthopod can line raw bone cavities. Cross leg flaps are a boon to them, whenever there is compound fracture with skin loss; or if he is interested in Surgery of the hand, he can always cover raw areas with free skin at suitable and correct time so as to prevent permanent contractures that always hamper reconstruction. Our thoracic friends can line chronic empyema cavities that refuse to heal with either free skin grafts or planned flaps. Reconstruction of gullet and trachea has been achieved while the plastic Surgeon is constantly helping the E. N. T. and Thoracic Surgeon in the reconstruction of Tracheo-bronchial tree. Vascular grafts other tissues and visceral transplants have themselves become a definite speciality and are beyond the scope of this field. These are all examples of simple free grafts or planned flaps of skin or mucosa. Each one can be learnt with little practice and patience. The General Surgeon, master of all trades who still holds the widest field in Surgery can also benefit by correctly skin grafting the patients with severe burns in order to save contractures thus making the final task of the Plastic Surgeon easier both from the point of view of function and cosmesis. He can also make good the losses of skin in some cases of radical amputation of the breast for cancer when skin is involved or there is shortage of flaps, without which nasty keloid form and limit the movements of the arm besides causing oedema. He can also utilise skin grafts to cover up defects after excising benign or malignant tumours. In tumour Surgery the more he practices these principles, the more venturing he becomes which allows him a free hand in excising the malignant lesions, not only to his satisfaction,

but he ensures greater comforts and functional results to his patient besides increasing the chances of cure or relief. Imagine a wide excision in the region of the cheek and lower half of the face. How uncomfortable the patient feels with constant dribble of saliva. If he is used to smoking then he has had it. For him the life is not worth living even if the Surgeon has cured him of this dreadful disease *i.e.*, Cancer. One can argue that reconstruction should not be done for at least six months so as to make sure that the growth does not recur. Our answer to that is, if you are excising only for relief and cure then some simple cover to the defect must be provided so that the patient may live and die in peace and comfort. If selection has been really used in an early case and the pathologist can assure us that we are well away from the field of the growth all round and the type of growth in classification is such that it grows slowly then waiting is useless. Certainly one must wait if the pathologist's services are not available or else the nature of growth is of rapidly spreading type; even in them some sort of temporary prosthesis can be devised.

One then wonders as to what is left for the Plastic Surgeon. The answer is that his field is wide and depends on as to how much he wishes to do. If one is not convinced of what is stressed here we shall make an humble appeal to anyone who is interested, to visit any Surgical Out-Patients of a Hospital any day and one will himself find many such victims thrust upon us from the remote hospitals of the State with horrible, stinking wounds either after a complete or incomplete, radical or palliative surgery who come for electric or deep-ray exposures. Our ethics does not allow us to disappoint the poor victim who comes to us with great hopes. The ghastly contractures with distorted limbs and appearances after injuries or burns are of common occurrence. If the Plastic

Surgeons were to be employed night and day the done cannot be undone. Much of it could be avoided and corrected by simple procedures. Still more than sufficient will be left for the specialist.

Thus this speciality has gained a sound footing all over the world. It is heartening that the sub-section of Plastic Surgery was inaugurated under the main body of the Associations of Surgeons of India at the Nagpur Session in 1957, by the well-known stalwart of this speciality *i.e.*, Sir Harold Gillies. The effective membership is still small because we are a few bunch of trained hands in this country, but we shall not be very wrong to say that this speciality has yet not gained enough impetus, that there are no facilities for training our young men in our own country, while comparatively other specialities have grown up tremendously, yet there is always an increasing scope for them still.

It is not that this particular branch of Surgery is less important but perhaps correct approach has not been made in the right quarters. This is one of the main reasons that this speciality is still having step-motherly treatment. A couple of youngmen (four or five in all) have been trained on Government expenses while majority of them have trained themselves under their own steam. Both the Government's and other private organisations like Rockefeller Foundation's, World Health Organisation's attention has yet not been drawn towards this field. Industrial accidents and Facio-maxillary work apart, the problem of cleft palate children and managements of major burns is still unsolved in our country. There is no reason why a defective child be not rehabilitated in society. Repair of the cleft is not all that is required but it is the speech therapy, training and further research work on its improvement along with orthodontic treatment that will ultimately make him fit

for vocation later. Imagine a defective child but yet very intelligent with a first class record appearing before a commission with a cleft palate speech! Therefore this can only be attained in a fully equipped training centre.

Approach towards problem of burns is still far from satisfactory. In a civilised country or State inspite of all sorts of precautions burns still will occur. In our country this is a common occurrence due to the house-wives catching fire to their clothes in the Kitchen accidents, the Kitchen also leads to high incidence of burns amongst the small children who play by the side of fire. This is not all; the common practice of revenge, suicide or homicide are all done by burning either with kerosine or acids.

Better facilities of combating shock are saving larger number of such victims but we shall not be wrong if we say all major burns ultimately lead to cripple dome due to wrong treatment. This can only be prevented by training our young Surgeons at suitable convenient centres in the art of skin grafting. Preservation of homografts (either from living donors or Postmortem homografts) and their use as primary dressings is another important aspect that must be arranged like other tissue banks.

We are happy to report here that the Government of Bengal has created a department of Plastic Surgery at the Post-graduate Medical College, Calcutta. Last year a department has been sanctioned and upgraded by the Centre at the Nagpur Medical College for training young Surgeons. The State of Uttar Pradesh has included this speciality in their Third-Five-Year-Plan and a token grant has been asked for from the States Government. The All India Post-graduate medical Institute was the first to advertise a Professorship.

Although the above seems to be a good progress but it is far from satisfactory. To start with at least one centre in each State is the least essential, attached to one Medical College as a nucleus, where facilities should be available of the services of Dental Colleagues for facio maxillary work, prosthetics or orthodontic work and we should have a fully equipped speech therapy centre with a children's hospital within the premises. A burns Unit must be attached to it. We shall also be readily available to our colleagues, the General Surgeons, Orthopaedic and E. N. & T. and to other Surgeons for combined approaches.

It is advocated that such speciality centres should be away from the main undergraduate or Post-graduate colleges. In our humble opinion essentially in our country a patient can come to a big college hospital in the State perhaps only once and it is not within his means to go from one centre to another for completion of his treatment. One cannot ask someone after excising his jaw or cancer of the cheek to go somewhere else for reconstructive work and to another place for fitting in of a prosthesis. Same is true from the view point of Surgeons who wish to train themselves in this speciality. Besides we of this speciality do not ask for formal Lecturers or examinerships for the undergraduates but the very existence of a centre within the campus will have the desired effect on the undergraduates and post-graduates in General Surgery and other specialised branches of Surgery. It will improve the outlook and their standards. This is one speciality which can amply illustrate the significance of team work in the broadest sense.

The section of this speciality last year at the Vishakhapatnam meeting discussed the "Problem of Training of a Plastic Surgeon" and had arrived at the following

conclusions that each one of us should have the following aims and objects in view:—

1. To train Plastic Surgeons.
2. Provide facilities to the general practising Surgeons to learn and train themselves on whatever work of our speciality they like by visiting us.
3. To be available to the various other specialities and specialists besides the general surgeon who may need our help and train their personnel to carry out simple procedures of grafting and reconstructive work.
4. The residents and house officers in a big general hospital of any kind must have an opportunity to learn the pre and post-operative care of such cases that are of general interest and general nature.
5. The undergraduates should have a nodding acquaintance of this speciality.

The above aims can be fulfilled in the following manner:—

1. This body should prepare a panel of qualified and trained Plastic Surgeons in this Country.
2. This body should prepare an informative pamphlet on the aims, objects, scopes and requirements of this speciality with suitable illustrative examples.
3. One centre, unit or department is the least essential requirement in each State preferably attached to a Teaching College. From this Central Unit or Department trained persons can be attached to other departments of General Surgery in another College in the State or big hospitals. This nucleus

may grow up into an independent Unit later depending on the demands of that region.

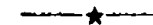
4. Till such time the above recommendation is implemented this body should recommend the institutions where the trained plastic surgeons are serving to allow them the basic facilities of running their own out-patients and follow through clinics; a combined maxillo-facial, prosthetic and dental clinics under their guidance and allow them the facilities of the services of their dental colleagues wherever they exist. A facility for treating their infants and children in the children's hospitals wherever they exist should be made available to them and they should fit in the training programme of post-graduate which depends on the above facilities.
5. To form a body of representatives of this section to carry on the above aims and visit various colleges from time to time in a State in order to assess and find out the practicability of opening a training centre and implementing the above recommendations.
6. The various States and Centres be asked to utilise the services of those trained persons available in various States who already are not attached to a teaching centre.
7. All the above suggestions should be sent to the various State Governments and Central Government and other Government bodies. This Section and its

nominees should be the official spokesman in helping various States or Centres to implement their plans pertaining to this speciality. We are aware of the inaugural speech of our Hon'ble Minister Sri Karmarkar who rightly reminded us that the future policies of planning will depend on us who will guide and advise the Government in this respect.

Last year the panel discussion on burns was shifted to the main general body meeting. We are confident the parent association will get richer day by day in asking us to discuss more and more of our common subjects of common interest in the main body meeting like last year. At least one such subject of each special sub-section *i.e.* Thoracic, Orthopaedics, Plastic, Anaesthesiology be discussed each year or on alternate year before the General House. It is unfortunate that the E. N. T. people have separated long before us. The reason was our rigid attitude towards specialisation, which is gradually softening now due to greater understanding.

A reorientation is essential if planned development of specialities is to take place in our country, because we need not stress again that the modern surgical pursuits are essentially a result of sound team work where each member of the team is specially trained in his own field and is equally important. Therefore, if we do not keep this aspect in view our progress is bound to be lop sided, and we shall never be able to catch up with the scientific progress in the World.

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THUMB LENGTHENING FOLLOWING INDUSTRIAL ACCIDENT

(A case report to illustrate a principle)

BY

H. W. WILLIAMS, Anand.

To all other considerations weighed carefully by Plastic Surgeons the world over before embarking on reconstructive surgery in a given patient, the Indian surgeon must add the probable time involved. This I have found to be the decisive factor in persuading or dissuading a patient. Plastic Surgery is relatively new by art in this country and the general public has little experience of what can be reasonably expected from its practitioners. For this reason, these two aims have been kept in view during the past five years. Firstly to provide photographic records of a sufficiently comprehensive character so that the patient may have an idea of the way reconstruction is to be planned and a loose leaf album in the consulting room is very valuable for this purpose. Secondly, we are on the look out for new methods and experiment with recognised procedures to obtain the quickest result commensurate with success.

Most Medical Colleges have good photographic equipment and an artist producing teaching materials, but in several hospitals these are not being used for clinical photography. With the limited resources of a Mission Hospital, who have worked out a simple programme. The X-ray Department was the obvious one in which to house clinical—photography, so large sheet of asbestos was screwed to the wall in one of the rooms. This received a coat of cream distemper and black curtains were arranged so that either a matt white or a matt black background could be obtained. A home

made reflector housing 3 photo flood bulbs was fixed on the opposite wall and so constant light factors made it easy to take routine exposures. This was modified later by placing the reflector bulbs in an adjustable trolley, so that photography in the operating theatre was also possible.

Following case report demonstrates a method of thumb reconstruction in shortest possible time.

Cyril John, aged 21, was admitted to a medical ward as "Pyrexia of unknown origin" and during examination the hand seen in Fig. 1 was noted. He was employed as an operator of a milling machine by a contractor at Baroda Railway Workshops. This job he lost because of this disability caused by running his thumb into the machine. As the picture shows the whole of the digit was missing but three-quarters of the metacarpal was present. The normal treatment of such a case would involve a minimum of two operations to obtain a skin and subcutaneous tissue extension by abdominal pedicle, with the insertion of a bone graft three months later. The man seemed to be unimpressed by the end result we promised and was critical of the time involved in the above procedure. We thought of the procedures originated by 'Hughes and Moore' for a similar case. Its attraction being that a single operation was involved. Briefly this entails making a transverse skin incision at the base of the metacarpal and mobilise the distal skin so that it can be slipped off the stump like a hood. A bone graft from the iliac crest is then pegged into the freshened metacarpal stump. This must be accurately performed. The skin flap is then fashioned to give a complete investment to the graft. A crescentic skin deficiency remains over the nail eminence laterally and this is covered by a thick split skin graft sewn into place. Compared with the photographs published by Hughes and Moore, we were more ambitious in the extent to



Fig. 1

Dated 20-3-58, Before Operation.



Fig. 2

Dated 29-4-58, On discharge.

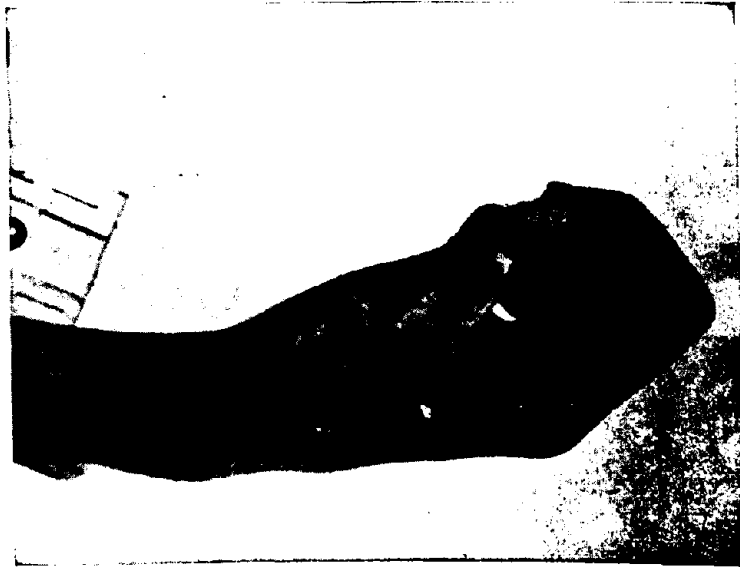


Fig. 3



Fig. 4

Fig. 3 and 4. Taken on review on 9-10-58.

which we mobilised the "Cocked hat" flap and the bone graft was a little longer. After the immediate dressing applying firm pressure to the split skin graft and lighter pressure to the pedicled graft we also applied a Gypsona slab dorsally. Despite this a haematoma formed around the bone graft and had to be evacuated. This slowed progress and resulted in a small area of dry gangrene on the anterior skin margin. However, the end result was excellent as Fig. 2 shows. Operation was performed on 25th March. He was re-examined by the Physiotherapy department on 26th June, 1958, and the report was:

Writing	...	Good	} 80% of Normal function.
Catching and throwing...		Good	
Picking up	...	Quite good	
Holding and pulling	...	Quite good	
Tying and untying string.		Quite good	

As emphasised in the original communication sensation is good, and is one of the great advantages over an abdominal pedicle. The man returned to his job he had lost and has continued to operate the same machine. Figs. 3 and 4 show the easy grip between the reconstructed thumb and each finger

tip, some forward rotation of the thumb being possible. It is generally considered that split skin is unsuitable on the palmar surface of the hand but it will be seen from Fig. 2 that the graft in this case is exposed to considerable wear which it has stood up well becoming mobile and supple.

Summary

1. A plea is made for the development of the quickest plastic procedures giving an adequate result.

2. These should be routinely photographically documented so that other patients may learn what is possible in their own case.

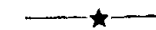
3. These two points are illustrated by a case of traumatic amputation of the thumb, where the patient has returned to his old machine following a one stage procedure.

My thanks are due to Capt. Tutton, M.S.R., for clinical photography.

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BACTERIOLOGICAL OBSERVATIONS ON EXPOSED WOUNDS

BY

R. N. SINHA and H. R. P. SINHA, Patna.

A series of 50 cases were studied to observe the normal bacterial flora of the human skin, at six pre-determined sites, 90 cases having clean surgical wounds (50 cases without dressings and 40 with sterile dressings), were studied to observe any qualitative or quantitative change in the bacterial flora treated with or without dressings.

The bacterial flora of skin vary considerably from one part of the body to another, due to local factors *i.e.* warmth, moisture, secretions, and proximity to orifices of body. Equilibria exists not only between host and normal flora but between the different species within the flora and the association of various bacterial species on a given surface of the body.

There are mechanisms about which we yet know relatively little, that tend towards the mechanical exclusion and removal of local destruction of most of those bacteria that reach various body surfaces from the outside world. These mechanisms vary in nature from one locality to another (Topley and Wilson, 1955). The unbroken skin, as a rule, presents a more or less impassable barrier to micro-organisms. Bacteria are found normally in the skin between the superficial horny cells, but ordinarily are not able to penetrate deep into the tissues unless favoured by some cutaneous injury, such as wound or burn.

The skin, however, is not an inert surface upon which bacteria may survive, but is actively bactericidal. Arnold and his co-workers found that bacteria which do not

normally occur on the skin, such as *Bacterium Prodigiosum*, the *Bacillus Typhosus* the B. colon and the haemolytic streptococci are rapidly destroyed when swabbed on the healthy unbroken skin of palm of the hand (Jordon Burrows: 1951). The auto sterilising capacity of skin is markedly reduced by dirt and is apparently a property of healthy skin.

On the other hand, bacteria normally present on the skin, such as the *Staphylococcus albus* are not appreciably reduced in numbers, when swabbed on the clean skin, a fact which accounts for their constant presence on the body.

For the growth of organisms of each species, there is a definite optimum range of temperature within which growth takes place. Another factor favouring growth of organisms is darkness. Direct sun rays are markedly bactericidal. Increased humidity usually leads to increase in growth and multiplication of organisms; drying in air is injurious to many species by virtue of lessening the humidity. The presence of water is necessary for the continued growth of all bacteria as 4/5th by weight of the bacterial cell consists of water, and, like other organisms, moisture is necessary for their growth.

A study of the above factors influencing growth of bacteria raises questions in ones mind about the wisdom of the time-honoured practice of treating wounds with voluminous dressings and bandages.

Experience with dressings on the wounds has shown that it is difficult to keep them in position for any length of time, further it becomes uncomfortable for the patients specially in a tropical country like ours. It is a common clinical experience that wounds on the exposed parts, specially the face, if dressed and bandaged, results in such a mess by accumulation of wound discharge, oral and nasal secretions and spilled food all hold snugly in place by dressings that healing of wound by primary intention, is a rare exception. Conditions in other parts of the body for wound healing are no better *e.g.* the wounds of the trunk, extremities, genital region, when covered with dressings, become soiled and become wet with perspiration and natural discharges, Barkley and Bonney before 1920 had given up all dressings for clean Gynaecological abdominal wounds. Roberts and Roberts in 1927 submitted their series of work to support their contention, that wounds treated by the open method yielded exceptionally high healing averages.

A. B. Wallace in 1948 re-introduced the exposure method of treatment of burns with the contention that a dry cool surface deprives organisms of the warm, moist environment required for their proliferation. Holman, Hoffmeister and Edgerton recorded that the rate of epithelialization began sooner in the exposed burns and seemed to spread more rapidly than the covered burns. They further observed that there was a remarkable absence of infection in the open as compared with the dressed wounds. Wilkinson and others in June, 1954, conducted a study of 211 patients with 222 clean major surgical wounds of the thorax and abdomen, of which one half were treated by the routine method by clean, sterile surgical dressings, and the other half without any dressings, appeared to heal more rapidly and with less local inflammatory reaction.

In the Patna Medical College Hospitals, where the present work has been carried out, one of us (R.N.S.) has treated most of our operative wounds by exposure *i.e.* without dressings. We have found that the wounds healed rapidly and with less number of complications than when surgical dressings were used. The fresh clean wound margins sealed in matter of hours following suturing. Coagulation of serum from the wound provides a strong barrier to the contaminant. Thus a properly sutured and congealed wound exposed to air was less likely to become moist. On the contrary a wound dressed and bandaged securely, was more often than not completely forgotten, when it is opened for removal of sutures after about a week. It is not difficult to imagine what happens during this period with discharges escaping from the wound and possible maceration of the skin edges under the dressing in this tropical country of ours. Not infrequently we find stitch abscesses, serum accumulation and local inflammation of wound margins.

In order to determine the percentage of different types of organisms present 6 different pre-determined sites of the human body were chosen *e.g.* face, axilla dorsum of the hand, abdomen, groin and dorsum of the foot. Bacteriological observations were carried out on fifty normal persons from different age groups, of both sexes taken at random. Further all observations on the wound flora have been made in ninety different cases of clean surgical wounds selected at random, in order to find the best way of treating them in the above mentioned sites. These cases were broadly divided into two main groups:

Group I

Consists of 50 cases and were treated without dressings that are further

sub-divided into four sub-groups. The first three received parenteral antibiotics.

(i) In 25 cases the exposed wound surface was treated with application of rectified spirit twice daily.

(ii) In 10 cases - the exposed wound surface was treated with application of 5% chloramphenicol ointment.

(iii) In 10 cases - the exposed wound surface was left without any local application.

(iv) 5 cases of exposed wounds were treated with application of rectified spirit, but did not receive parenteral antibiotics.

Group II

Consisted of 40 cases of surgical wounds that were treated with sterile dressings. All these cases received parenteral antibiotics.

Bacteriological studies were made on the material collected from the skin surfaces from various sites as mentioned already in our non operated cases while in the series of operated cases it was taken from the vicinity of the wounds on the 1st and the 8th post operative day. The material so collected was inoculated on blood agar plate. The colonies grown after the incubation for 24 hours, their characters, morphology, physiological and biochemical reactions were studied. Coagulase test was carried out as a routine to determine the incidence of coagulase positive strains of staphylococcus group of organisms.

Location and types of wounds

These include a wide variety e.g. from the face, neck, thorax, abdominal wall, inguinal region, scrotum and extremities.

Group I (cases treated without dressings) Sub-group (I) (application of rectified spirit)

Type.	Cases.
1. Cancrum oris	1
2. Post burn contracture neck	3
3. Thyroglossal Fistula	1
4. Thoracotomy	2
5. Appendectomy following acute appendicitis	2
6. Inguinal Hernioraphy	3
7. Operation for strangulated hernia.	1
8. Laparotomy and closure after intestinal perforation	1
9. Facial fistula closure	1
10. Volvulus Laparotomy	1
11. Gunshot injury abdomen	1
12. Cholecystectomy	1
13. Removal of vesical calculus after supra-pubic cystostomy	2
14. Hydrocele	2
15. Filariol Scrotal tumour	1
16. Neuro-fibroma foot-Excision	1
	25

Group I Sub-group (II) treated with application of 5% Chloramphenicol ointment

Type.	Cases.
1. Excision of Rodent ulcer face	1
2. Post-burn contracture neck	1
3. Appendectomy	1
4. Inguinal Hernioraphy	1
5. Operation of strangulated hernia...	1
6. Gastro - jejunostomy for Pyloric obstruction	1
7. Partial gastrectomy for gastric ulcer.	1
8. Hydrocele	2
	10

Group I Sub-group (III) cases treated without any application of alcohol or ointment

Types.	Cases.
1. Appendectomy	1
2. Cholecystectomy	1
3. Perforated duodenal ulcer closure...	1
4. Inguinal Hernioraphy	3
5. Supra-pubic cystostomy for vesical calculus	1
6. Hydrocele	2
7. Filariol Scrotal tumour	1
	10

Group I Sub-group (IV)

Types.	Cases.
1. Cancrum Oris-Repair	1
2. Adenoma Thyroid-Partial Thyroidectomy	1
3. Cholecystectomy	1
4. Inguinal Hernioraphy	1
5. Partial gastrectomy	1
	5

Observations on normal skin

Table V

Classification of growth in different regions.

Regions.	No. growth.	Scanty growth.	Luxuriant growth.
1. Face	—	94	6
2. Axilla	—	2	98
3. Dorsum of hand	8	92	—
4. Abdomen	2	98	—
5. Groin	—	—	100
6. Dorsum of the foot	—	78	22

The commonest organism found present in all the six different sites was staphylococcus albus (84-100%) and Straphylococcus Citreus in 12-32 per cent cases. Bacillus Coli was present on groin and face in 12 and 4% of cases respectively. Bacillus proteus was present in 4% of cases of face and 2% of cases on dorsum of the hand and foot

Table VI

Percentage of different types of organism present on different sites.

Organisms.	Face.	Axilla.	Dorsum of Hand.	Abdomen.	Groin.	Dorsum of foot.
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Staphylococcus	94	100	84	94	98	96
(a) Albus	—	—	—	—	—	—
(b) Citereus	26	32	12	20	18	18
(c) Aureus	2	3	—	—	—	—
2. Streptococcus	4	—	—	—	—	—
3. Bacillus Coli	—	—	—	—	10	—
4. B. Coli anacroteus	4	—	—	—	2	—
5. B. Proteus	4	—	2	—	4	2
6. Neisseria Catarrhalis	6	—	2	2	2	2
7. Bacillus Subtilis	3	—	—	—	—	—

and 4% of cases in groin. Neissiora Catarrhalis was present in 6% of cases of face and in 2% of cases on the dorsum of the hand, food abdomen and groin.

Bacteriological observations of the wound flora.—Were made on the 1st and 8th day of operation, and its results are shown as under :

Group II

(Cases treated with dressings)

Total number of cases in this group were 40. All cases showed growth on the 8th day. 27.5% of cases had no growth on the 1st day. There were luxuriant growth in 85% of cases on the 8th day.

Table VII

Group I	Sub-Group	No growth		Scanty growth		Luxuriant growth		Total No. of cases.
		1st day	8th day	1st day	8th day	1st day	8th day	
	1	No. of cases % age 8%	No. of cases % age 12%	15%	11%	2%	2%	25
	2	3%	Nil	7%	7%	Nil	3%	10
	3	2%	Nil	7%	4%	1%	6%	
	4	5%	3%	2%	2%	Nil	Nil	2
Group II	—	11	Nil	29	6	Nil	—	40

(a) Group I (25 cases treated by exposure) Sub-group I with local application of 5% ethyl alcohol.—No growth : in 32% of cases of 1st day, which increased to 48% on the 8th day.

(b) Group I - (Sub-group ii) - 10 cases treated with local application of 5% chloramphenicol.—There are no growth in 30% of cases on the 1st day, whereas all cases showed growth on the 8th day.

(c) Group I - (Sub-group ii) - 10 cases exposed wounds surface not treated with application of alcohol or without ointment.—All cases showed growth on the 8th day. 60% cases showed luxuriant growth on the 8th day.

(d) Group I - (Sub-group iv) - 5 cases of exposed wound surface were treated with application of rectified spirit but no antibiotics.—All cases showed growth on the 1st and 8th day. There was no luxuriant growth on any wound surface on any day.

Study of bacteria isolated on the 1st and 8th day (shown in percentage)

(a) Group I (Sub-group i).—Staphylococcus albus was isolated in 60% of cases on the 1st day and was reduced to 48% on the 8th day. Bacillus coli and bacillus proteus were isolated in 24 and 4% of cases respectively on the 1st day whereas they were reduced to nil on the 8th day. Staphylococcus pyogenes was absent on the 1st day, but it was found in 8% of cases on the 8th day. There was no change in the rest.

(b) Group I (Sub-group ii).—Staphylococcus albus was isolated in 70%. There was no other organism found on the 1st day.

On the 8th day, Staph. Albus, Citreus and Streptococcus Pyogenes was present in 90%, 20% and 30% respectively, whereas Bacillus coli appeared in 20% of cases.

(c) Group I (Sub-group iii).—Staphylococcus albus increased from 80% to 100% on the 8th day, Staph. aureus was absent on the 1st day, and increased to 10% on the 8th day. Streptococcus Pyogenes increased from 10 to 50% of cases. Bacillus Coli was present in 20% of cases on the 1st day which was reduced to zero on the 8th day.

(d) Group I (Sub-group iv).—Staphylococcus albus was reduced from 60 to 40% of cases on the 8th day. Staph. Citreus was reduced from 20 to zero% on the 8th day. Staph. aureus was present in 20% of cases on both the days.

B. Group II

(Cases treated with dressings)

This group of cases showed increase in gram positive cocci as well as considerable increase of gram negative Bacilli (B. Coli and proteus) Staph. Citreus and albus increased from 20 and 72.5% to 25.5% and 100%, whereas B. Coli and Proteus increased from 7.5 and 0% to 22.5% and 2.5% respectively.

To summarise cases treated with the application of rectified spirit twice daily over the wound surfaces (sub-group i), showed that there was no growth in eight cases on the first day, which increased to twelve cases on the 8th day. There was scanty growth in 15 cases on the 1st day which was reduced to 11 cases on 8th day. Cases treated without the application of spirit or ointment over the wound surfaces "Sub-group iii", showed there were two cases of no growth on the 1st day whereas all cases had growth on the 8th day. On the whole, the results indicated that these were quantitative reduction of bacterial growth in sub-group (i) and increase in sub-group (iii) on the 8th day and also

indicate the effect of cleaning and bactericidal effect of rectified spirit over the wound surfaces.

A study of cases of sub-group (ii) treated with 5% chloramphenicol ointment, showed no growth in 30% of cases on the 1st day, whereas all the cases had growth on the 8th day, there was no luxuriant growth on the 1st day, 30% cases showed luxuriant growth on the 8th day. The wound surfaces smeared with ointment were more likely to absorb dust, and the organism carried by them; they were more difficult to clean and were more moist than those in other sub-groups; these factors might well have been the cause of increase in the bacterial flora amongst the cases of this sub-group.

Sub-group (iv) of group I behaved in the same way as sub-group (ii) of Group I.

Cases treated with dressings in Group II showed that there was no growth in 27.5% cases whereas all cases showed growth on the 8th day. None of the cases showed "luxuriant growth" on the 1st day, whereas 85% cases had luxuriant growth on the 8th day. This quantitative increase of bacterial growth under the dressed wounds was probably due to darkness, moisture and possible maceration of wound surfaces, which are known to favour bacterial growth. In sub-group (iii) cases, 60% showed luxuriant growth on the 8th day which is qualitatively less (80%) than that of dressed wounds (Gr. II). Cases treated with 5% Chloramphenicol, showed about 30% luxuriant growth on the 8th day, inspite of moisture of the wounds, more chance of dust containing bacteria getting stuck in the greasy ointment, and hence the effect of chloramphenicol locally has to be admitted. But the best result in the series is Gr. I in which wounds were exposed and were regularly cleaned with rectified spirit twice daily.

The luxuriant growth in this series being only 4%. The study of above facts indicate that alcohol has a place in reducing the bacterial flora of wounds, it also shows that moisture, darkness and maceration of wounds, surfaces under the dressed wounds and grease coating of ointments would favour bacterial growth.

Conclusion

1. The study of bacterial flora on normal human skin showed that staphylococcus albus was present in all the regions of human body. Staphylococcus Citreus present in fair number in all the regions of human body. Groin harboured B. Coli in 12% and B. Proteus in 4% of cases. Axillae and groin contained maximum number of organisms of different types. The presence of these organisms on human body, suggest that all these cases coming for surgery, a thorough cleaning of the skin surface must be carried out; any method aiming at short circuiting this procedure, of shaving and antiseptic dressings, will lead to introduction of these organisms from the skin to the wound during the operation.

2. Wounds treated without dressings and the application of rectified spirit over wound surfaces certainly has less amount of bacterial growth, but the bacteria were not completely eliminated.

3. Wounds treated with application of 5% chloramphenicol ointment, favoured the multiplication of organisms (colonising) and was more likely to absorb dust and the bacteria contained therein.

4. Wounds surfaces treated without application of alcohol or ointment, showed fair amount of bacterial growth, although the colonising organisms were reduced to nil, but it definitely showed the persistent survival of pyogenic cocci.

5. Cases treated with the application of alcohol over the wound surfaces but no administration of parenteral antibiotics, showed a similar result as that of the cases treated with the administration of parenteral antibiotics; administration of antibiotics parenterally or locally did not materially alter, the bacterial flora of wound surfaces, hence a plea is made to reorientate our thoughts about routine administration of antibiotics.

6. Wounds treated with dressings showed increase of bacterial growth both quantitatively and qualitatively in this group of cases, and the cases treated with the application of ointment, showed the highest incidence of wound infections.

7. In tropical countries like ours, for most of the year, warmth and humidity conditions favour bacterial growth. The usual type of dressings swabbed with layers of gauze and cotton wool tend to encourage bacterial growth rather than to prevent it. Moreover it is doubtful as to how long the dressings and bandages remain sterile themselves and are capable of preventing infection.

8. When wounds are kept exposed, they are by no means, "open wounds" for long, but become "closed" by the formation of coagulum over the wound surface. This is a fairly stable barrier against contaminants carried by dust and flies. The effect might further be augmented by use of mosquito nets, and not allowing procedures like sweeping of the floors or by dusting blankets and bed sheets in the presence of patients. In the light of above observations it would be advisable to keep our cases in air conditioned wards (if that was economically feasible), in which filtered air could be introduced, which would further reduce the environmental hazards.

9. Without dressings, wounds were seen to heal quickly and with comparatively less complications.

10. Economic aspect also demands attention, as over all saving in expenses over (a) undue use of antibiotics—both general and topical, (b) dressings and bandages, (c) less number of days spent in the hospital because of quicker healing.

When all these savings are considered nation wise, they will be considerable.

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THE XXII ANNUAL CONFERENCE

The XXII Annual Conference of the Association of Surgeons of India will be held at Poona from the 27th to 30th December, 1960. The following Subjects will be discussed :

1. **Reconstructive Surgery of the Biliary Tract.**
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2. **Clinical and Experimental Studies in Keloids.**
by Drs. K. K. Ghosh and J. L. Sinha.

Besides this, a few "Short Papers" will be read at the Conference. Further details about the Conference will be announced later.

* * * *

SUBJECTS FOR DISCUSSION AT FUTURE MEETINGS

23rd Meeting (1961)

1. (a) **Injuries of the Hand.**
by Dr. Subir K. Chatterjee, Calcutta.
- (b) **Early repairs of Hand Injuries.**
by Dr. C. Balakrishnan, Nagpur.
2. **Spinal Cord Tumours.**
by Dr. R. Chatterjee, Calcutta.

24th Meeting (1962)

1. **Tumours of Urinary Bladder.**
by Drs. K. K. Ghosh and H. K. Sarkar, Calcutta.
2. **Management of Burns.**
by Dr. Anjali Mukherji, Calcutta.
3. **Experiences in the Use of Extracorporeal circulation for cardiac Surgery.**
by Dr. A. K. Basu, Calcutta, P. K. Sen, Bombay and Dr. S. N. B. Roy
Calcutta.
4. **Septic and Suppurative Arthritis of the Hip.**
by Dr. B. Mukopadhaya, Patna,
and
5. **A Paper on Anaesthesia (to be decided in due course).**

—★—

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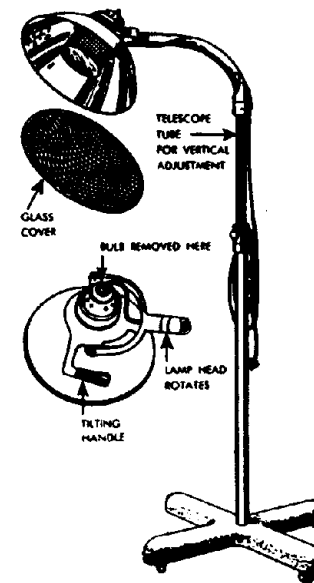
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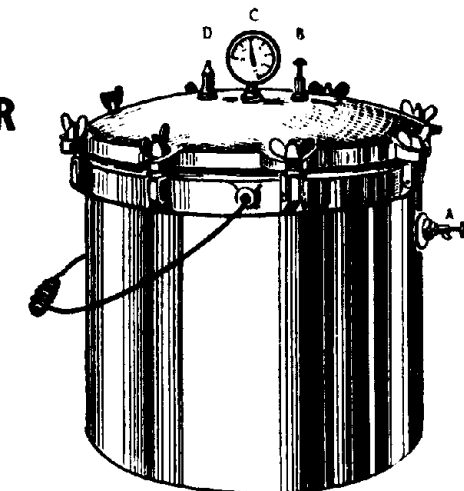
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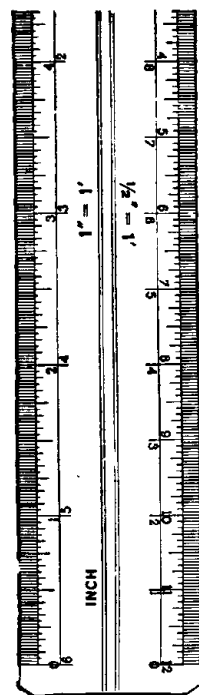
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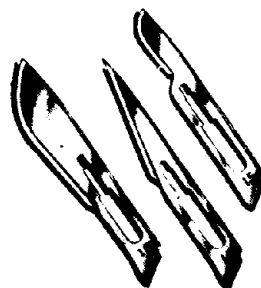
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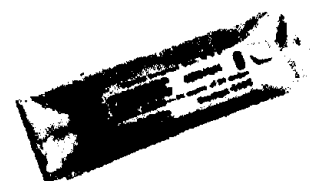


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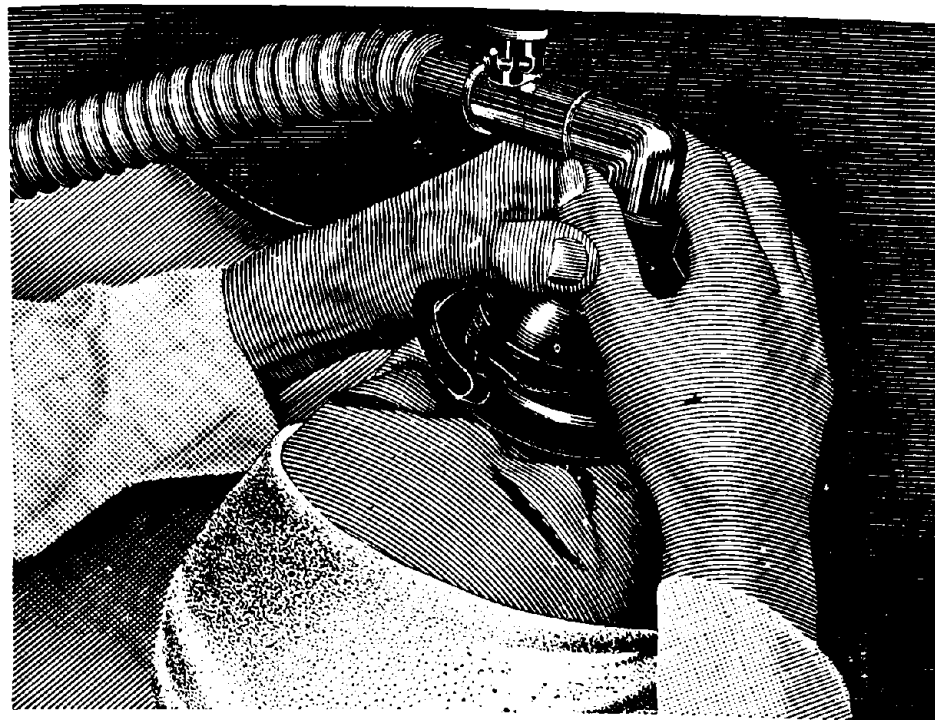
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No. 4

WIRE REINFORCED SKIN GRAFTS IN THE EXPERIMENTAL EXCISION AND RECONSTRUCTION OF THE TRACHEA

BY

TARA CHANDRA and P. N. SATSANGI, Lucknow.

A direct attack on a lesion of the tracheo-bronchial tree of any considerable extent demands some reconstructive method for the restoration of the continuity of the lumen. Many plastic procedures have been tried in experimental and clinical practice: free fascial grafts (Laffel)¹; fascial grafts supported over a stainless steel wire spiral (Belsey)², or over tantalum gauze (Rob and Bateman)³; skin tubes (Fairchild⁴, Negus⁵); prosthesis of glass tube and vitallium (Daniel)⁶; of polythene (Clagget et al)⁷; homogenous tracheal autografts (Jackson)⁸, lyophilised trachea auto-grafts (Marrangoni)⁹, wire reinforced dermal grafts (Gebauer)¹⁰ and a host of other methods. The brilliant results from the use of wire reinforced dermal grafts reported by Gebauer tempted us to try this procedure in greater detail.

The objectives in the reconstruction of the tracheo-bronchial tree, as pointed out by Belsey¹, are to provide for (i) lateral rigidity (ii) longitudinal elasticity and flexibility, (iii) an adequate and air tight lumen, and (iv) an uninterrupted lining of ciliated epithelium. A properly reinforced dermal graft theoretically would seem to answer these problems satisfactorily: it can provide

the rigidity required to maintain the lumen patent, yet would provide the necessary elasticity and flexibility, and would provide a ground substance for the regeneration of the tracheal epithelium. Further more, skin grafts have advantages over the fascial graft that it is stronger and can withstand tension in all directions while fascial grafts can only do so in the long axis of their fibres; secondly, its metabolism being higher than that of fascia it would be more readily incorporated in the living tissues (May Spann).¹¹ The present paper deals with our experiences with wire reinforced skin grafts.

Experimental Technique

General.—Experiments were done on mongrel dogs obtained from the Municipal Board. They were kept in quarantine for 3-4 days pre-operatively. They were closely watched post-operatively and a post-mortem was held on their death. Longitudinal and transverse sections of the grafts were cut and studied, in all relevant cases, to find out the histological changes.

Antibiotics.—Prepared grafts were dusted with penicillin powder, penicillin or sulphonamide powder was used locally. In all cases of operations on the neck penicillin, 4 lac

units, was given post-operatively for 4 days, in cases of intra-thoracic procedures however penicillin in the earlier series was changed to terramycin 100 mgm. intramuscularly for two days post-operatively.

Anaesthesia.—Anaesthesia was induced either by ether or by chloroform or intravenous kemithol. An intra-tracheal tube was put in. The femoral vein was exposed and an intravenous saline drip started. The anaesthesia was maintained by either ether and oxygen or by intravenous kemithol and oxygen. On an average, when ether alone was used both for induction and maintenance, 2 lbs. were required and when kemithol alone was used a 10% solution of 375 gm. to 5 gm. was required.

Operative procedures.—The following three procedures were carried out:—

1. Wedge resection of the cervical trachea and repair with wire reinforced skin grafts ... 21 dogs.
2. Wedge resection of the thoracic trachea and repair with wire reinforced skin grafts ... 7 dogs.
3. Wedge resection of the cervical trachea and repair with skin grafts ... 1 dog.

Exposure of the cervical Trachea.—With the dog placed supine, and the neck extended by a pillow placed underneath, a collar incision was made. Skin and platysma were divided and the two flaps reflected up and down. The strap muscles were divided and the trachea exposed. The pre-tracheal fascia was divided. A segment of trachea was dissected free from the surrounding structures and a tape passed around it.

Exposure of the thoracic trachea.—Three approaches were tried one through the bed of the 4th rib on the left side, another through the bed of the 4th rib on the right side and the third through the right 4th intercostal space. The last approach was found to be the most convenient and was adopted as a routine in the later series. The mediastinal pleura was incised, and on the right side the vena azygos was dissected and divided between ligatures. A segment of trachea was dissected free from the surrounding structures and a tape passed around it.

Preparation of the Graft.—Skin pieces were obtained from three sites, locally from the wound margins, from the non-hairy part of the abdomen and thirdly, following the advice of Gebauer,⁷ from the interscapular region. The skin from the interscapular region was found to be thicker than elsewhere and this region may be adopted as the site of choice. It was not easy, in the dogs, to separate the epidermis from the underlying dermis and, therefore, whole thickness skin grafts were used, all the subcutaneous fat having been carefully scraped away. The selected site was well shaved and a rectangular piece of skin was taken out. In the beginning, pieces as wide as 1½ inches and 2 inches long were removed but later the width was limited to ½-¾ inch.

The skin pieces were reinforced with stainless steel wire nos. 30 and 32, either in the form of a mesh i.e. in both the axes of the graft or in the form of a spiral i.e. in the long axis only, of the graft. A straight cutting needle of suitable size was used. Gebauer has advised 30 gauge wire welded to a cutting needle which is not too heavy and does not have much of a curve. Such a needle was not available over here. The prepared graft was dusted with penicillin powder and kept aside wrapped in a moist sponge.

Results and Analysis

A detailed account of the results are given in the accompanying table.

Wedge resection of cervical trachea and repair with wire reinforced skin graft.—This procedure was carried out on 21 dogs. There were two deaths during the operation. Of the remaining 19, six (dog nos. B4, B5, B9, B12, B23 and B30) died during the first week; one dog (dog no. B1) ran away in the second week, two (dog nos. A12 and B2) died in the 4th week, three (dog nos. A15, B31 and B35) died in the fifth week, two (dog nos. B61 and B15) died in the 6th week, one (dog no. B24) died in the 7th week, while one (dog no. 34) died in the 8th week and dog no. A14 was sacrificed in the 8th week. Thus eight dogs survived more than one month.

Of the six deaths that occurred in the first week, two were due to technical faults, dog no. B9 died of shock following haemorrhage while dog no. B12 died of mediastinal emphysema due to defect in suturing, the rest of the four dogs died due to infective complications.

Out of the four dogs that died within 2-4 weeks, in two (dog nos. A11 and A13) the skin graft was taken from the neck wounds, and consequently there was tension on the skin margins during closure, which led to the breaking down of the sutures and resultant infection. In dog no. B2 where there was no infection, the graft took nicely, there was complete fibrous tissue replacement of the graft, the wire was incorporated in the graft. The lumen was stenosed, and microscopic examination showed bundles of collagen fibres in the peripheral parts of the grafts and fibroblasts and inflammatory cells in the inner part of the graft (Fig. 1 (a) and (b)).

Wedge resection of the cervical trachea and repair with wire reinforced skin graft.—1-2 cartilage rings were removed, and in the earlier experiments, a graft equal to the width of the cartilage was sutured in place after careful moulding but this procedure led to the immediate narrowing of the lumen; hence, in the later experiments a graft equal to the size of the defect created was used. The anastomosis was made with interrupted sutures of fine wire in the beginning and later with 00 silk. The corners of the graft were always trimmed as they were almost devitalised during reinforcement. The graft margins were made to overlap slightly the defect margins, as is done in patch grafting anywhere else. If any wire loop tended to project beyond the graft it was turned towards the tracheal lumen. It was always the deeper surface of the graft which was put towards the lumen, the epidermal side was kept on the outer side. Air tightness of the suture having been tested the wound was closed.

Wedge resection of the thoracic trachea and repair with wire reinforced skin graft.—The technique of grafting was similar to that described above except that in one case the epidermal surface was put towards the lumen.

A catheter was put in the chest through a separate stab incision and connected to a suction machine. The chest was closed, the lung was inflated and the catheter pulled out.

Wedge resection of the cervical trachea and repair with skin graft.—It was done in one dog only. One cartilage piece was removed and a skin piece of suitable size was sutured in place, keeping the epidermal surface outside and the deeper surface, inside.

Table Showing Summary of Experiments and Results

Experiment No.	Procedure	Dog No.	No. of Days Dog Survived	Post-Operative complications	Post-mortem findings		Remarks
					Trachea	Else-where	
1	Wedge Resection of the Cervical Trachea and Repair with wire Reinforced Skin Graft.	A 11	19	—	Graft partially taken.	Donor area gaped.	—
2		A 12	25	—	Graft taken completely.	—	—
3		A 13	15	—	Graft taken partially.	Donor area gaped.	—
4		A 14	55	—	Graft replaced by a fibrous membrane.	Small stitch abscess.	—
5		A 15	33	—	Graft turned bluish.	—	—
6		B 1	13	Dog ran away.	—	—	—
7		B 2	26	Local collection in the neck wound on the 3rd day. Aspirated.	Graft taken well. Marked stenosis.	—	—
8		B 3	Died	during	Operation.	—	—
9		B 4	7	Local sepsis.	Graft sloughed out.	Right lower lobe consolidated.	—
10		B 5	5	Do.	Do.	Two right lobes consolidated.	—
11		B 6	37	Respiratory obstruction in the last week.	Marked stenosis.	—	—
12		B 7	Died	during	Operation.	—	—
13		B 9	2	—	No leakage.	—	—
14		B 12	3	Hissing noise during respiration.	Leakage at left upper corner.	Mediastinal emphysema.	—
15		B 15	40	Respiratory obstruction in the last week.	Marked stenosis.	—	—
16	Wedge Resection of the Thoracic Trachea and Repair with wire Reinforced Skin Graft.	B 23	6	Tracheo-cutaneous fistula.	Graft not taken.	Two right lobes and left lower lobe consolidated.	—
17		B 24	45	Laboured breathing in last fortnight.	Marked stenosis.	—	—
18		B 30	6	Dyspnoea on 5th day.	Leakage at left upper corner.	Mediastinal emphysema.	—
19		B 31	34	Laboured breathing in the last days.	Graft replaced by fibrous tissue. Lumen narrowed.	—	—
20		B 34	54	Do.	Do.	—	—
21		B 35	34	Do.	Do.	—	—
22		A 17	14	—	Fear in the posterior fibrous membrane. No leakage at suture line.	—	Technical Defect.
23		A 18	14	—	Graft sloughing out.	Total emphysema on left side; most of lung on both sides consolidated.	—
24		A 25	5	—	No leakage.	Right sided pleural effusion.	—
25		A 27	14	—	Leakage at one point.	Mediastinal emphysema.	—
26		A 28	Died	during	Operation.	—	—
27		B 28	1	—	No leakage.	—	—
28		B 29	4	—	Graft sloughing out.	Emphysema on the right side with consolidation of two right lobes.	—
29	Wedge Resection of the Thoracic Trachea and repair with Skin Graft.	A 36	96	—	Perfect healing but with stenosis.	—	Sacrificed.



Fig. 1-a
Anastomotic site in Dog no. B₂ showing fibrous tissue replacement of the graft.



Fig. 1-b
Histological structure of the graft. Peripheral part rich in fibres, inner in inflammatory cells.

In dog no. A12, again, where there was no infection the graft was replaced by a fibrous membrane which incorporated the wire. But in this case there was a lining of a single layer of cubical epithelium (Fig. 2a and b). In the other two cases the microscopic picture was dominated by signs of inflammation.

In all the cases dying within 4-6 weeks, the graft had taken well. But there was stenosis of the lumen, and fibrous tissue replacement of the graft. In dog no. B31 remnants of skin and hair follicles were still discernible at places. Unfortunately a certain degree of post mortem autolysis had taken place so the full histological details could not be made out, in the rest of the cases the fibrous membrane revealed no marked histological difference from the earlier group of dogs. No evidence of a lining epithelium was seen in any of these cases.

In dogs dying within 6-8 weeks, stenosis was a still more marked feature. In almost all these cases respiratory difficulty had appeared in the last few days of their lives.

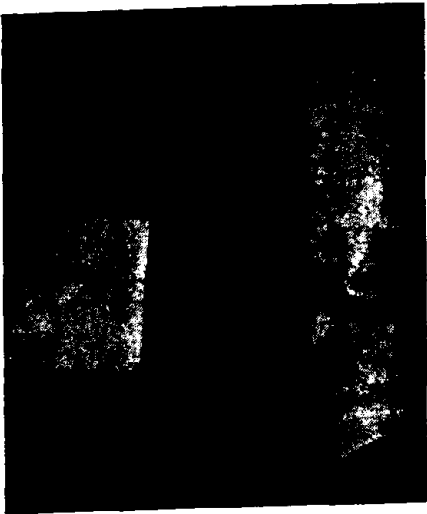


Fig. 2-a
Anastomotic site in Dog no. A₁₂ showing fibrous tissue replacement of the graft.

In dog nos. B24 and B34, the fibrous membrane consisted of bundles of collagen fibres, a few inflammatory cells and no epithelial lining. Dog no. A14 demonstrated the phenomenon of extrusion of the wire. The whole wire was lying crumpled up attached at one end of the fibrous membrane bridging the defect. Histologically the fibrous membrane revealed less of well formed bundles and more of fibroblasts, inflammatory cells and newly formed blood vessels (Figures 3 (a), (b) and (c).

Wedge resection of the thoracic trachea and repair with wire reinforced skin.—These procedures were carried out in seven dogs, one died during operation, four dogs died within 1-2 days and two died within 4-5 days.



Fig. 2-b
Microscopic section of the graft showing a single layer of cubical epithelium.

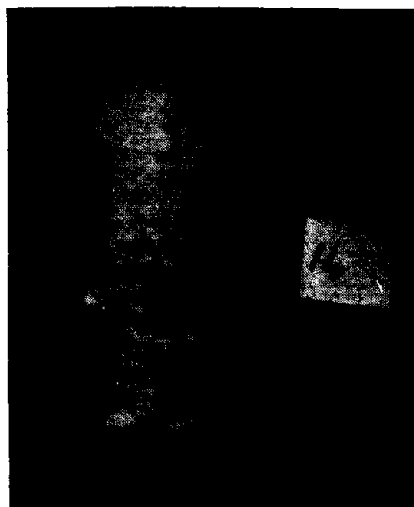


Fig. 3-a

Anastomotic site of the Trachea in Dog no. A₁₁ from outer aspect showing fibrous tissue replacement of the graft.



Fig. 3-b

Same from the inner aspect showing the crumpled wire attached at the end of the graft in the process of extrusion.



Fig. 3-c

Microscopic section of the graft showing the granulation tissue.

Discussion and Conclusions

The fate of the transplanted skin grafts in deeper tissues has been a subject of study by various workers. Mair⁹ from his study of hernial repairs by skin grafts, concluded that, 'the skin changes into a highly vascular connective tissue in which no epidermal or dermal elements can be identified, the graft shows a rich infiltration with collagen and elastic fibres'. He did not find any evidence of even microscopic cyst formation. Peer and Paddock¹³ found that the epidermal elements survive for long and lead to cyst formation. May and Spann¹¹ found that cutis grafts (epidermis having been removed) is readily replaced by living connective tissue with blood vessels and nerve supply.

The poor results obtained in this group were due to the fact that post operative drainage of the pleural cavities was difficult to carry out and, secondly, in certain cases, the pleural cavities in dogs communicate with each other and thus a bilateral pneumothorax develops.

A study of the grafts showed that though they were carefully moulded before insertion, they tended to flatten out. Histological examination of the longitudinal sections showed that the submucous layer at the junctional site hypertrophies as early as 1-2 days after operation and contains many newly formed blood vessels and inflammatory cells which tend to invade the graft.

Wedge resection of the cervical trachea and repair with skin graft.—This procedure was carried on in one dog no. A₃₆ only which survived for about 14 weeks. There was marked stenosis of the lumen, with fibrous tissue replacement of the graft but the gratifying feature was an inner lining of ciliated epithelium. (Figures 4 (a) and (b)).

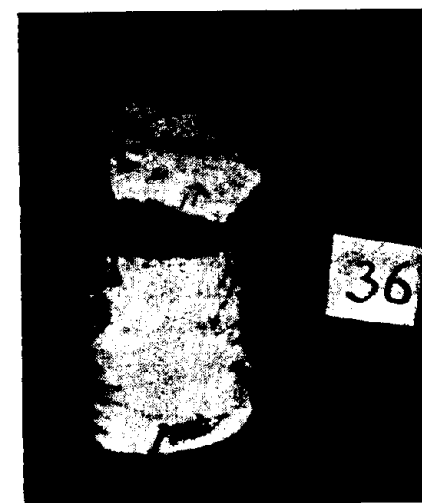


Fig. 4-a

Anastomotic site of Trachea in Dog no. A₃₆. Showing fibrous tissue replacement of the graft with stenosis.



Fig. 4-b

Microscopic section of the graft showing an inner lining of ciliated epithelium.

The skin transplants used in the tracheo-bronchial reconstruction may be expected to behave like embedded skin transplants elsewhere. But these differ from the rest in two respects; firstly, they have to derive their blood supply from the comparatively avascular cartilages and secondly, they have to lie unsupported on any bed and therefore the study becomes more interesting. Gebauer^{5, 6} who introduced this method and has used it extensively in the reconstruction of tubercular stenosis of the trachea and bronchi, removes the epidermis, reinforces the dermis only with wire and keeps the epidermal side towards the lumen. He believes that these grafts are not converted into fibrous tissue, but retain viability, as well as their histologic, collagenous and elastic characteristics. The advantage of keeping the epidermal side towards the lumen, in his opinion is that this surface is naturally designed to bear an epithelium. In his earlier publications he even postulated that remnants of the papillae of the basal cell layer may regenerate a ciliated epithelium by metaplasia, though now he no more believes in it.

The technique in the present series was slightly different from that of Gebauer's. The epidermis was not removed, more as a technical expedient rather than on any theoretical grounds, and it was the deeper surface that was kept towards the lumen. The results obtained demonstrate that within a day or two, marked submucous hypertrophy of the junctional site occurs, new blood vessels and inflammatory cells appear. Very soon the whole of the graft becomes vascularised and infiltrated with inflammatory cells. Gradually the whole graft is converted into a thick fibrous membrane, consisting of bundles of collagen fibres, fibroblasts and inflammatory cells which gradually diminish in number. As no special staining for elastic tissue was made it is not

possible to deny or affirm the presence or absence of elastic fibres. The wire is usually incorporated in the fibrous membrane but it is not a predictable feature. The wires may sometimes be extruded.

All the skin structures—epidermis and hair follicles gradually disappear. Only scattered remnants were seen in the 5th week and none in the 6th week. A lining epithelium does grow, whether invariably or occasionally cannot be answered emphatically; the width of the graft may have some part to play in it. Evidence of a cubical epithelium was seen as early as four weeks and ciliated epithelial lining was found after 13 weeks. Evidently, this epithelial lining was a result of the growth of the tracheal epithelium over the graft.

A question arises as to whether a ciliated epithelium all round the circumference of the reconstructed tracheo bronchial lumen is absolutely essential. Belsey¹ believes it is, while Gebauer⁶ is not so dogmatic. He is of the opinion that the presence of a ciliated epithelium on a part of the circumference of the lumen can subserve the physiological function of expulsion of the mucous and secretions. He says, "It seems illogical to expect more normal epithelium than that which covers a healed stenosis. It consists of an atrophic type of bronchial epithelium with a scarcity of mucous glands". Nevertheless, as seen in the present study, and as demonstrated by Gebauer, there is always a possibility of regeneration of a ciliated epithelium.

As regards the other aspects of the problem, the wire reinforced skin graft does provide a non-collapsible semi rigid wall. But the difficulty is, it tends to stenose and may necessitate reoperation. This stenosis is a factor common to all the reconstructive procedures of the trachea and bronchi. The

large availability and the technical ease in handling, make the skin graft superior to fascial, pleural or pericardial grafts with or without supports. The semi-rigidity and flexibility proves it a better alternative to the use of glass or metal prostheses. It seems, therefore, not illogical to conclude that the wire reinforced skin or the dermal grafts offer some of the very good, though not ideal, reconstructive procedures for tracheo-bronchial defects.

Summary

1. Experiences with wire reinforced skin grafts in the reconstruction of the trachea in 29 dogs have been described.
2. The fate of the skin graft has been discussed and compared with the results of other workers.

3. Attention has been drawn to the fact that fibrous tissue replacement of the graft occurs, and the lumen tends to stenose.
4. There is always a possibility of the regeneration of a ciliated epithelium.
5. There is a danger that in certain cases the wire may be extruded.

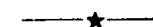
Acknowledgements

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COMPLICATIONS OF RESECTIONS FOR PULMONARY TUBERCULOSIS*

BY

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The increasing popularity of resectional surgery in the treatment of pulmonary tuberculosis warrants a careful appraisal of its role in the therapeutic programme against this disease in our country. Recent reports from the West give mortality rates as low as 1.7%. The picture is not so bright as yet in our country, and for this reason we have ventured to study and assess the causes, the best methods of prevention, and the management of the complications following resectional surgery.

The first 90 consecutive pulmonary resections undertaken at the Kanchrapara T. B. Hospital during the period Feb. 1956 to Nov. 1958 have been studied. The operations initially were performed by two surgeons, the late Dr. M. K. Roy Chowdhury, and by Dr. G. S. Karai. Subsequently, the operative work has also been carried on by Dr. A. K. Ghosh. The number of pulmonary resections carried out each year is shown in Table I.

From Feb. 1956	... 20
1957	... 15
1958 up to Nov.	... 55

A note is necessary about the type of cases tackled in this initial group. Kanchrapara Tuberculosis Hospital is a large sanatorium 40 miles from Calcutta housing over 900 patients. At the inception of the Surgical Unit in Nov. 1956 about 420 cases were initially reviewed for possible surgery, and 200 from this number selected and recommended for operation. There were many in this lot with old-standing chronic disease,

perhaps 50% being of a salvage nature. All of them were medical failures and had had a prolonged trial of rest, and antitubercular drugs with or without collapse therapy. The duration of their illness varied from 1½ to 8 years, the majority having the disease from 3 to 5 years at the time of operation, and during this period receiving Streptomycin from 40 gm. to 225 gm. often irregularly given prior to hospitalisation, producing resistance states in many.

The pre-operative sputum status was as follows:

	+ve	-ve
Male	... 11	38
Female	... 7	34
Total	... 18	72

KANCHRAPARA TUBERCULOSIS HOSPITAL
PULMONARY RESECTIONS 1956-58.
AGE & SEX DISTRIBUTION

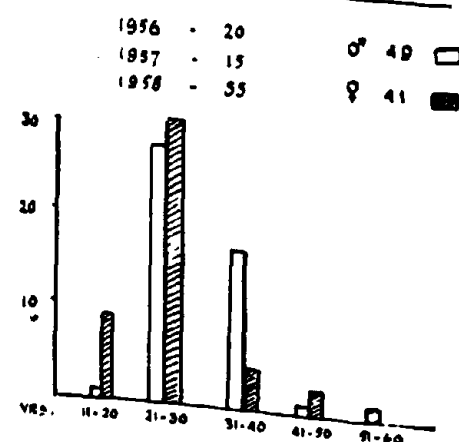


Fig. 1

*Paper read at the Third Annual Thoracic Surgical Conference of the Association of Surgeons of India at Vellore in July 24, 1959.

Of these 90 cases, 23 were pneumonectomies, 44 lobectomies, 21 segmentectomies, 2 lobe and segment combinations. 4 were planned pleuropneumonectomies and one in each group of lobectomy and segmentectomy had associated pleurectomy.

KANCHRAPARA TUBERCULOSIS HOSPITAL
DISTRIBUTION OF RESECTIONS,
SEX, LATERALITY & DEATHS

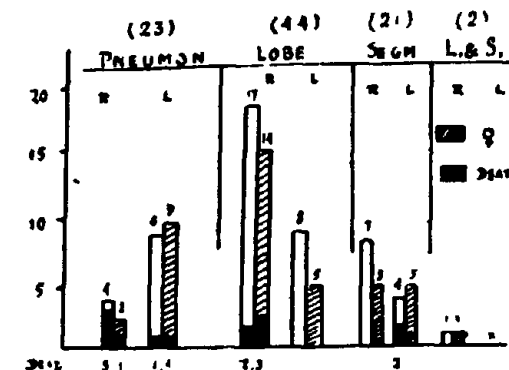


Fig. 2

The preponderance of pneumonectomies on the left side, of lobectomies and segmentectomies on the right, in almost equal numbers in both sexes may be noted, for besides being an index to the laterality of the cases, it has a bearing on the nature of the complications.

The indications for resection in this series have been considered under the following heads.

Fig. 4.—Table shows the complications met with; many of these complications were concomitant, and they occurred in 35 cases of the 90, an incidence of 39%.

An analysis follows, of the complications considered individually.

Kanchrapara Tuberculosis Hospital
Indications for Resection
90 Cases 1956-58

Particulars	Male	Female	Total
1. Cavity	11	9	20
2. Destroyed Lung/Lobe	4	2	6
3. Endobronchial Stenosis	2	—	2
4. Bronchiectasis	5	4	9
5. Residual Disease	13	12	25
6. Atelectasis	4	6	10
7. Extensive Unilateral Disease	5	7	12
8. Tuberculoma	1	0	1
9. Failed Thoracoplasty	2	—	2
10. Disease Cum Empyema	2	1	3
Total	49	41	90

Fig. 3

Kanchrapara Tuberculosis Hospital
Incidence of Complications
90 Cases, Pulmonary Resection 1956-58

Particulars	Male	Female	Total%
1. Empyema with/without B. P. Fistula	9-18%	3-7.3%	12, 13.3%
2. Residual air space in Pleural cavity	6-12%	2-5%	8, 8.8%
3. Pleural Haematoma	4-8%	—	4, 4.4%
4. Major Wound Infection	3-6%	—	3, 3.3%
5. Spread of Disease	3-6%	1-2.5%	4, 4.4%
6. Shock	6-12%	2-5%	8, 8.8%
7. Cardiac Arrhythmia	—	1	1
Hypotension	—	—	—
Pyrexia	1-2%	4-10%	5, 5.5%
Icterus	1-	—	1
Bronchospasm	1-	—	1
Paresis Left Recurrent Laryngeal Nerve	1-	—	1

Fig. 4

(1) Empyema with/without Bronchopleural fistula

In this group of 12 cases, evidence of fistula was present in all cases except one, where following a left pneumonectomy only an empyema occurred and was treated by drainage and thoracoplasty. Since secondary pyogenic infection is invariable, and the line of management is the same, no attempt at distinction between pyogenic and tubercular empyema was made.

Their analysis according to operation performed is as below.

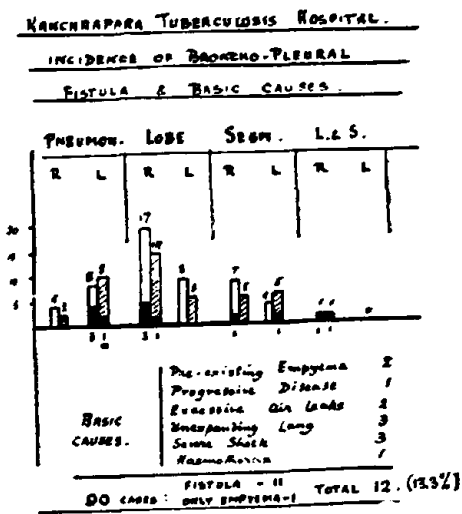


Fig. 5

It needs to be studied side by side with the analysis of the probable factors in causation of the empyema as discoverable in each case.

- 1. Pre-existing empyema ... 2
- 2. Operation undertaken in phase of progressive disease ... 1
- 3. Uncontrollable air leak from raw surface ... 2

- 4. Unexpanded lung
 - (a) following lobe and segment ... 2
 - (b) with emphysema of lung ... 1
- 5. Severe shock ... 3
- 6. Haemothorax ... 1

All these fistulae declared themselves within 2 days to 3 weeks after operation, usually around the 10th day. Pneumonectomies showed a high rate, 25% in males, and 9% in females. It is a common measure of precaution to avoid operating if the main bronchus evidences active disease, and yet, advising resection in a case with persistent positive sputum cannot always be avoided. Of the four fistulae following pneumonectomy, three had positive sputum pre-operatively, one of the lungs being resected deliberately to check progressive disease in a young adult of 19. Our technique of closure of the bronchus has generally been to clamp the distal end, cut and insert sutures, and close the proximal end with black silk or cotton interrupted sutures, just the minimal number, and without excessive stripping of the fibrous coat of the bronchus. The bronchial vessels as far as possible are dealt with prior to cutting the bronchus. Pleural coverage has not always been given, but locally Streptomycin powder is used before final closure of the thoracotomy.

Because of continued air leakage from the strip surface following damage to minute bronchioles, segmental resections rate just as high as pneumonectomies in the production of fistulae. Occasionally this has been due to misjudgement, where the remaining anterior segment in an upper lobe contained small scattered disease and would have warranted perhaps more safely, a lobectomy. We have over the past two years stopped doing a combined lobectomy and segmentectomy. Because of the small volume

residual lung, one often plans a quick acc-reducing thoracoplasty over it, but the appearance of a fistula has usually beaten to the post. We consider, disease that has infected one lobe and transgressed the sure to significantly affect the next, is preferably dealt with as a pneumonectomy else resected under a thoracoplasty.

(2) Residual air-containing space in pleural cavity

8 cases in this group manifested apical pleural air pockets without any definite evidence of fistula, clinically or radiologically. One or a combination of antecedent causes were small bronchial leaks, small residual lung or early adhesion of visceral and parietal pleura in the lower part of the pleural cavities. All eight followed upper lobe resections and were treated with post-resection thoracoplasty, our policy being that if after 3-6 weeks' observation the air space persists, a small thoracoplasty will reduce the potential risk from the pocket.

(3) Pleural Haematoma

Post-operative pleural collection of blood was met with in 4 cases, 3 after segmental and 1 after a lobar resection. Intrapleural collections once clotted have not been easily aspirable, and while spontaneous absorption occurred in two cases, in one case it evacuated itself through the bronchial stump leading to a bronchopleural fistula. The fourth case was deliberately reopened next morning for evacuation of clot following signs of a persistent slow haemorrhage within the chest overnight. Apparently a large intersegmental vein had been exposed and had failed to stop bleeding.

(4) Post-operative Shock and Haemorrhage

Haemorrhage, where it has been a problem during operation, has reflected itself in the complications of the post-operative



Fig. 6
Post-operative X-ray showing Intrapleural Haemorrhage.



Fig. 7
X-ray 3 months after Evacuation of Haemorrhage.

phase as shock, and sometimes even been directly responsible for post-operative deaths. Thoracic surgeons everywhere cannot fail to appreciate the significant advantages to be gained from a good anaesthetist, their newer techniques and a sounder understanding of the complicated subject of fluid requirements and body mechanisms under anaesthesia. Thanks to their efforts post-operative shock is much less to-day. In this series, of 4 cases who survived significant post-operative shock, 3 were due to haemorrhage and responded to blood transfusion and vasopressor drugs, while the fourth which we attributed to a blood transfusion reaction was saved by cortisone and antihistamine intravenously.

Eight cases in this group of significant shock and haemorrhage appear to have had a haemic cause for the blood loss and died within 36 hours of the operation. Accurate determination of the exact cause is difficult. One of these patients, during closure of a post-resection thoracoplasty under general anaesthesia, developed intense bronchospasm soon after a fresh bottle of blood had been started. Almost simultaneously marked oozing commenced from everywhere, the blood pressure fell, and a sharp tachycardia warranted reopening of the muscle layers to look for haemorrhage. No specific source was found, and the patient died soon after presumably of an anaphylactic reaction to the transfusion. Subsequent sampling did not show any incompatibility. He was originally resected for right upper lobe disease 3 weeks previously, and had received 1800 c.c. of blood at the time.

Apart from the features of this case, in the other 7 there is a picture closely associated with widespread vascular oozing that occurs after a stretch of extrapleural stripping or the separation of extensive capillary adhesions, particularly noticed when the

operation has lasted a few hours, and characterised by a marked dilution of the blood and widespread oozing all over. The probable sequence is that the initial blood loss during mobilization depletes the liver fibrinogen, particularly if the original content was low. Rapid transfusion of stored blood does not restore the fibrinogen level, adds to the defective coagulation with the citrate infused, and a simultaneous adrenocortical depletion completes the picture of an irreversible type of shock which has sometimes baffled us during a long operation. What part is played by a mounting blood acidosis remains questionable as well. Where it has proceeded into an irreversible state we have lost the case, generally within 36 hours, in spite of all efforts.

Recently in cases where such a difficulty has been anticipated, intravenous cortisone given just before the mobilisation commences, has remarkably improved the picture, and capillary oozing has been milder. Carried into the post-operative phase, cortisone and vasopressor drugs have only been given provided no major source of bleeding was present. The use of cortisone and simultaneous replacement of blood cells, of fluid volume, and judicious doses of Vit. K, C, and Calcium gluconate, have encouraged us to extend the ambit of salvage surgery to the residue of poor risk cases lying in the sanatorium, provided respiratory efficiency has not been a bar.

(5) Post-operative Spread

Post-operative spread of tuberculosis to unaffected segments or flare-up of controlled contralateral disease, has not been so much of a bugbear to us as older reports would anticipate. Transbronchial spread occurred in 4 cases—only one of them had a positive sputum pre-operatively, and two were associated with a bronchopleural fistula. The first case was a medical failure, with marked

bronchostenosis and tubercular ulcerations almost up to the carina, sputum 3 + positive. A left pneumonectomy was deliberately carried out by Dr. M. K. Roy Chowdhury, and though the patient had a significant post-operative spread in the opposite lung, the patient has since been discharged about 4 months ago (Fig. 8 & 9). None of the patients in this group died, except one, who died 10 months later; he also had a bronchopleural fistula and empyema and is included in the Bronchopleural fistula series.

Among other complications, cardiac arrhythmia with sudden hypotension, 10 hours after a left apico-posterior resection in a woman of 50, was probably of coronary origin, and required intravenous noradrenaline for 72 hours to restore her.

A new problem facing us is that of post-operative staphylococcal pneumonitis, resistant and coagulase + ve; one case, a girl of 19 died of suppurative pneumonitis 3/52 after a lower lobectomy.

Pyrexia of other than pulmonary origin, in 5 cases, responded to quinine in 2, was due to B. Coli in the urine in 1, and was unexplained in 2. There was one case each of serum jaundice, of persistent bronchospasm after a pneumonectomy, and one of damage to the left recurrent laryngeal nerve.

The total number of dead being 13 out of 90, the mortality has been 14.4% (Fig. 10). These have been 8/49 in males, and 5/41 in females; Right sided operations preponderating there were 9/51 on the right, and 4/39 on the left. Pneumonectomies for



Fig. 8
Pre-operative X-ray.

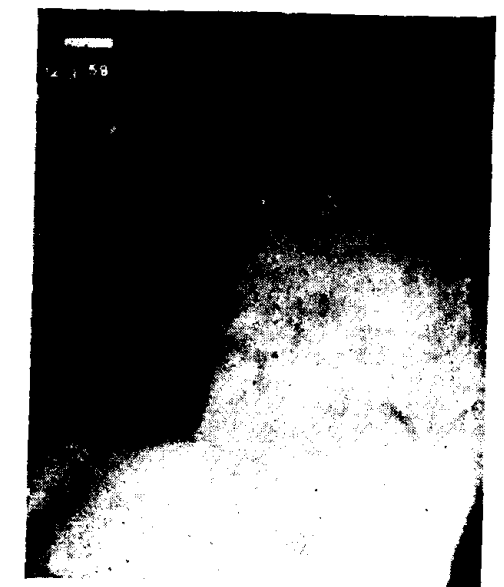


Fig. 9
Post-operative Spread.

Kanchrapara Tuberculosis Hospital Analysis of Mortality in Resections

Cause of Death

1. Irreversible Shock and Haemorrhage	...	8
2. Vascular Accidents	...	3
3. Pulmonary Oedema	...	1
4. Pulmonary Suppuration	...	1

Operated Lesion	No.	Dead	%
1. Cavity	20	4	20%
2. Destroyed Lung	6	4	66%
3. Endobronchial Stenosis	2	—	—
4. Bronchiectasis	9	—	—
5. Residual Disease	25	1	4%
6. Atelectasis	10	1	10%
7. Extensive Unilateral Disease	12	2	16.5%
8. Tuberculoma	1	—	—
9. Failed Thoracoplasty	2	1	50%
10. Disease <i>Cum</i> Empyema	3	—	—
Total	90	13	14.4%

Fig. 10

destroyed lung claimed the highest toll particularly if on the right side. Shock and haemorrhage, and vascular accidents have been responsible for the immediate mortality in 11 cases, while one died of pulmonary oedema within the 36 hour post-operative period.

In summary, therefore, it will be seen that the majority of the post-operative complications do not radically influence mortality so much as they do, the morbidity. However small the part surgeons have to play in the total management of tuberculosis, we are judged by the end result of those we work upon. To the tubercular patient submitted to surgery after the long period of waiting, there is nothing so frustrating, or so damaging to his morale as the postponement of his expectations by long continued morbidity. It is up to us as surgeons aiming at the early rehabilitation of the patient, that we deliver him as far as possible from this surgical infliction, by careful attention to all possible details to minimise the incidence of morbidity.

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ANAESTHESIA IN CARDIAC SURGERY

BY

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The last two decades or so have witnessed a tremendous growth and phenomenal advance in thoracic and cardiovascular surgery, thanks to the invaluable part played by chemotherapy, antibiotics and blood transfusion, but perhaps the most valuable contribution to the advance of cardiac surgery has been made by the improved anaesthetic techniques and as the tempo of this progress rises fast, anaesthesiology must of necessity keep pace with it.

During any surgical procedure, while administering general anaesthetic, the anaesthesiologist aims at keeping the patient asleep, free from pain and reflexes, properly relaxed and as near the physiological status as possible, without, at the same time, jeopardizing his safety. For this purpose certain fundamental principles have to be followed. These include assuring the patient of adequate oxygen supplies for his tissues and elimination of carbondioxide. This necessitates maintenance of an adequate supply of oxygen in inhalational gas mixture, an effective spontaneous or controlled respiration, an adequate gaseous exchange between the alveoli and lung capillaries and enough circulating blood volume to transfer the gases to and from the tissues.

In intrathoracic surgery, these fundamentals become all the more important.

In cardiac surgery, the anaesthetist is confronted with special problems. The operative procedure means intrusion into the sanctity of the heart itself, the most vital organ in the body. Over and above, it is not a sound heart to deal with, but most

often a grossly diseased and failing heart with myocardial insufficiency, congenital anomalies or valvular defects which have greatly altered the haemodynamics of the body.

Cardiac surgery thus combines the hazards of general surgery and anaesthesia with special hazards inherent with intrathoracic surgery and surgery of the heart itself.

Under these conditions, far from ideal for the anaesthetist, his primary aim then becomes the safe conduct of the patient through the operative period. All other considerations are relegated to the back ground. This is by no means an easy task. It requires constant vigilance and watchfulness, a precision of judgement and experience and skill of years.

In ordinary surgical procedure in an average patient, a small error of judgement by the anaesthetist or a minor technical fault may not cause much harm to the patient, or at the most may result in a situation easy to retrieve, but in cardiac surgery this may tip the scales against the patient's life, hence all the basic principles of anaesthesiology have to be observed scrupulously in order to maintain the delicate balance between life and death in these cardiac invalids.

History

John Snow in 1858 first administered an inhalational anaesthetic agent through an endotracheal tube.

Tuffier and Hallian were the first to use rhythmic inflation of the lungs after endotracheal intubation for thoracotomies in animals.

Large bore endotracheal catheters were introduced by Magill and Rowbotham during first World War.

Ralpwaters first used carbon dioxide absorption technique by chemical means for anaesthesia.

Rehn in 1897 launched the modern attack on diseased heart by successfully repairing a wound in the heart.

In 1913, Doyen first attempted surgical correction of a stenosed pulmonary valve and Tuffier successfully dilated a stenosed aortic valve. Dilatation of the mitral valve was performed by Souttar with success in 1925.

Gross in 1939 ligated a patent ductus.

In 1945, Blalock and Taussig heralded the surgical attack on cyanotic heart disease by advocating systemic-pulmonary artery anastomosis.

In 1948, Bailey performed the modern mitral commissurotomy while Brock and Sellors working independently established the operation of pulmonary valvotomy.

In 1950, McQuiston introduced the concept of induced hypothermia during anaesthesia to decrease the oxygen demand during cardiac surgery on "blue babies".

Valuable contributions in this field have been made by Bigelow (1950), Swan, Virtue (1955), and Dundee (1959).

Recent demonstrations (Gibbon, Lillehei, Cooley) of the feasibility of extracorporeal circulation for cardio-pulmonary bypass to secure a dry heart for open intracardiac

surgery has ushered a new era in the realm of cardiovascular surgery and sustained efforts continue to be directed towards achievement of the ideal.

Material

This report deals with 76 patients who were anaesthetized 80 times (4 patients being anaesthetized twice) for various cardiac surgical procedures during a period of January 1952 to May 1959 at V. J. Hospital Amritsar. Of these actually 73 patients could be operated upon, 3 patients having been sent back after only being anaesthetized.

46 of the patients were males and 30 females. Their ages ranged from 4 to 42 years. The number of patients in various age groups is shown in Table I.

Table I

Age	No. of patients
Upto 10 years	2
11-20 years	36
21-30 years	31
31-40 years	6
Above 40 years	1
Total	76

Table II shows their preoperative diagnosis, and the details of various surgical procedures performed are given in Table III.

Table II

Disease	No. of patients
Mitral stenosis	49
Constrictive pericarditis	19
Patent ductus arteriosus	5
Fallot's tetralogy	2
Congenital pulmonary stenosis	1
Total	76

Table III

Operations performed.	No. of patients.
Mitral valvulotomy	44
Pericardiectomy	19
Ligation of patent ductus	3
Blalock's operation	1
Brock's pulmonary valvotomy	2
Thoracotomy	2
Cardiotomy	2
No operation performed	3
Total	76

Out of 49 cases of mitral stenosis, valvulotomy was performed in 44; in 2 cases finger exploration revealed predominant mitral regurgitation and nothing further could be done, while the remaining 3 patients were sent back after being anaesthetized only.

Of the 5 cases with patent ductus, ligation was possible in 3 cases; in 4th case operation was abandoned because of serious haemorrhage during mobilization of the posterior wall of the ductus. In the 5th patient, a thoracotomy diagnosis of patent ductus was not confirmed and so chest was closed. Brock's operation was performed in one patient with Fallot's tetralogy and in another with congenital pulmonary stenosis while Blalock's operation was done in the other patient with Fallot's tetralogy.

Preoperative Evaluation and Preparation

Preoperative assessment and preparation of the patient for cardiac surgery is primarily the conjoint effort of the Cardiologist, the Anaesthetist and the Surgeon.

The patients were brought into their best possible condition by a combination of supportive measures and strict cardiac regime. Congestive heart failure was eliminated by

rest, low salt diet, digitalization and injections of mercurial diuretics. We consider digitalization as a very important measure for controlling the heart rate. Fluid and electrolyte balance was corrected. Anaemia was treated by suitable measures. Septic foci in the nose, throat, teeth and elsewhere were detected and treated. The nutritional status of the patients was improved by highly nutritious food and breathing and coughing exercises were given to prepare them for post-operative period. The patient before operation was allowed to mix freely with the operative patients so that he could educate and familiarize himself about what was going to happen. This allays his fears and apprehension to a great extent and facilitates his post-operative care.

Activity of rheumatic lesion etc., contraindicates operation and hence the operation was deferred in the cases showing signs of activity. Intractable heart failure is another contraindication, but patients with congenital lesions may have to be anaesthetized with existing heart failure and the risks are correspondingly heavy.

For final assessment, the patient was visited by the anaesthetist 24 hours prior to operation. Frequent earlier visits serve to establish a good patient-anaesthetist-relationship and to win over the confidence and co-operation of the patient.

The patient was thoroughly examined and his pulse, respiration, blood pressure and temperature recorded. His weight and height were noted. Findings in the lungs, heart and abdomen were recorded. Recording of resting pulse and blood pressure is very important. Every effort was made to stabilize the heart rate before submitting the patient for operation.

Relevant investigations were checked and recorded. These included Hb., R.B.C. count,

total and differential leucocytic count, bleeding and coagulation time, sedimentation rate, blood urea estimation and liver function tests if necessary, a complete urine examination and a record of vital capacity and breath holding time.

We have refrained from submitting the women to operation at the time of menstruation. They have a tendency to store sodium and water at such intervals (Beecher, 1952). Finally, the patient having been surveyed by the anaesthetist, a suitable premedication was ordered.

Pre-Anaesthetic Medication

A night's sleep for the patient was ensured by giving pulv luminal gr. 2 or 2 tablets of Soneryl (gr. 3) for an average adult, previous evening at bed time.

Premedication for the morning was selected according to individual needs of the patient.

The details of premedication used are given in Table IV.

Table IV

Premedication.	No. of patients.
Morphia and atropine ...	29
Luminal, morphia and atropine.	18
Luminal, morphia and hyoscine.	10
Atropine ...	8
Pethidine and atropine ...	6
Morphia and hyoscine ...	4
Luminal, pethidine and hyoscine.	1
Luminal, pethidine and atropine.	1
Luminal and hyoscine ...	1
Luminal and atropine ...	1
Morphia and pethidine ...	1
Total ...	80

For an average adult, injection luminal (gr. 1-2) intramuscular was given 2 hours before and then morphia (gr. 1/8-1/6) with atropine (gr. 1/150-1/100) or morphia with hyoscine hydrobromide (gr. 1/150-1/100) or any other combination was given subcutaneously 1½ hour prior to scheduled time for anaesthetization.

Atropine alone was used in children and was administered 45 minutes before the time of anaesthetization.

Comments

Adriani states that purpose of premedication is.—(1) psychic sedation (2) reduction of metabolic rate (3) to obtain an additive effect between a non-potent drug and one which is more potent (4) abolition of secretions from the respiratory tract and (5) prophylaxis to avoid anticipated undesirable effects. This purpose is well served by morphia with atropine which has been our favourite combination.

In cardiac cases the ideal premedication is that which affords adequate sedation without causing depression of medullary centres. Most of the experienced workers favour light premedication for patients with mitral stenosis. Keown states "Time has taught us to be suspicious of over-sedation". The lesson that heavy premedication must be avoided in advanced cases is well brought out by the following illustration:—

Case No. 45.—18 years old, short statured, sparsely built girl (Ht. 4'-9"; Wt. 74 lb.) was given Inj. morphia gr. 1/6 and Inj. pethidine 50 mg. intramuscularly half an hour before the anaesthesia. The idea was to have an adequate sedation, as on a previous occasion she had developed marked tachycardia and acute pulmonary oedema after topical analgesia. Induction was started with Sod. pentothal. Hardly

75 mg. pentothal had been given, when her pulse became imperceptible. She was resuscitated and operation cancelled.

Morphia.—It causes adequate sedation, produces euphoria, allays apprehension and prevents excitement—a highly desirable effect in cardiac patients in whom psychic trauma associated with operation is marked. It also brings down metabolism.

Vandam and Burnap (1956) deprecate the use of morphine and emphasize that in advanced cases, its use causes circulatory instability and hypotension, which will be aggravated by the subsequent use of potentially hypotensive general anaesthetics.

We have avoided the use of morphia in patients below 12 years of age for fear of medullary depression. McQuiston, however, considers psychic sedation and depression of metabolism as the most important object of premedication in children with cyanotic heart disease, who because of low cardiac reserve cannot meet the increased oxygen demands during a state of excitement fear or crying and may become excessively cyanosed and unconscious. He advocates the use of morphine (with atropine or hyoscine) for children and even infants in whom after sedation, cyanosis was found to be decreased and in none of his 142 patients, operation had to be cancelled because of excessive depression.

Atropine.—We have used this drug (or hyoscine) because of its valuable property of keeping the respiratory passages dry and of blocking the harmful vagal impulses to the heart during intubation, intercostal stimulation, traction on the hilum, and mechanical irritation of pericardium. Its undesirable effect is tachycardia, but when used in combination with morphine, this effect may be minimised in an adequately digitalised and sedated patient. In children

we have used atropine in relatively larger doses (gr. 1/200—1/100), as they can tolerate it. Keown uses atropine routinely and in children recommends a dose of gr. 1/600—1/300.

Pender (1953) has given up the routine use of atropine to avoid tachycardia in mitral heart surgery. In spite of using ether as agent for maintenance, he was not troubled by excessive secretions without the use of atropine.

Vandam and Burnap also condemn the use of atropine or its substitutes, as in doses of gr. 1/100, in their opinion, it not only fails to block the vagal impulses completely but also causes marked rise in pulse rate.

On the other hand, Donnel and McDermott (1955) find that atropine or scopolamine does not produce undue tachycardia.

Barbiturates.—In the absence of low blood pressure, barbiturates have been used for premedication in this series. Beecher states that barbiturates are more effective and safer as tranquilizers for patients than narcotics. Though potentially hypotensive they cause less respiratory depression. Intramuscular sodium pentothal has been used for children by Keown without any local ill effect.

Anaesthetic Management

The following procedure has been adopted in our cases:—

Before the patient is shifted to operation room, the anaesthetic equipment is thoroughly checked. The drugs for intravenous use, wherever possible, are prepared fresh and arranged in order on a separate trolley.

The premedicated patient is then shifted in and is carefully but quietly examined

and his vital signs recorded with least disturbance. There should be no hesitation in last minute cancellation of the operation, should condition of the patient so warrant this step.

Every attempt is made to induce the patient to sleep with least possible delay as a patient in suspense becomes apprehensive and reacts by rise in pulse rate.

Tables V and VI outline the modes of induction and intubation respectively, employed in this series.

Table V

INDUCTION

Drug used	No. of patients.
Pentothal sodium 2½%	... 53
Nitrous oxide, oxygen and ether	... 17
Open ether	... 9
Not induced*	... 1
Total	... 80

*One patient sent back after topical analgesia alone because of rise in pulse rate.

Table VI

INTUBATION

Anaesthetic employed	No. of patients.
General anaesthesia	... 38
(a) Sod. pentothal, ether, nitrous-oxide, oxygen and scoline	30
(b) Open ether	8
Topical analgesia (½% anethane)	... 30
Topical plus general anaesthesia	... 10
No intubation*	... 2
Total	... 80

*2 patients sent back before intubation.

The present routine is to induce the patient to sleep with slow intravenous injection of 2½% solution of sodium pentothal

with minimum required dose. When the eye-lash reflex has been abolished, nitrous oxide and oxygen (50 : 50) is switched on and delivered through the mask. Ether is then added slowly in gradually increasing concentration. If the patient starts swallowing, a little more sodium pentothal is added. If ether is added very gradually and with patience, the induction is smooth at the cost of a little extra time only. A sudden increase in the concentration of irritant ether vapour will provoke a severe bout of cough and undue straining by the patient. All this time a constant watch on the vital signs is kept by the assistant.

It is a safe policy to have a scrubbed surgeon and a nurse near by with sterilized instrument trolley at hand, before induction is started, in order that an immediate thoracotomy is possible, should a cardiac stand-still occur during the initial phases of anaesthesia.

A cuffed endotracheal tube of appropriate size is kept ready. It should be of greatest permissible diameter so that it can be slipped through the glottis without traumatizing the vocal cords.

When the patient's breathing has become regular, 20 to 60 mg. scoline is injected intravenously and the assistant is alerted to feel the pulse constantly till intubation is over. As the respiration starts fading under the effect of scoline, artificial respiration by manual compression of the rebreathing bag is started. After ensuring adequate oxygenation, endotracheal tube is quickly inserted orally under direct laryngoscopy. The tube is connected with the machine. Both apices of the lungs and axillae are auscultated for evidence of proper aeration, indicating proper position of the tube in trachea. The tube is then fixed in position. The controlled breathing is continued till the spontaneous

respiration returns and anaesthesia is maintained with nitrous oxide, oxygen and small quantities of ether along with additional drugs as pentothal or pethidine by intravenous route.

After the tube has been secured in place or earlier, a vein at the ankle is dissected and intravenous infusion of 5% glucose in distilled water is started at a very slow rate.

The patient is now put into position and blood pressure checked again. Some patients show a marked fall in blood pressure, as this unnatural lateral position further decreases the already limited cardiac output (Keown). If the blood pressure does not recover in a reasonable time, postponement of operation is decided upon. When the chest is about to be opened, spontaneous respiration is knocked out by injection of 5-10 mg. tubarine and controlled respiration is continued at a rate of 15-20 times/mt., till the time of closure of chest cavity when the water-seal has started working. In controlled respiration normal breathing is imitated, the anaesthetist timing the respiratory excursions of the patient with his own and with each compression of the bag, displacement of 250 to 300 cc. of gases is aimed at. We have relied upon nitrous oxide, oxygen with ether in small amounts supplemented with pentothal or/and pethidine, employing 'blow over' technique or to and fro method with carbon dioxide absorption technique.

An attempt is made to regulate the anaesthetic so that patient is almost moving when the last few stitches are being applied. After making sure about the expansion of the lungs and after removing secretions, the tube is removed under atropine cover.

At the end patient should be able to respond to call and be able to talk and move all the four limbs. This helps the detection of embolic episodes.

Blood transfusion is started at a slow rate after the skin incision. Rate of transfusion is regulated by the amount of blood loss estimated by gravimetric method, *pari passu*—as the operation proceeds.

Throughout the period of presence of the patient in operation room, an accurate record of the condition of the patient including the vital signs is maintained, while a minute to minute watch is kept during strategic moments, e.g. during intubation, finger-fracture of the mitral valve, closure of the patent ductus, and occlusion of pulmonary artery (in Blalock's operation). Time of starting local and general anaesthesia, of beginning and end of operation and of administration of drugs with their amount administered is noted. After observing the patient for a variable time according to the patient's condition, he is transferred to the ward with an experienced house surgeon in attendance.

In earlier cases we employed topical analgesia for intubation, using 0.25% anethane for spraying the upper respiratory tract. Intubation was carried out under the effect of pethidine (50-75 mg.).

In 10 cases after achieving topical analgesia, the patients were put to sleep with sodium pentothal, nitrous oxide, oxygen and then intubated with the help of intravenous scoline. The advantage of additional topical analgesia besides the general anaesthetic for intubation is that it reduces the incidence of arrhythmias during intubation, but our difficulty with topical anaesthesia has been that by the time topical anaesthesia is established, this period of waiting and suspense has caused a steep rise in pulse rate and operation may have to be cancelled. One of the patients developed acute pulmonary oedema.

We have, since, given up topical analgesia, and intubation is now carried out under the effect of general anaesthesia. In children open ether is used for induction and intubation.

Comments

O'Donnel and McDermott (1955) argue that since general anaesthesia has to be deepest for intubation and these patients do not tolerate deep anaesthesia, it is better to use topical anaesthesia for intubation.

Combined use of pentothal sodium and scoline makes induction and intubation a smooth and rapid process and the complications as excitement, cough, straining, breath holding, hypoxia and anaesthetic over-dosage can be avoided. The use of scoline eliminates the need for deep anaesthesia during intubation and it allows intubation without cough or bronchospasm which would ordinarily occur in light anaesthesia. As the respiration is controlled easily, adequate oxygenation can be maintained.

Cardiac rhythm—disturbances are quite frequent during intubation. The causative factors are hypoxia and mechanical irritation of laryngeal area (Campbell, 1954). Vandam and Burnap consider hypoxia as the important factor rather than vago-vagal reflex.

Arcuri et al. (1953) could reduce the incidence of electro-cardiographic disturbances during intubation under general anaesthesia from above 60% to only 17% with the use of prior intravenous injection of procaine.

The selection of a particular anaesthetic agent is a matter of individual choice for the anaesthetist and of individual need of the patient. No one agent has supremacy over others nor can it be suitable for all types of patients. Each worker has his own preference.

McQuiston and Vandam and Burnap advocate the use of cyclopropaine as with its use, the induction is smooth and rapid, recovery is quick and a minute to minute control of level of anaesthesia is possible. Keown finds Decamethonium bromide-pentothal-nitrous oxide-oxygen as the best combination; others find ether most satisfactory.

With us, pentothal, scoline, nitrous oxide, oxygen and ether combination has worked satisfactorily.

A few points need recapitulation:—

1. Induction must be smooth and free from excitement, straining and coughing.
2. In the anaesthetic management of cardiac cases, all the fundamental principles for proper administration of a general anaesthetic should be observed carefully, the most important being to provide enough oxygen, a patent airway, an effective exchange, adequate cardiac action and an effective circulation to facilitate proper oxygenation with carbon dioxide elimination. This may look too simple, but no amount of repetition in enumeration of this principle is sufficient to over-emphasize its importance.
3. The patients have taught us that during cardiac surgery especially in advanced and poor risk cases, the safest policy is to keep them in light plane of anaesthesia. Occasional slight movement by the patient is a happy sign. A rather liberal use of muscle-relaxants allows cutting down the anaesthetic agents to the barest minimum and myocardial depression from anaesthetic agents is avoided. Moreover all the general anaesthetic agents are potentially hypotensive as by causing muscular relaxation and vaso dilatation they increase the peripheral vascular bed. This hypotensive effect is directly proportional to concentration of the

anaesthetic agent. For blood pressure to be maintained constant, when peripheral resistance decreases, cardiac output, must of necessity be increased. In patients with advanced mitral stenosis, cardiac output is relatively fixed and cannot be increased to compensate for the decrease in peripheral resistance. This disproportion between the vascular bed and the circulating blood volume causes failure of effective circulation and may predispose to a period of profound hypotension during anaesthesia and post-operatively from which the patient may not come out.

Hypothermia

Hypothermia during anaesthesia and surgery was employed in 7 patients. 4 patients were adults and were considered to be 'poor risks'. It was thought that they will not be able to stand normothermic anaesthetic and surgical procedures. In one patient, on a previous occasion operation had been postponed as after anaesthetizing his blood pressure had fallen to 75/60 mm. Hg. with a pulse rate of 138/mt. 2 of these patients were subjected to mitral valvulotomy and the other 2, to pericardiectomy. 3 of the 7 patients were children with congenital heart disease; one with a pulse rate of 130/mt., temperature 99.8°F. and marked cyanosis was submitted to Blalock's operation; second patient with pulmonary stenosis had a pulse rate 150/mt. and temperature 99°F. and had Brock's operation done; third patient with a preoperative diagnosis of patent ductus had a pulse rate 140/mt. and temperature 99.2°F.

Premedication used was morphia and atropine or atropine alone. Anaesthetic

agents employed were nitrous oxide, oxygen, ether and sodium pentothal with to and fro method and carbon dioxide absorption technique. Tubarine was employed to control the breathing and to prevent shivering. After anaesthetization of the patient, hypothermia by surface cooling was achieved with the use of thin plastic bags filled with pounded ice. Whole of the body was covered with ice bags with greater concentration on the axillae, groins, flexor surfaces of knee and elbow, the chest remaining free. Phenergan, Pethidine and Largactil (Lytic cock tail) was used in 2 cases, largactil alone in one case and pethidine alone in 2 cases.

The lowest temperature levels achieved in these patients were 95°F., 90°F., 93°F., 93.4°F., 95.6°F., 94.2°F. and 95°F. respectively.

Cardiac arrest occurred in one patient anaesthetised for pericardiectomy. Heart was revived and at the end of operation, blood pressure and pulse were same as of pre-anaesthetic level i.e. blood pressure 75/60-72/58 and pulse 104-108. Hypotension however persisted in the postoperative period till his death 27 hours later. Transient irregularity in pulse was noted in 2 patients.

Comments

Surface cooling method of hypothermia is very simple method and needs no elaborate arrangement, but it is time-consuming. Besides, accurate temperature control is not possible because the degree of fall of temperature after removal of cooling agent, is difficult to predict.

Arrhythmias

Some irregularity of the cardiac rhythm is almost invariable during cardiac manipulations. Needless to say, electrocardiography is of immense help in detection and intelligent management of arrhythmias. Occasional extrasystoles were frequently noticed and ignored. Multiple multi-focal ventricular extrasystoles however may be precursors of ventricular fibrillation (Hewer and Lee).

Hypoxia and hypercapnoea are the root causes of serious arrhythmias (Sandove et al.) so the best means of preventing arrhythmias is adequate oxygenation and carbon dioxide elimination. Thus in hypothermia carbon dioxide retention predisposes to cardiac arrhythmias which can be prevented by hyperventilation (Virtue).

In this series surgeon routinely injected 8-10 cc. of 2% procaine into the pericardial sac and waited for a few minutes before opening it.

In earlier cases, we used 1% solution of novocaine intravenously in repeated doses of 5-10 cc. at 10-20 minutes interval during the course of operation. Its use has since been abandoned as it seems to be of doubtful value.

The role of procaine in preventing arrhythmias is disputed. Keown categorically states that intravenous procaine does not prevent ventricular tachycardia or ventricular fibrillation while it may aggravate hypotension. Sandove et al. (1955) also use procaine less frequently.

Fitzpatrick et al. (1954) using intrapericardial and intracardiac procaine studied 50 patients and found that procaine did not prevent the development of arrhythmias, on the other hand it induced tachycardia in 90% and hypotension in 45% of their cases.

Cardiac Arrest

Cardiac arrest occurred in 9 patients during the course of anaesthesia and surgery. These can be divided into three groups:—

(a) In 4 patients, revival was possible with cardiac massage and other resuscitative measures and the patients underwent operation successfully. One patient (Case No. 56) was anaesthetized for pericardiectomy. Fifteen minutes after intubation cardiac asystole occurred. Immediate thoracotomy and manual compression of the heart for 1-2 minutes restored the normal heart action. Other 3 patients (Case Nos. 18, 57 and 61) developed cardiac asystole a short time after finger-fracture of the mitral valve. Manual compression was successful in restoring normal heart beat.

(b) In 3 patients, despite vigorous resuscitative measures heart beat could not be revived. One undergoing pericardiectomy, a 'poor risk' was the first in this series to be operated. The other two, undergoing mitral valvulotomy had cardiac arrests during intracardiac manipulations. One (Case No. 10) had intractable congestive heart failure, a poorly functioning enlarged liver and a high bloodurea. She had received Quinidine 1 Tab. B. D. for five days preceding operation. Cardiac massage, intra-arterial transfusions, intracardiac injections of calcium chloride and adrenaline failed to revive the heart.

(c) In another 2 patients, it was possible to restore heart beat, but blood pressure failed to come up and they died in the immediate postoperative period. One of them (Case No. 48) was undergoing Brock's pulmonary valvulotomy for Fallot's Tetralogy. One stay suture in wall of right ventricle gave way leading to profuse haemorrhage and cardiac arrest for a short while which recovered spontaneously as bleeding was controlled and blood replaced.

Cardiac arrest occurred again before closure of the chest. Cardiac massage for 2 hours restored only a weak heart beat. Patient's condition deteriorated and he died a few hours later.

The other patient (Case No. 75) was anaesthetized and cooled for pericardiectomy. Half an hour after starting anaesthesia cardiac arrest occurred while his rectal temperature was 95°F. Immediate thoracotomy and manual compression of the heart, restored cardiac function in a few minutes and operation was carried out. Postoperatively hypotension defied all treatment and he died 27 hours after operation.

Comments

From the above cases, one may observe that—

(1) Cardiac arrest is more prone to occur in hypoxic and poor risk patients and those with advanced mitral heart disease. Revival of the heart in these cases may be difficult and even if heart is revived, medullary functions may not recover and hypotension may resist all treatment.

(2) Massive haemorrhage seemed to precipitate cardiac arrest in 3 cases.

(3) In 5 out of the 9 cases, cardiac arrest occurred during intracardiac manipulation or a shortwhile after. Possibly decreased ventricular output during these manipulations interfered with coronary circulation. Hypoxia and hypercapnoea are the primary causes which bring about cardiac arrest by sensitizing the heart to circulating epinephrine and by causing vagal stimulation (Lam 1955, Lahey 1950, Hinchey 1957). Quinidized hearts are said to be difficult to revive (O'Donnel and McDermott).

Tachycardia

Tachycardia was a real problem at almost all the phases of the anaesthetic management of the patients. It may be due to

various factors as apprehension, under digitalization or active rheumatic disease. It may lead to serious consequences as acute pulmonary oedema, hypotension from decreased cardiac output, myocardial failure or ventricular fibrillation.

Hypotension

Transient hypotension is quite commonly encountered in certain phases of operative procedure, e.g. when rib spreader is applied, when sternum is retracted or when finger is exploring the mitral valve. Fall of blood pressure also may occur when the patient is put into lateral position or when supine position is resumed at the end of operation. Beecher says that excess of carbon dioxide accumulated during unfavourable lateral position is eliminated as patient is put into supine position and as stimulant action of carbon dioxide is withdrawn, there is fall of blood pressure. Resting the patient for a short while by suspending manipulations, withdrawing the finger into auricle and replacement of lost blood usually helps to restore the blood pressure.

Persistent and serious hypotension (with a systolic blood pressure of 75 mm. or below) was encountered in 7 patients. All except one (with constructive pericarditis) had advanced mitral disease. In 4 of these blood pressure came down just after induction. As there was no substantial improvement after cutting down the anaesthetic agent and increasing the concentration of oxygen, the operation was cancelled. In 3 patients with mitral stenosis hypotension supervened in later stages when retreat was not possible. This hypotension persisted in postoperative period and proved fatal. Hypotension is attributed to the inability of the heart with stenosed mitral valve to increase its output in response to the decrease in peripheral resistance caused by general anaesthetics which also have direct myocardial depressant effect.

Post-operative Complications

These can be divided into two groups :

- (a) Those unrelated to anaesthesia.
(b) Those which could be attributed mainly or partially to anaesthesia.

They are enumerated in Table VII below :

Table VII**Postoperative Complications****(a) Unrelated to Anaesthesia :**

Cerebral embolism	...	1
Auricular fibrillation :		
Persistent	...	4
Paroxysmal	...	2
Occasional extrasystoles	...	4
Pneumothorax	...	1
Empyema	...	1

Pleural effusion	...	1
Anterior mediastinal abscess	...	1
Paralysis left vocal cord	...	2
(b) <i>Related to anaesthesia :</i>		
Postanaesthetic delirium	...	1
Severe central depression	...	4
Serious hypotension :		
Irreversible	...	6
Reversible	...	1
Pulmonary oedema	...	1
Congestive heart failure	...	1
Acute dilatation stomach	...	2
Atelectasis	...	1

Deaths

There were 15 deaths. 3 patients died during operation, 10 died in the immediate postoperative period (within about 24 Hrs.) and 2 died later on during their stay in hospital. The causes of death are enumerated in the Chart below :—

CHART No. I

Serial No.	Case No.	Operation Done.	Time of Death.	Cause.
1	1	Pericardiectomy	During operation.	Cardiac arrest.
2	10	Mitral valvulotomy	During operation.	Cardiac arrest.
3	38	Mitral valvulotomy	During operation.	Cardiac arrest.
4	9	Mitral valvulotomy	20 hours after.	Hypotension pulmonary embolism?
5	11	Mitral valvulotomy	7½ hours after.	Central depression and cardiac tamponade.
6	29	Mitral valvulotomy	24 hours after.	Severe hypotension.
7	30	Mitral valvulotomy	3 hours after.	Severe hypotension.
8	34	Mitral valvulotomy	4 hours after.	Hypoxia.
9	45	Mitral valvulotomy	8 hours after.	Central depression and hypotension.
10	48	Brock's operation	5 hours after.	Hypotension.
11	60	Pericardiectomy	3½ hours after.	Hypotension.
12	67	Blalock's operation	13½ hours after.	Hypoxia.
13	75	Pericardiectomy	27 hours later.	Hypotension.
14	18	Mitral valvulotomy	10th day.	Congestive heart failure.
15	26	Mitral valvulotomy	6 weeks later.	Incessant vomiting with peripheral circulatory failure.

Deaths

(a) *Immediate deaths.*—Cardiac arrest was responsible for 3 immediate deaths in case Nos. 1, 10 and 38. Details have been given under 'cardiac arrest'.

(b) *Post-operative deaths.*—In 6 cases hypotension alone or in association with other factors was responsible for death.

(1) *Case No. 9.*—32 years male, mitral valvulotomy done. Had marked hypotension. By the end of operation blood pressure came down to 70/30 mm. Hg. and then was unrecordable and pulse was imperceptible. 100% oxygen with B.L.B. mask was administered. In the mean time excessive drainage was noticed in the water-seal bottle (probably the result of leakage from auricular stump on which no over and over stitches had been applied). Rapid blood transfusion given. After an hour blood pressure was recorded at 85/60 mm. Hg. and pulse was perceptible, but patient was comatose and regained consciousness about 2 hours after operation. There was persistent low blood pressure with some fluctuation. Leak through the bottle was continuous and blood was replaced accordingly. 20 hours after operation, he suddenly became dyspnoeic and cyanosed and collapsed (pulmonary embolism?).

(2) *Case No. 29.*—30 years male, had advanced mitral disease. He had marked hypotension throughout the period of anaesthesia and in the post-operative period till the time of his death 24 hours after operation.

(3) *Case No. 30.*—24 years female also had advanced mitral disease and shared the same fate as Case No. 29.

(4) *Case No. 48.*—17 years male had Brock's valvulotomy for Fallot's tetralogy and got cardiac arrest after massive haemorrhage from the ventricular wound. Two hours of manual compression of the heart restored only a feeble heart beat. Blood pressure failed to come up and patient died in the evening.

(5) *Case No. 75.*—16 years male was to undergo pericardiectomy under hypothermic anaesthesia because of poor condition, but cardiac arrest occurred during anaesthesia. Spontaneous heart beat was restored by manual compression and pericardiectomy done. In the post-operative period a severe hypotension supervened which defied all treatment.

(6) *Case No. 60.*—17 years male was submitted to pericardiectomy. 1½ hours after warding the patient, blood pressure was suddenly unrecordable. Despite treatment, it failed to come up and patient died 3½ hours after operation.

In 4 cases, severe central depression and hypoxia proved fatal.

(7) *Case No. 11.*—23 years old girl underwent mitral valvulotomy. When warded, she had a blood pressure of 95/75 mm. Hg. and pulse rate 110/mt., but she never regained consciousness. Blood pressure went down steadily and pulse became more and more feeble. She died 7½ hours later. Partial postmortem examination revealed a big clot and free altered blood under a tense pericardium.

(8) *Case No. 45.*—18 years old girl with mitral stenosis was under observation for several months because of persistent high pulse rate and raised E.S.R.

On her first visit to operation room, during induction after topical analgesia, she developed acute pulmonary oedema and operation was cancelled. Next time a rather heavy premedication (morphia gr. 1/6 pethidine 50 mg.) intramuscular was ordered for her (Patient's height 4'-9", weight 74 lb.), in order to achieve adequate sedation and to prevent tachycardia this time. After induction with 75 mg. of sodium pentothal and 50 mg. of scoline, her pulse became imperceptible. Operation was cancelled. In the ward she remained drowsy and cyanosed with a pulse rate ranging from 160-180/mt., in spite of oxygen therapy. She died 8 hours after anaesthesia with signs of consolidation left side of chest and terminal hyperpyrexia.

(9) *Case No. 34.*—14 years female, while undergoing mitral valvulotomy was cyanotic throughout the period of anaesthesia and remained cyanosed and deeply comatosed till the time of her death 4 hours after operation.

(10) *Case No. 67.*—12 years male was anaesthetized under hypothermia for Blalock's operation for the relief of supposedly a Fallot's tetralogy. He was steered safely through operative procedure. Soon after being warded he started having convulsions and his cyanosis deepened. His condition deteriorated and he died 13½ hours after operation. Partial post-mortem examination revealed the lesion to be Eisenmengers' complex instead of a Fallot's tetralogy. Near the site of anastomosis a thrombus was present in the left pulmonary artery. Thus

inadvertently, this patient, instead of being relieved by operation, was subjected to the stress of anaesthesia and operation with superadded pulmonary artery occlusion.

(c) *Late deaths.*—Two patients died later during their hospital stay :—

(1) *Case No. 18.*—14 years old child, had intractable right heart failure and mitral valvulotomy appeared to be the only alternative for him. During operation, cardiac standstill was treated with manual compression and heart revived. On the 4th post-operative day he developed congestive heart failure which did not yield to treatment and proved fatal on 10th post-operative day.

(2) *Case No. 26.*—25 years female, on 4th post-operative day after mitral valvulotomy, started running temperature which persisted for 5 weeks and ultimately responded to heavy doses of Penicillin (Culture of blood for *Streptococcus viridans* was negative), but then patient had incessant vomiting for 24 hours and developed peripheral circulatory failure with terminal anuria.

Summary

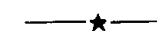
Anaesthetic management including pre-operative assessment, preanaesthetic medication and anaesthetic procedure in 76 patients undergoing various cardiac surgical procedures has been described.

Complications and problems inherent with anaesthesia in cardiac surgery have been discussed briefly.

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REVIEW OF OGILVIE'S HERNIORRHAPHY PERFORMED FOR UNCOMPLICATED INDIRECT INGUINAL HERNIA

BY

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So much has been written on the subject of herniorrhaphy that one fears to present yet another review, lest its very title may throw the reader into a fit of boredom. But the very existence of such a large number of articles, techniques and suggestions itself suggests that the matter has been constantly engaging the minds of numerous surgeons who feel somehow that there is still something more to learn regarding this subject.

Aim

I must admit, however, that this review will not bristle with original concepts either of principle or practice, for the main aim of this review is not to decry other methods of herniorrhaphy, but to emphasize and to reiterate that Ogilvie's herniorrhaphy per se is eminently satisfactory and entirely sufficient to prevent a recurrence when performed in the right type of case.

Type of case

As is well known patients with indirect inguinal hernia present themselves with varying deficiencies of the internal ring, and also of the muscular and fibrous defences of the canal. It would be obviously irrational to suggest the simple repair of the internal ring for all the cases of indirect hernia.

This review would hence advocate the use of this operation only for those cases where the internal ring alone has become damaged, but where the muscle defences are intact

and the fibrous posterior wall of the canal sound.

This type of case is quite commonly met with especially in the young adult as has been mentioned by Ogilvie¹ and Griffith². This has also been our experience here.

Anatomy of the Transversalis Fascia

Origin.—Each muscle and its aponeurosis has a capsule of fascia. The fascia of the transversus abdominis muscle on its under-surface is the transversalis fascia. This fascia though it may appear thin and flimsy is strong and resilient and serves to hold together the muscular and aponeurotic fibres as a unit thus resisting splitting of the muscle fibres during a gridiron incision.

If we enumerate the layers of the abdominal wall from within outwards, the first layer is peritoneum, then extra peritoneal connective tissue, next a dense fascia and then comes muscle, etc. The dense fascia is a continuous sheet (sometimes called the endoabdominal fascia) that completely envelops the abdominal cavity. Wherever this endoabdominal fascia covers a specific muscle, it is referred to by the specific name of that muscle. Thus we have the iliac fascia (covering the iliopsoas muscle) and the transversalis fascia.

Lower extent.—In the floor of the inguinal canal the transversalis fascia is quite tough

and resilient. This sounds unconvincing to those who have seen large hernias where the transversalis fascia has been frayed and distorted beyond recognition. But the description of the fascia is as seen in the dissection room or in the operation theatre in the case of a young patient with good muscular walls and a small hernia that has not distorted normal structures.

At the medial angle where the transversalis fascia inserts into the pubis, it is quite thick and this part is called the "ligament of Henle". It is also thickened just medial to the internal ring and this is called "the interfoveolar ligament of Hesselbach". The inferior epigastric vessels run within this ligament.

As stressed by Griffith² and by McVay³ the transversalis fascia does not insert into the inguinal ligament. It proceeds beneath it and in the region between the inguinal ligament and the Coopers ligament it fuses with the iliac fascia coming up from below. The line of fusion is a thickened region called "the iliopubic tract or the ligament of Thompson" and runs from the anterior superior iliac spine to the pubis. The iliac fascia between the iliopubic tract and Coopers ligament covers the femoral ring.

Internal Ring.—This is the neck of an evagination of transversalis fascia around the emerging vessels and vas. When viewed from within the peritoneal cavity the internal ring has the shape of the arms of a sling directed upwards and laterally like the letter "U".

An indirect hernial sac leaves the abdominal cavity anterior to the vas and vessels,

through the internal ring and hence within the evagination of transversalis fascia (Figure 1).

Functional Anatomy of the Inguinal Canal

A static outlook of human anatomy could hardly satisfy surgeons who were more interested in a functional appreciation of it. For they had ample opportunity to study the body tissues as they work in the living human being as opposed to the anatomists who have the ill-luck of having to study tissues long since dead and stiffened with preservative.

1. *Internal Ring.*—(a) When the abdominal muscles contract, the internal ring is found to move upwards and laterally behind the internal oblique muscle. Also the curving fibres of the internal oblique move downwards and medially, thus beautifully protecting the internal ring.

(b) When the cremaster contracts, it pulls up the cord and is even said to plug the internal ring like a cork.

(c) Normally the passage of intra-abdominal pressure into the inguinal canal at rest is a fairly direct one. But when the

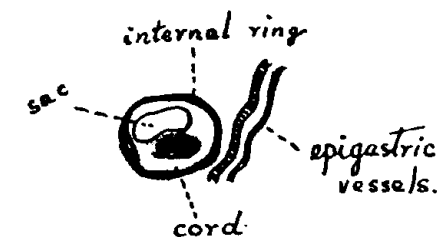


Fig. 1

internal ring moves upwards and laterally the direction of the inguinal canal is so altered that the direction of the intra-abdominal force is broken and gets spent against the musculature of the lower abdominal wall.

2. *The Canal.*—On contraction of the internal oblique and transversus the lower margin of the muscle is said to move downwards almost right down to the inguinal ligament like a window shutter.

Besides, the transversalis fascia gets tightened like a protective shield. The inguinal ligament is also said to move upwards very slightly.

Zimmermann¹⁴ states that the impregnability of the internal ring to herniation in the absence of a congenital sac depends upon the valvular character of the inguinal canal and the proper functioning of the internal oblique muscle. Both are important and both are badly damaged in most of the routine operations for inguinal hernia.

Wherever in the body a duct enters or leaves a hollow viscus, the same sphinctoric mechanism is to be found e.g. the intramural part of the ureter, the inner ends of the fallopian tubes or the opening of the common bile duct into the duodenum (Figure 2).

3. *External Ring.*—On contraction of the abdominal muscles the conjoint tendon gets taut and the crura of the external ring come together thus effectively narrowing the ring.

Thus we see how dynamic is the protection of the inguinal region. Patey⁹ studied the effect of faradic stimulation and he confirmed all these actions with one exception. He found that the lower edge of the internal oblique goes down only just a little and does not reach the inguinal ligament as mentioned by Ogilvie⁷ and Keith⁴.

I tried the effect of faradic stimulation too. The action of the cremaster, the internal oblique fibres near the internal ring, and the tightening of the conjoint tendon were beautifully demonstrated. But I could not

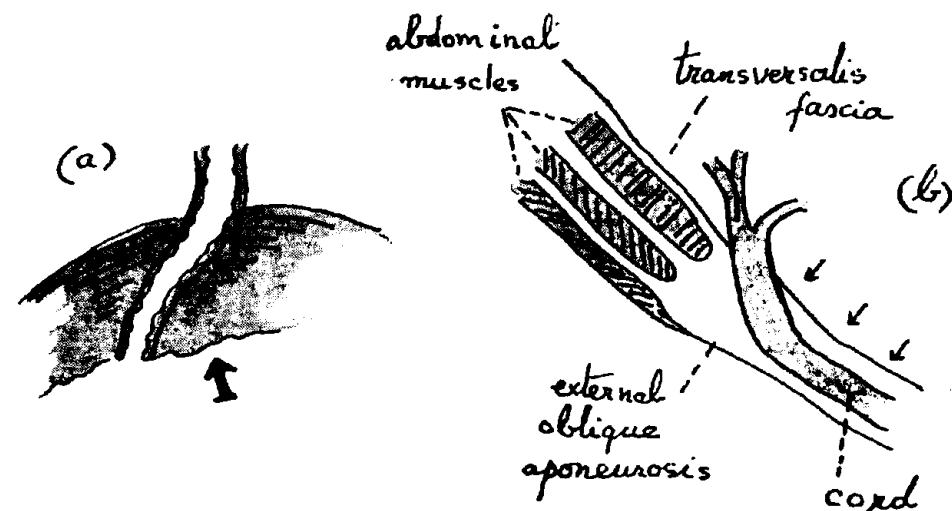


Fig. 2

(a) Entrance of ureter into bladder showing valvular action.

(b) Diagrammatic section through inguinal canal showing similar valvular action.

appreciate the upward and outer movement of the internal ring. I also found that the fibres of the internal oblique move downwards, but did not reach the inguinal ligament. This movement was better appreciated by increasing the strength of the current.

Pathology

In an ordinary indirect hernia, there are but two deviations from the normal.

- (i) a preformed sac of congenital origin.
- (ii) a secondarily dilated internal ring.

The neck of a congenital oblique hernia lies above and to the outer side of the cord and in its early days does not dilate the fibrous collar of the internal ring. With the repeated entry of abdominal contents into the sac and particularly with their lodgement there, the ring becomes secondarily dilated.

Initially the ring stretches in the upper and outer segment (where the sac lies) while the inner margin is not displaced. With the passage of time the whole ring becomes dilated the inner border with the deep epigastric artery is displaced medially and the cord leaves the posterior wall much nearer the midline than is normal.

Pre-Operative Care

Careful examination of the patient and correction of any condition that may predispose to recurrence should be accomplished.

Technique

A skin crease incision was found to be any day better than the standard oblique incision.

The incision in the *external oblique* should open the external ring so that this can be adequately narrowed subsequently. The fascia covering the external oblique aponeurosis (*viz.* the same deep fascia that covers each muscle and its aponeurosis on all sides like a capsule as mentioned before) should not be brushed off when exposing the aponeurosis as this may lead to fraying of the edges while suturing.

The *ilio inguinal nerve* should be seen and carefully preserved as damage to it or inclusion within a ligature may give rise to persistent pain in the operated region.

The *cord* is then mobilised. We have not removed the *cremaster muscle*, but according to Warren¹² and Zimmermann¹⁴ it is better to remove it and thus effectively expose the internal ring. Removing the cremaster also reduces the cord to only the vas and vessels and the internal ring can then be snugly closed around these small structures.

The *sac* is next dissected out completely. It is inadvisable in a complete hernia to remove only the portion in the inguinal sac and leave behind the rest with the cut end open since the formation of a hydrocele in the remnant has been noted by Griffith². It is important to retract the edge of the internal oblique in order to transfix the sac high enough and also to expose effectively the internal ring.

After high ligation of the sac, the repair of the *internal ring* is next undertaken. With a finger through the internal ring, but extra-peritoneally, the finger is advanced medially and the condition of the transversalis fascia in the region of the inguinal floor and

femoral canal is noted. (Figure 3), to see if anything more than a simple suture of the ring is indicated.

Ogilvie⁷ states that the diameter of an unstretched ring is equal to the diameter of the cord when engorged with blood or very roughly the diameter of the distal joint of the little finger. Any ring bigger than this needs repair.

The margins of the ring are best appreciated by palpation. Ogilvie describes two types of repair of the ring :

(i) *Simple Suture*.—This according to him is meant for the early case where the cord is not displaced medially, the inner margin of the ring firm and the deep epigastric artery runs a straight course. Here the cord is to be held laterally and the ring is sutured medially (Figure 4).

(ii) *Reconstruction of the Ring*.—This is meant for the advanced case where the ring as a whole is dilated the cord displaced and the artery shifted. He uses silk to darn the

region in between the lips of the ring. He has also suggested the use of fascia lata either as free strips from the thigh or external oblique aponeurosis, or as a strip from the external oblique aponeurosis attached laterally. In the latter case, he passes the attached strip through the internal oblique muscle fibres and then darns the region of the ring medial to the cord, his idea being that when the external oblique muscle contracted, the attached aponeurotic strip would be pulled up tight. Another operation suggested is that of Sir Philip Turner. Here a flap of deep fascia of the thigh is cut, passed under the inguinal ligament (to which it is still attached) and sutured to the margins of the internal ring.

Post-operative Care

The patients were kept with a bolster under their thighs after the operation, but were encouraged to move their legs and to take deep breathing exercises. Stitches were removed on the 7th day and they were usually discharged on the 8th day.

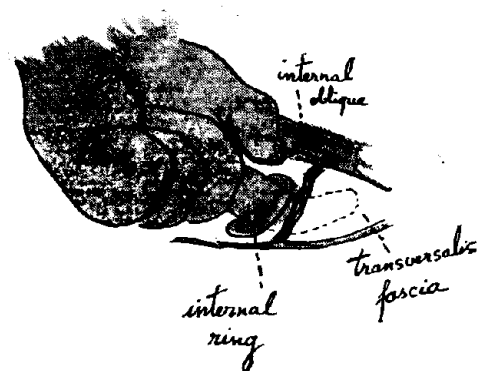


Fig. 3

(Schematic diagram) showing index finger being introduced through the internal ring and extra-peritoneally behind the transversalis fascia in the inguinal floor (cord is not shown in diagram).

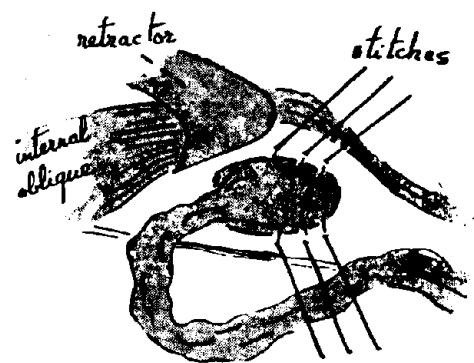


Fig. 4

Shows the internal ring exposed after retracting the internal oblique and transversus. The cremaster has been excised in the diagram. Sutures have been placed in the transversalis fascia for its closure.

Convalescence lasted for 3 weeks in the case of those doing light work and 6 weeks for those doing heavy work.

C. Age

This varied from 8 years to 63 years and were distributed as follows :

8-20 years	...	5 cases.
20-30 "	...	56 "
30-40 "	...	169 "
40-50 "	...	13 "
50-63 "	...	7 "

Analysis of our cases

All the cases studied were operated by the Ogilvie's technique.

A. Number Operated

707 cases were operated.

These were distributed as follows :

Year.	No. of Cases.	Year.	No. of Cases.
1948	10	1952	66
1949	42	1953	99
1950	117	1954	122
1951	41	1955	107
		1956	103

B. Number of cases that could be followed

250 cases were traced. These were distributed as follows :

Year.	No. of Cases.	Year.	No. of Cases.
1948	4	1952	28
1949	13	1953	36
1950	39	1954	47
1951	11	1955	40
		1956	32

Practically all the above patients came to the hospital for re-examination. The remaining few replied to a questionnaire.

D. Sex

Only males were included but because in women a hernial repair usually results in complete closure of the canal and this type of operation is not under review.

E. Side

Unilateral—247 cases. Bilateral : 3 cases. In the bilateral cases, the opposite side was operated on after 3 months in 1 case, after 1 month in another and on the same day in the 3rd case.

F. Operative Procedure

1. *Anaesthesia*.—Spinal was used in all cases, except the 8 year old boy who was given general anaesthesia.

2. *Surgeons*.—The Chief Surgeon had operated on most of the cases in the 1948-1949 period, but subsequently the Senior Surgical Registrar and the other house officers had operated on several cases.

3. *Technique*.—Skin crease incision was taken in 63% of cases. Simple suture of the ring was done in all cases. Suture material used was cotton No. 80 double.

G. Complications

There were no pulmonary or cardiovascular complications. There were no deaths. The complications that did occur could be divided as follows:—

1. Early

- i. Gross Haematoma (Table I)
- ii. Wound Sepsis (Table II)

From this, it can be seen that most of the septic cases occurred in the earlier years when antibiotics were not used routinely. Of course, I am certainly not advocating the random use of antibiotics is one's aseptic technique and operative finesse are beyond reproach. As a matter of fact there are several surgeons who are of the firm belief that no antibiotics should be used after a clean case like a hernial repair.

Table I

Year	No.	Surgeon
1949	1 Case	Chief.
1950	1 "	House Officer (H. O.)
1951	2 Cases	H. O., H. O.
1953	6 "	H. O.
1954	2 "	Chief.
1955	1 Case	H. O.
	2 Cases	H. O.
Total	15 Cases	

Table II

Year	No.	Antibiotics	Surgeon
1949	1 Case	—	H. O.
1950	1 "	—	H. O.
1951	1 "	From 1st day	H. O.
1951	1 "	" 5th "	H. O.
1951	1 "	" 4th "	H. O.
1954	1 "	" 1st "	Chief.
1954	1 "	" 1st "	H. O.
Total	8 Cases		

2. Late.

i. *Varicocoele*.—1 case. This may have been due to excessive narrowing of the internal ring.

ii. *Testicular atrophy*.—1 case.—In this case, there was haematoma in the region of the wound and in the scrotum post-operatively. It was either this or probably excessive narrowing of the internal ring that caused this complication.

iii. *Late suture sinus*.—5 cases. They all healed up after the cotton threads were removed.

iv. *Persistent pain in operated region*.—3 cases. No mention has been made in the records regarding injury to the ilioinguinal nerve.

H. Recurrences

5 people came back with a hernia at the original site of the operation. These could be analysed as mentioned in Table III.

I had operated on the first two cases when they came back with recurrences and found that their hernias were direct ones. These were probably due to an early direct hernia overlooked at the time of the first operation. These cannot be strictly called recurrences and hence have been excluded from the recurrence rate.

In the fourth case, the patient stated that he got the recurrence on one side while he was still in the ward. I thought at first that he might have mistaken a haematoma for a recurrence, but he was positive, it used to disappear just like before the operation. In all probability then, the sac was not removed. Both sides by the way, were operated on the same day.

Most recurrences have occurred within 2 years. This has been confirmed by other authors like Palumbo; Paul and Scott⁶. The recurrence rate is 1.2%.

We have not studied the effect of early ambulation. But several authors like

Jackson⁸ and Pratt¹⁰ feel that it does not contribute to an increased recurrence rate.

Conclusion

Ogilvie's herniorrhaphy per se is adequate to obtain a cure for a particular type of case (which is quite common) viz. when the internal ring alone is damaged, but the muscle defences are intact and the fibrous posterior wall of the canal is sound.

Summary

The indication for Ogilvie's herniorrhaphy has been precisely expressed. The anatomy of the transversalis fascia is described, but emphasis is laid on the functional anatomy of the inguinal canal and the pathology of inguinal hernia. The salient feature in operative technique are outlined. 707 cases have been operated on.

Acknowledgements

I wish to thank the Superintendent and the Chief Surgeon for permitting me to use the hospital records and for other facilities.

Table III

Age	Associated Disease	Surgeon	Post-operative course	Convalescence and occupation	Type of Recurrence	Interval prior of recurrence
40	—	H. O.	Uneventful	1 month—Clerk	Direct	1 year
35	—	H. O.	"	6 weeks—Millhand	"	"
38	—	Chief	"	Unemployed	Indirect	2 years
43	Chronic Bronchitis	H. O.	Chronic Cough	2 months—Millhand	Bilateral Indirect	1st—7 day 2nd—2 years
30	—	H. O.	Uneventful	6 weeks—Millhand	Indirect Re-operated 2 years ago. No recurrence	3 years

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USE OF A STORED RIB-GRAFT IN THE TREATMENT OF ATROPHIC RHINITIS

BY

D. K. GOSAVI, Miraj.

Many of the surgical procedures employed in the treatment of atrophic rhinitis are aimed at reducing the size of the nasal cavities by introducing various grafts in the subperiosteal pockets of the nasal floor, the median septum or the lateral wall of the nose. Today the most commonly used material is either polished ivory, acrylic, autogenous bone or cartilage. All these techniques have their merits and demerits. Most people agree that bone is superior to the rest of the materials in such grafting operations.

Though bone has been more commonly employed now-a-days in such procedures, the idea has not been a new one by any means. For, as early as 1900, Schonstadt used tibial shavings underneath the mucoperiosteum of the nasal floor. Bruning used fatty tissue instead of bone chips, and Eckert Mobius used prepared cattle bone-spongiosa from the knee of the cattle to achieve the same results.

I have tried a technique in which a stored bone graft i.e. chips of the ribs, removed from patients operated on for thoracoplasty, are used. To the best of my knowledge this method has not been reported by anyone before.

Six patients with atrophic rhinitis have so far been operated upon. The technique is described here.

Technique

(1) *Obtaining the graft.*—The graft is obtained from the ribs removed during the operation of thoracoplasty. The rib so

removed is cleaned by scraping off the attached muscle element. It is washed with normal saline, dried and then wrapped in a piece of sterile gauze. Finally the packing is inserted in a sterilized test tube and the test tube is stored in a refrigerator at a temperature of 0°-4° C. Such a stored rib can be used for a period of 10 days without ill effects for the purpose of grafting.

(2) *Anaesthesia.*—Premedication is done as usual for the nose operations. The operation is done under local infiltration anaesthesia through the sublabial route.

(3) *Technique of operation.*—After infiltrating the soft tissue with 2% procaine containing adrenaline, a sublabial incision is made deep down to the bone in the region of the lateral incisor and the canine teeth. The soft tissues and the periosteum are elevated and the pyriform crest of the nose is exposed. The crest is lowered by nibbling with a rongeur. When this is done, the inferior turbinate bone which is attached to the lateral wall of the nose can be separated medially together with the mucoperiosteum by using a small periosteal elevator.

(4) In the pocket so prepared in the lateral wall of the nose the bone chips are inserted as posteriorly as possible. When this is done the mucoperiosteum together with the attached turbinate bone is mobilized towards the septum. The pocket is fully stuffed with the chips, so that the turbinate bone almost touches the septum. This is done so, because the tissues shrink to some extent during the post-operative period.

The incision in the naso-labial fold is sutured with plain catgut. No packing is required in the nose.

There were no complications in any of the cases.

Post-operative course

Most people experience headache for a couple of days. The usual analgesics are employed for relief. There may be oedema and swelling over the upper lip and lateral wall of the nose, which lasts for a few days. Inj. Penicillin 10 lac units and Streptomycin 1 gram are given for 10 days. The nose is cleaned daily twice with an alkaline solution and chloretone drops instilled. The patients generally leave the hospital within eight to ten days.

Results

Out of the six cases so far treated, four had bilateral disease and two had unilateral.

Two cases were early, three cases fairly advanced, and one was very advanced.

Four cases had satisfactory relief at the time of discharge *i.e.* there were no green crustations. One case was slightly improved. The one with advanced disease showed no improvement at all.

Discussion

The suggestion of using a bone graft in reducing the size of the airways is more appealing than burying an element like ivory or acrylic in the nasal tissues.

The procedure of acquiring bone graft from iliac crest is a troublesome thing for the patient and also for the surgeon. Probably this procedure achieves both the objectives *i.e.* simplicity of acquiring the material and the advantage of the living bone graft: it should deserve trial from Otolaryngologists to evaluate the merits and demerits of this technique.

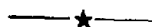
Acknowledgement

I am grateful to Dr. A. G. Fletcher, Jr., Director of Surgery, Wanless Tuberculosis Sanatorium and Dr. W. M. Bond, Head of the Pathology Department, Wanless Hospital, Miraj for making available the ribs required in this operation. I am also thankful to Dr. A. N. Gaikwad, Miraj and Dr. K. L. Shah, Bombay for their valuable suggestions.

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MANAGEMENT OF TUBERCULOUS CONTRACTURE OF THE BLADDER

BY

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Persistence of dysuria in patients after removal of a tuberculous kidney is found in a small, but important, number of cases. This has been observed to be due to either an excessively irritable bladder or a contracted bladder. The former is due either to tuberculous ulceration or scarring of the bladder and has been managed by adequate chemotherapy, or, if necessary, partial cystectomy for the ablation of the ulcer or the tuberculous scar. The latter, however, presents a more formidable problem. The capacity of the bladder is reduced to one as low as 10 or 15 c.c. resulting in what is known as a "thimble bladder" and the patient has to void urine at 10-15 mts. intervals or even more frequently. This life of the patient becomes miserable.

The treatment of this condition till recently has been far from satisfactory. Such cases had been treated by urinary diversion either by cutaneous ureterostomy or ureterosigmoidostomy. The results of such procedures, however, have not been commendable and fatal results have ensued, due, either to ascending infection in the remaining kidney and subsequent renal failure or to the biochemical disturbances associated with ureterosigmoidostomy.

The possibility of an operation on the bladder itself for the relief of this condition was thought of as soon as streptomycin made healing a probability. The use of an intestinal graft to increase the capacity of the bladder was considered. The procedure itself, however, is not a new one. It is said to

have been performed in dogs by Tizzoni and Foggi in 1888. Since then several more reports have appeared. Couvelaire summarised them in 1950.

The method used for the Ileocystoplasty consisted basically of terminal or lateral anastomosis between an isolated loop of bowel and the bladder with the result that a tubular diverticulum with a muscular wall is added to the bladder. It was realised later, that if the orifice of the anastomosis is small (as in cases of terminal anastomosis or lateral anastomosis with small orifice) the graft neither fills nor empties rapidly and there is a tendency for stagnation of urine. This could be circumvented by anastomosing the remaining ureter to the intestinal loop, as in the method sometimes used to bridge the gap left by removal of a damaged or diseased ureter, described by Couvelaire (1950) and Annis (1953). In the absence of any ureteric disorder, however, this addition to the operation seems unjustifiable.

It was then thought that the bigger the communication between the bowel loop and the bladder the easier will be the emptying, provided that the graft was contractile. It was also conceived that if the bowel could be incorporated in the bladder wall as a flat patch the resultant increase in the capacity will be far greater than that achieved by the use of a tubular graft. Accordingly, a flat graft was designed and practised in experimental animals and then on human patients by various workers. The procedure brought definite improvement to



Fig. 1

Excretion pyelogram of A. D. revealing no dye in the right kidney, hydronephrosis and hydroureter on left side and a bladder of small size.

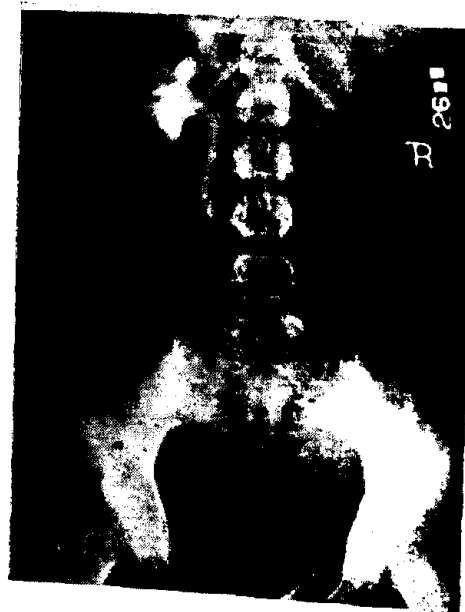


Fig. 2

Excretion pyelogram of A. D. repeated on 20th May, 1957 showing no excretion on the right side and marked hydronephrosis and hydroureter on the left side with thimble bladder.



Fig. 3

Excretion pyelogram of A. D. repeated on the 25th May, '58 showing marked hydronephrosis and hydroureter more than in previous films.

the patient by increasing the capacity of the bladder and thereby relieving the patients of troublesome frequency of micturition. The reduction in frequency has been quite encouraging. It has been cut down from once every 10 mts. to as low as once in 3-4 hours.

An undesirable feature of ileocystoplasty has been the discharge of mucus in the urine. However, this itself is not enough to make the urine alkaline.

As mentioned at the very outset the incidence of this condition is not great. Of the fifty cases of urinary Tuberculosis which attended the G. U. department of the Patna Medical College Hospital in the year 1957-58 only two cases presented for persistent dysuria after healing of or extirpation of the renal lesion, and were established to be cases of contracted bladder. This amounts to an incidence of about four percent.

Case Reports

Case No. 1.—A. D., a Hindu female, 25 years of age, was admitted in the hospital on 5th February, 1957 with the complaint of increased frequency of micturition and with the provisional diagnosis of floating kidneys. She was kept on a nutritious diet. On 22nd March, she developed a tender fluctuant swelling in the suprapubic region. Achromycin was started and on 1st April, 1957, the swelling was incised. On incision, to our great surprise, urine mixed with blood came out. On exploring the cavity it was found to be lying between the bladder and the skin, and the urine had collected there from a leak in the bladder at the bottom of the cavity. The bladder wall was considerably thinned out. The case was diagnosed as one of Tuberculosis of the kidneys and ureters with tuberculous cystitis. Anti-tuberculous treatment with Streptomycin, PAS and Isonex was started. Excretion Pyelogram was taken on 20th May, 1957, and it showed no excretion on the right side and marked hydronephrosis and hydroureter on the left side with a thimble bladder. Suprapubic leak of urine continued. On 6th June '57 Nephroureterectomy was performed on the right side. The kidney was enlarged, containing multiple tuberculous cavities, and the ureter was thickened,

dilated and tortuous. The bladder was markedly contracted. The bladder was sutured and the suprapubic leak restarted and it discharged intermittently. Excretion Pyelogram was again done on 7th October, 1957. It showed hydronephrosis and hydroureter in the remaining kidney. On 13th November, 1957, when suprapubic leak had stopped, she developed a subcutaneous cystic swelling in the suprapubic region. It disappeared on catheterization and thereby established that the swelling was due to urine collected under the skin from the leaking bladder. Excretion pyelogram was repeated on the 25th May, 1958 and it showed marked hydronephrosis and hydroureter, more than in previous films. It was thought to be due to constriction of the lower ureteric and by the fibrosis of the bladder. Consequently to salvage the only remaining kidney the ureter was transplanted into the sigmoid colon as the case was not suitable for any other procedure. This was done on 28th May '58 and Excretion Pyelogram taken on 11th June showed marked improvement. On 13th June, 1958, she was readmitted to the hospital in a moribund condition. Her blood urea was estimated to be 240 mg. per cent and an attempt at excretion Pyelogram showed non-excretion of dye within an hour. She was given all possible treatment but it was of no avail and she died on the 20th August, 1958. Postmortem examination could not be arranged.

Case No. 2.—J. D., a Hindu female, 35 years of age was admitted in the hospital on 8th August '57 for the treatment of Renal Tuberculosis. She was being treated by private practitioners since 1954 for the complaint of frequency of micturition. Excretion Pyelogram on 1st September '55 revealed right kidney to be normal and the left kidney showing distortion of calyces and hydroureter. Since then she was on anti-tuberculous regime. Excretion Pyelogram on 14th Nov. '57 showed right kidney normal and left kidney having marked distortion of Calyces and hydroureter. Persistence of lesion without any improvement in the left kidney led to Nephroureterectomy in Feb. 1958. The kidney and ureter were found to be tuberculous. Patient had an uneventful recovery and was discharged in Feb. 1958.

She was re-admitted on 21st August, 1958 for the complaint of frequency of micturition. She had to micturate every 10 mts. or so in the day and 4 to 5 times at night. Excretion Pyelogram on 27th August, 1958 showed the remaining kidney and ureter to be normal, but the bladder cast a shadow which was definitely smaller than usual. Consequently her symptoms were attributed to the small size of the



Fig. 4

Excretion pyelogram of A. D. done on the 11th June showed marked improvement.

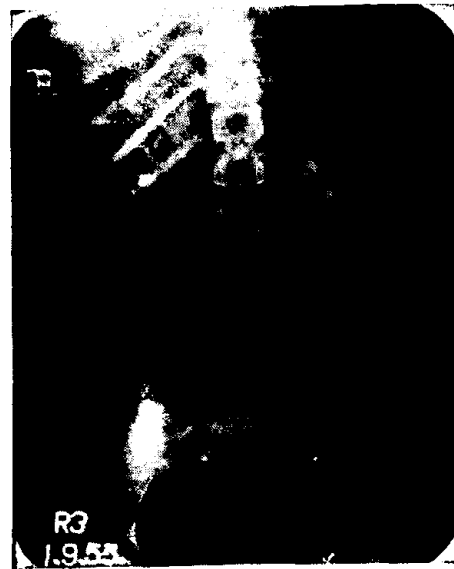


Fig. 5

Excretion pyelogram of J. D. done on the 1st September, 1955 revealed right kidney to be normal, left kidney showing distortion of Calyces and hydronephrosis.

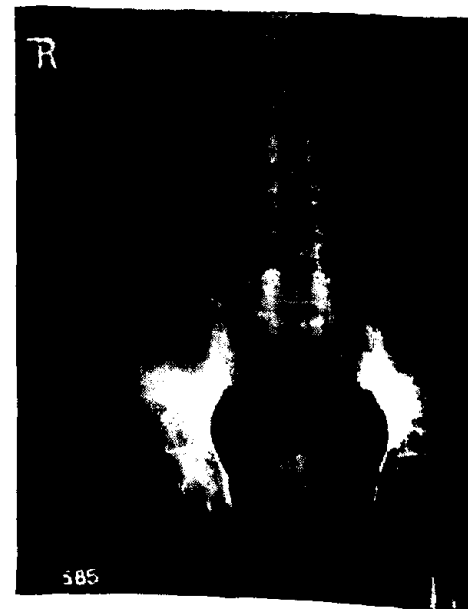


Fig. 6

Excretion pyelogram of J. D. done on the 14th November, '57 showed right kidney normal and left kidney having marked distortion of Calyces.



Fig. 7

Excretion pyelogram of J. D. done on the 27th August, '58 showed kidney and ureter to be normal but bladder casting shadow which was definitely smaller than the usual.

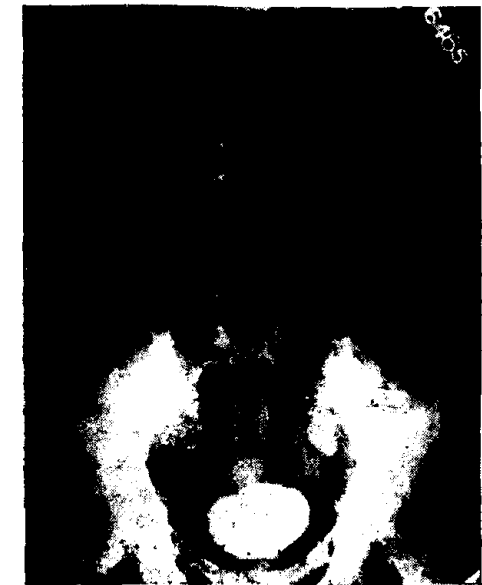


Fig. 8

Excretion pyelogram of J. D. done on the 7th October, 1958 showed normal kidney and ureter and bladder size definitely bigger than before. There was no diverticulation.

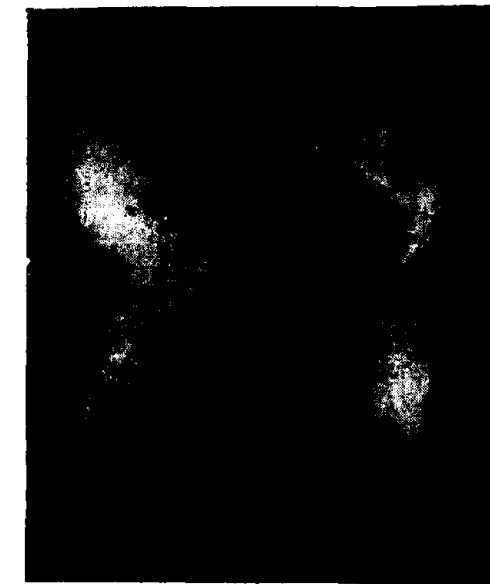
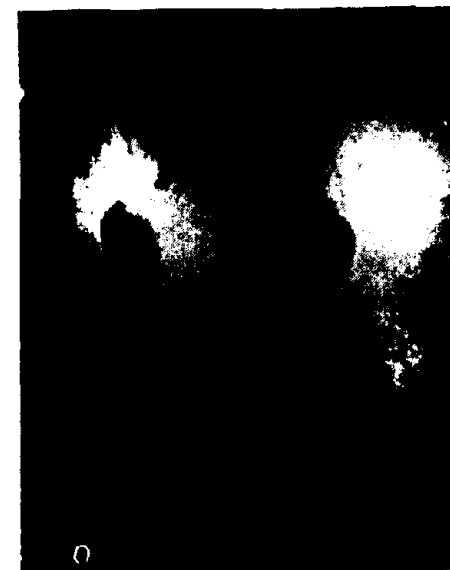


Fig. 9 & 10

Cystogram done on J. D. has shown definite increase in size of bladder capacity as a result of the intestinal graft.

bladder and ileocystoplasty was contemplated. It was performed on 1st September, 1958. A loop of intestine measuring 3" with its mesentery was isolated from the terminal ileum and the continuity of the intestine re-established. The isolated loop was split at the antimesenteric border and closed at the ends. The flat graft was transplanted to the top of the bladder which was previously incised transversely. The suture line was extraperitonised and the wound was closed leaving a drain in the retropubic space. The bladder was drained with an indwelling Foley's catheter. Recovery was uneventful except that there was suprapubic leak for about a week after removal of stitches. The patient was afebrile on the 12th day of operation. Excretion pyelogram on 7th October, 1958 showed normal kidney and ureter and bladder size definitely bigger than before. The frequency of urination had decreased to hourly intervals in the day time and only once in the night.

On 21st October '58, there was rise of temperature to 102°F. X-ray of the chest showed evidence of infiltration and she was put on strict antituberculous regime. On 14th November, 1958, examination of urine revealed the presence of pus cells, epithelial cells, granular casts and phosphate crystals with alkaline reaction. By 17th Nov. '58 she was afebrile. She was again febrile on 4th Dec. '58 and was this time treated by Achromycin which brought her temperature to normal and on 5th January, 1959, she was discharged from the hospital doing well, except for an incisional hernia.

Cystogram done after operation showed a definite increase in Bladder capacity brought about by the intestinal graft. Frequency at the time of report has been reduced to six to eight times in day time and once at night.

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Comments

On a review of the cases reported it follows that while ureterosigmoidostomy brought about immediate relief from the distress of urinary fistula (due to tuberculous contracture of the bladder) as well as disappearance of hydronephrosis and hydroureter the result in the long run was quite discouraging. While this method could be used to salvage a dying kidney, it is not beneficial for the maintenance of the life of the kidney. The patient is liable to the risks of either ascending infection of the kidney or of the biochemical disturbances associated with this procedure. In this case the patient showed immediate relief both subjective and objective; but this was only temporary.

The other case on whom Ileocystoplasty was performed showed rather an ideal result, except for some minor post-operative trouble. The urinary frequency was definitely reduced and urgency and dysuria had disappeared. There is definite and marked increase in the bladder capacity thereby obviating any chance of back pressure and its bad effects on the remaining kidney. The result, in our opinion, has been commendable.

OBLITERATIVE OR STENOSING CHOLANGITIS

(With Report of 2 Cases)

BY

M. AHMAD, Calcutta.

Obliterative Cholangitis is a rare disease, though it has been known for a long time. As far back as 1885, Bristowe is said to have described it. Later on Walter in 1933, Lahey in 1937 and Cattel in 1947 described this condition in some detail.

Flickinger in 1946 thought that at least 12% of the benign strictures of the common bile duct and the hepatic ducts are due to obliterative cholangitis.

Wilson in 1939 was also of the same opinion. According to Wilson, most of the cases of benign strictures of biliary tract are due to trauma, some due to ulceration from a stone in the biliary ducts and the rest due to obliterative cholangitis. This has also been well dealt with in Judd's articles in 1926.

Carter in 1951 has also discussed this problem and so has Lee in 1955, with a case report of one such case.

Phillip and Kilgore's case (1935) was diagnosed at autopsy. Rains (1958) in his Hunterian lecture has discussed this subject in some detail.

Aird in 1957 has described 2 such cases associated with Crohn's Disease and in two cases of Rains, non-specific infective changes were seen in the colon.

Pathology

In a great majority of cases it is associated with neglected calculus disease of the gall bladder or empyema of the gall bladder.

In these neglected cases, there is a long history of bouts of jaundice, chill and rigor. The gall bladder at operation may be small, pearly white and fibrotic or there may be an empyema. The duct may also be seen to be scarred and obliterated.

In certain instances, though rarely the gall bladder may be normal. The bile ducts alone may be involved in a chronic, progressive inflammation, leaving a scarred and obliterated duct, and the mucous membrane may be destroyed.

It may be of two types:—

I. *Localised Type*.—Where there is a small area of stricture anywhere in the bile ducts. It can be discovered only by the probe. This localised form of disease is rather less common. The local stricture may be in the common bile duct, the common hepatic duct, the right or the left hepatic duct or in the intra hepatic ducts (Carter's case).

II. *Extensive Type*.—This is the most usual type met with. There is extensive involvement of, usually, the extra-hepatic ducts and sometimes of the intra hepatic duct and much less commonly of both.

The end result is a fibrous, obliterated, cord like duct with markedly reduced lumen.

While obliterative cholangitis may occur in any neglected case of calculus cholecystitis, it is most common in cases of empyema of the gall bladder, especially in those cases

with a long history of Charcot's triad—i.e. shivering attacks with fever and mild jaundice.

It is sometimes possible to predict at the time of the operation whether a particular patient is likely to develop obliterative cholangitis after the operation.

A 'Red Hot' duct indicates that the mucous membrane is inflamed and in such cases evidences of jaundice develop soon after cholecystectomy, especially if the common bile duct has not been drained and the drain has not been kept for some length of time, while in other cases, the common bile duct may look normal and if obliterative cholangitis does develop in such cases, it usually takes a long time, may be years after the operation for the symptoms and signs of obstructive jaundice to become obvious.

There may be another group of cases, in which the C. B. D. is neither dilated nor is there any evidence of stone in it. If any thing, it is smaller, thicker and whiter. These are early cases of subacute or chronic obliterative cholangitis and the obvious clinical symptoms and signs may develop months after the first operation.

At operation we may meet another type of case, where the common bile duct is obviously dilated and thickened. After drainage of the common bile duct, biliary mud with sand and grit, comes out. Some of these cases may also develop obliterating cholangitis later on, in spite of the drainage of the duct. Obliteration may also occur in cases developing biliary fistula following cholecystectomy when the fistula persists for sometime.

There is the last and rarest group of patients where the gall bladder is normal and the changes of obliterating cholangitis are seen only in the common bile duct, the common

hepatic duct, the right or left hepatic ducts (Wilson's and Phillip and Kilgore's Case). If the hepatic duct alone is involved, the gall bladder is flaccid (Rain). These cases are often diagnosed as virus hepatitis and only an exploratory laparotomy, establishes the diagnosis.

Histology

Autopsy histology shows—a localised or generalised thickness of the wall of the duct obliteration of its lumen and destruction of its mucous membrane.

Etiology

The variations in the site, the extent of the pathological lesion and the clinical types of patients in which it can occur, suggest that there may not be a common cause. The following, however, may be the causes:—

- (1) Acute chemical inflammation of the biliary channels due to regurgitation of bile and the pancreatic juices.
- (2) Ascending bacterial infection from the duodenum, which can happen in exactly the same way as infection by the Larvae of the Liver Fluke. However, bile culture in all the cases may not be positive. In Carter's 15 cases, culture was positive in only 10 and it was mostly B. Coli that was grown.
- (3) Infection implanted in the Common bile duct from the infected gall bladder—probably the commonest cause.
- (4) Periductal fibrosis—as has been noticed in cases of biliary leakage or fistula. Bile in the peritoneal cavity, is a strong chemical irritant, which causes adhesions and fibrosis.

Experimentally, strong, biliary reaction and marked fibrosis is seen around the ducts if bile is made to leak around the ducts. The irritant property of the bile is probably due to the bile salts.

- (5) Prolonged use of the T tube may, rarely, cause this condition; this, however is rare. T tubes have been used in this Hospital for years in several cases of chronic relapsing pancreatitis, without the development of this disease.

Whatever may be the causes, the ultimate result is the same i.e., development of obstructive jaundice due to obliteration of the lumen of the duct, fibrosis of the wall and destruction of its mucous membrane.

We have already discussed the site and the extent of the lesion. However, there are certain very peculiar features:

- (1) The obstruction is never complete and the stool is never markedly clay coloured.
- (2) Above the stenosed area, exploration of the duct never results in a gush of bile.

Symptoms and Signs

The symptoms depend upon the exact clinical group in which the patient falls.

- (1) In non-operated cases, where the gall bladder is otherwise normal, the symptoms are, slowly progressing jaundice, some aching pain in the right hypo-chondrium and some rise of temperature. These cases are initially indistinguishable from virus hepatitis or a malignant growth of the ampullary region of the duodenum.

- (2) The next group present themselves as cases of empyema of the gall bladder with or without history of bouts of jaundice associated with chill, rigor and fever. The operation is done and later on, weeks, months or years after (7 years in Ayeswark's case), a slow progressing jaundice develops.

- (3) In this group fall neglected cases of calculus cholecystitis with a long history of biliary colic and the associated symptoms and signs. They may also develop this condition months or years after the operation.

- (4) In this last group are cases who develop biliary fistula, following cholecystectomy or cholecystectomy and choledochostomy and the fistula takes some time to close. These cases develop the symptoms and signs of obstructive jaundice soon after the operation or after a few weeks or months.

In all such cases the differential diagnosis between traumatic stricture of the biliary tract, residual stone, carcinoma of the head of the pancreas, periampullary carcinoma, chronic relapsing pancreatitis and obliterative cholangitis has to be made. The pre-operative diagnosis is mainly by exclusion. The exact diagnosis can be made sometimes only at the operation.

There are, however, certain points which help in the diagnosis:—

In Obliterative Cholangitis

- (1) The obstruction is never total and complete and the stool therefore is never truly clay coloured.
- (2) Irregular temperature is sometimes present.

- (3) The pain is never colicky in nature (c.f. stone in the common bile duct) or severe.
- (4) At operation there is never a gush of bile from the duct above the stenosed area.
- (5) The proximal ducts are not obviously dilated.
- (6) The whole area is full of adhesion and the ducts are difficult to identify.
- (7) Sometimes Kocherization of the duodenum and even duodenostomy may be required to identify the common bile duct or its opening at the sphincter of Oddi.

Laboratory Investigations such as, Van den Bergh reaction, serum alkaline phosphatase reaction, thymol turbidity test, Takata-Ara test—all point towards obstructive jaundice.

I. V. Cholangiogram may sometimes show the site of the stricture and the normal ducts above the strictured area. In extrahepatic type of lesion, the hepatic ducts may be visualized and are normal looking. In extensive types, the biliary channels may be very thin and small in calibre. Sometimes the dye may not be visible at all.

Ba-Meal Examination of the duodenum must be done to exclude any disease of the head of the pancreas.

Management

The management of these cases is difficult. However, attention to the following points will eliminate some of the causes which lead to this condition :—

I. Biliary leakage must be prevented to eliminate the ill effects of bile salts on the peritoneal cavity and at the porta hepatis.

(a) The cystic duct must be ligated well so that the chances of the ligature slipping is least. In cases where the cystic duct has been taken up by the distended gall bladder and the gall bladder end of the duct is dilated, a transfixion suture must be used. This has been the routine practice for such cases for some years now.

(b) The cystic duct must be tied close to the common bile duct, to prevent any blind pouch of the cystic duct which may lead to recurrent infection and formation of stone.

(c) When the common bile duct is drained, the T tube must be of correct size and the sutures must be such that the T tube does not come out by itself.

(d) In case of any doubt about the ligature or in difficult cases, a drain must be put in the peritoneal cavity.

II. In grossly neglected cases of gall bladder calculus diseases and in empyema of the gall bladder, the pus must be sent for culture and sensitivity test and then appropriate systemic antibiotics must be given. Locally, also, the appropriate antibiotics may be given by the following method :— After the cholecystectomy or such other operative procedures as may be indicated have been completed and before closing the abdominal cavity, a catheter is left at the site of the main operative field and one end of it is brought out through a small, stab incision in the flank. The catheter is clamped so that it has no communication with the external air. By puncturing this catheter by a fine needle, the appropriate antibiotics can be injected into the peritoneal cavity as required. In the case of a negative culture, only solutions of crystalline penicillin and streptomycin are given. This method has

been tried in neglected cases of calculus gall bladder and empyema of the gall bladder, with good results.

III. In cases where the common bile duct is 'red hot' it must be drained though there may not be any history of jaundice nor any suspicion of stone in the common bile duct and the T tube should be retained for a fairly long time.

IV. When a patient develops obstructive jaundice following cholecystectomy, full investigations, including blood examination for bilirubin content, icteric index, thymol turbidity test, serum amylase content, examination of stool and urine, barium meal x-ray of the duodenum and I.V. cholangiogram must be done. When all the investigations point towards obstructive jaundice and no obvious reason for this can be ascertained, one may think of the possibility of traumatic stricture or obliterative cholangitis.

Usually, however, the diagnosis is made at the operation table when the duct system is found to be markedly stenosed and fibrosed. There are two constant findings *i.e.* (1) the common bile duct is very difficult to demonstrate. Kocherization of the duodenum and even duodenostomy may sometimes be required to expose the common bile duct. (2) The common bile duct is not dilated and no gush of bile comes out from the part above the obstruction.

The methods of relieving the obstruction are :—

(A) Resection of the stricture and end-to-end anastomosis using an indwelling tube. This is possible only in the localized type of disease where there is one single short area of stricture.

The T tube must emerge out at an area above or below the site of anastomosis and this must be retained for 3-4 months.

(B) By-pass operation using the stomach, duodenum or a jejunal/loop (not Roux loop) *e.g.* Choledocho-duodenostomy, choledocho-gastrostomy or choledocho-jejunostomy.

Choledocho-duodenostomy is sometimes possible if the area of stricture is a localized one, situated at the lower end of common bile duct.

The disadvantages of these procedures are :

I. Stenosis at the site of anastomosis.

II. Regurgitation of gastro-intestinal contents into the biliary tract and its consequences.

(C) By-pass using Roux-en-Y type of jejunostomy as modified by Cole.

This prevents regurgitation of gastro-intestinal contents into the biliary tract and can be used in extensive extrahepatic type of obliterating cholangitis.

Its modification by Rain can be used if the stenosis is at the porta hepatis.

(D) In cases where the stenosis extends upwards in the hepatic ducts beyond the porta hepatis in the liver substance, the By-pass operations are out of question and then the following may have to be resorted to :—

(1) Ureteric catheter drainage of the common bile duct or hepatic duct in the first stage and later Roux-loop may be sewed at the porta hepatis.

(2) Retrograde dilatation of the common bile duct after doing duodenostomy and putting a T tube in the common bile duct, through which ureteric catheters to the left and right hepatic ducts may be passed and drained outside.

(3) Longmire's operation of partial left hepatectomy with dissection and preservation of the left hepatic duct, which can be implanted in the Roux Loop of jejunum. This can be of use only if there still exists normal communication between the left and right hepatic ducts at their junction, below the porta hepatis, because a peripheral communication between these ducts appears to be improbable.

(E) In extensive extra hepatic obstructive cholangitis, if the patient's condition does not allow any extensive procedure, a T tube may be kept in the common bile duct and retained there for a long time, in the hope that after the T tube is removed, the lumen of the ducts will not become obliterated again. However there are certain disadvantages:

- (1) As the epithelium of the ducts is destroyed, there is the danger that after removal of the T tube, the duct may become obstructed and stenosed again.
- (2) A very prolonged use of the T tube may itself be a factor in further causing cholangitis.

Case Reports

Case No. 1.—A Hindu female, 33 years old, was admitted on 3-12-55 and then complained of:—

- (1) Pain right hypochondrium—off and on, colicky in nature, radiating to the back and right shoulder, accompanied by vomiting, more so with fatty meals—7 months.
- (2) Feeling of heaviness of the right hypochondrium—7 months.
- (3) Fever—off and on—101–103°F. With some chill and rigor—7 months.
- (4) She had noticed a lump in the right hypochondrium—7 months.

- (5) There was no jaundice either in the history or on examination:—The gall bladder was distended, enlarged upto the umbilicus and tender. No other clinical abnormality was detected.

Cholecystography on 5-12-55 showed:—Non-functioning gall bladder without any radio-opaque shadow in that region.

Blood Examination on 7-12-55 showed:—Icteric index 2—Van-den-bergh reaction—delayed direct positive.

Bilirubin content	...	1 mgm/100 c.c.
Total protein	...	8.87 Gram/100 cc.
Albumin	...	3.75 Gram/100 c.c.
Globulin	...	5.12 Gram/100 c.c.
Blood urea	...	49 mgm/100 c.c.
N. P. N.	...	39 mgm/100 c.c.

Other routine examinations were within normal limits.

A diagnosis of empyema of the gall bladder was made. Preoperative antibiotics were started and the patient was operated on, on 15-12-55 under general anaesthesia. On exploration, a large distended gall bladder was found, with a large single stone in Hartmann's pouch.

Cholecystectomy was done; the stone in the gall bladder was a cholesterol solitaire.

There was no previous history of jaundice, the stone was a large single one and so the common bile duct was not explored; clinically it looked normal and was not distended or red and congested. Bile taken from the gall bladder at the time of the operation was later reported on as sterile.

Post operatively.—She had a stormy period and on the 3rd day of the operation i.e., on 18-12-55 a small amount of bile started coming from the drainage tube in the right flank.

The quantity of bile never exceeded 2-3 oz. and within two weeks it completely disappeared. During this period she also developed slight icteric tinge and irregular fever, which however completely disappeared in 3 weeks time.

It was suspected that the patient may have a residual stone in the common bile duct. Icteric index on 23-12-55 was 12 and Van den Bergh reaction was direct immediate positive. I. V. cholangiogram was done on 3-1-56. It did not reveal any radio-opaque shadow in the region of the biliary tract; the biliary tract however was not well visualized by the dye.

By 28-1-56 the jaundice had completely disappeared and the patient was discharged on 30-1-56.

The patient remained well and without any abdominal complaint and was discharged even from the outpatient department and follow up, by the end of 1956. However, the patient was readmitted on 28-8-57 and then complained of:—

- (1) right sided abdominal discomfort and heaviness. No colicky pain—7 months.
- (2) jaundice—off and on—slight—7 months.
- (3) irregular fever with chill and rigor—7 months off and on.
- (4) pruritus—7 months.

She also mentioned that though the urine was high coloured, the stool was of normal colour.

On Examination.—Jaundice was present—moderate degree. Liver was enlarged 2½ fingers. There was irregular fever.

Blood Examination on 31-8-57 showed:—

Blood urea	...	24 mgm/100 c.c.
N. P. N.	...	23 mgm/100 c.c.
Total protein	...	7.31 Gram/100 c.c.
Albumin	...	2.67 Gram/100 c.c.
Globulin	...	4.64 Gram/100 c.c.

Urine Examination showed—presence of Albumin and some Granular casts.

Biochemical tests on 6-9-57 showed:—

- (1) Vandenberg reaction—Immediate direct positive.
- (2) Icteric index—12.
- (3) Thymol turbidity test—5.3 units.

All these pointed towards obstructive jaundice.

I. V. Cholangiogram on 4-9-57 did not show any shadow of the dye in the biliary tract.

A preoperative diagnosis of:—

- (1) a small residual stone in C. B. D. or
- (2) an obliterative cholangitis was made.

Exploratory laparotomy was done on 12-9-57 under G. A. through another right paramedian incision. There was marked adhesion in the region of the gall bladder fossa, and the common bile duct.

It was dissected free, but the common bile duct could not be definitely identified. Exploration by a syringe of the thick cord like structure suspected to be the common bile duct did not bring out any bile.

Kocherization of the duodenum was then done, this also did not help in the identification of the common bile duct.

The duodenum was then opened in its second part and bile could be seen in the duodenum.

With great difficulty, the ampulla of Vater was identified, it could hardly admit the smallest size probe.

The duct was dilated with great difficulty, by means of urethral dilators and was opened in the supra-duodenal portion on the tip of a dilator.

It was then evident that the common bile duct and the hepatic ducts as far as the porta hepatis were white, cord like and strictured with little lumen in it.

A diagnosis of obliterative cholangitis involving the whole of the extra hepatic biliary channels, was made.

The right and left hepatic ducts were then dilated by dilators with great difficulty and a T tube was inserted in the common bile duct, one end of the horizontal limb lying in the right hepatic duct and the other end in the duodenum through the sphincter of Oddi. This had to be resorted to as the patient's condition did not permit of any more extended surgical procedure. The wound was closed in the usual way.

The patient made a good post-operative recovery. The duodenum did not leak, the jaundice disappeared except for a little icteric tinge and the temperature was normal. She was discharged on 2-10-57 with the T tube *in situ*. She remained well for 5 months except for a slight icteric tinge which was fluctuating, sometimes completely disappearing and sometimes coming back again. The patient was admitted again on 27-8-58 and complained of:—

- (1) Fever off and on—with chill and rigor—5 months.
- (2) Pruritus—6 months.
- (3) Jaundice off and on—9 months.

On Examination.—Jaundice was present in moderate degree. The Liver was enlarged—2 fingers. There were evidences of pruritus. Stools, however, were normal in colour though the urine was high coloured.

Blood Examination on 29-8-58 showed :

Van-den-bergh reaction — immediate — direct	positive.
Bilirubin content	... 5 mgm/100 c.c.
Icteric Index	... 8.
Blood Urea	... 54 mgm/100 c.c.
N. P. N.	... 40.6 mgm/100 c.c.
Total protein	... 7.62 Gram/100 c.c.
Albumin	... 4.03 Gram/100 c.c.
Globulin	... 3.59 Gram/100 c.c.

I. V. Cholangiogram.—On 3-9-58 by Biligraphin did not show the biliary tracts well.

T tube Cholangiogram.—On 15-9-58 showed, (Fig. 1 and 2) patent common bile duct without any evidence of obstructive dilatation of the biliary tract. The intra-hepatic part of the right hepatic duct was also visualised. There was no evidence of any calculus in the biliary tract. The dye had entered the duodenum and the stomach.

The patient was given a course of chloramphenicol and the jaundice and the Neuro-dermatitis markedly receded and the patient became a febrile. It would appear that there was an element of infection which was relieved by the chloramphenicol. The T tube was removed on 10-10-58 and the patient is well and without jaundice so far.



Case No. II.—This case was under the care of Prof. A. K. Saha. A man of 34 years, was first admitted on 4-8-58 for empyema of the gall bladder with complaints more or less similar to those in Case I, and was operated upon by Prof. Saha on 13-8-58.

The gall bladder was distended with purulent fluid and contained multiple large infective stones. The common bile duct looked and felt normal and was not explored. Post operative course was uneventful.

However, one month after the operation when the patient had joined duty after discharge from the hospital he developed pain in the right hypochondrium—not colicky in nature and associated with progressive, intense jaundice and without any fever or vomiting.

Investigations.—On 15-9-58 showed:—Vanden-bergh reaction—immediate direct positive. Icteric index—40.

Stool was whitish and semisolid.

Urine Examination revealed—excess of bile salts and pigments. A diagnosis of residual stone in the common bile duct was made and the abdomen explored on 26-9-58. On exploration, the gall



Fig. 1 and 2

It shows a patent common bile duct without any evidence of obstructive dilatation of the biliary tract. The intra-hepatic part of the right hepatic duct is also visualised. There is no evidence of any calculus in the biliary tract. The dye has entered the duodenum and the stomach.

bladder fossa, and the region of the common bile duct were full of adhesions. The common bile duct was dissected free, and was found to be cord like, thick and whitish. Needle aspiration did not bring out any bile. The duodenum was opened and the rest of the procedure was as in Case I.

In this case also, the obliterative process seemed only to extend up to the porta hepatis and here also a T tube was put in the common bile duct. Following the operation the jaundice became progressively more and more intense and he died about 1½ months after the second operation.

Summary

A short history of obliterative Cholangitis is given and the pathology and the factors leading to its production are discussed. A summary of the various types of

treatment and their indications has also been given. Two case reports of obliterative cholangitis have been included.

Acknowledgement

I must thank Dr. A. K. Dutta Gupta, Ex-principal-Superintendent, Nilratan Sircar Medical College for allowing me to use the hospital records of the cases. I must also thank Dr. A. K. Saha, F.R.C.S., M.Ch. for allowing me to include the record of the 2nd case, which was admitted under his care and also for his very valuable help and guidance in the preparation of this paper.

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FIBROSARCOMA OF THE PAROTID GLAND

BY

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Though there are excellent reviews of benign and malignant epithelial tumours of both the major and minor salivary glands, there are extremely few connective tissue tumours reported from these sites. Foote and Frazell² mention that "There is no theoretical objection to the existence of a great many mesenchymal tumours of the salivary glands, but vast patience is required to accumulate acceptable data. Publication of single case reports of convincing material of this sort should be encouraged". In the light of the above statement we are reporting a case of fibrosarcoma of the parotid gland.

Case Report

Mrs. K. a Hindu female aged 30 years was admitted for a lump in the right parotid region of 3 months' duration. The lump measured 8 × 10 × 5 cms. and had a well defined margin. It was fixed to the

overlying skin and had ulcerated at a few places. The mass was fairly well fixed to the deeper structures. The general configuration was that of a parotid tumour. There were no signs of facial nerve involvement.

Gross Description.—The specimen was an ovoid tumour mass 7 × 7 × 4 cms. The external surface was covered by skin which had ulcerated at places. The sectioned surface was soft, necrotic and presented a pink-gray to dark brown colour. There were also areas of haemorrhage and cystic degeneration (Fig. 1).

Microscopy.—A large number of Hematoxylin and Eosin stained sections have been studied. Differential stains used are Masson's trichrome and Mallory's phosphotungstic acid and hematoxylin stains. The tumour is uniformly composed of large spindly cells with prominent hyperchromatic nuclei (Fig. 2). Mitoses are numerous. The cytoplasm is long drawn out and devoid of striations. Giant, multinucleated tumour cells are frequent (Fig. 3). The stroma is scanty. No parotid tissue is demonstrated in any of the sections.



Fig. 1
Photograph of the gross specimen.

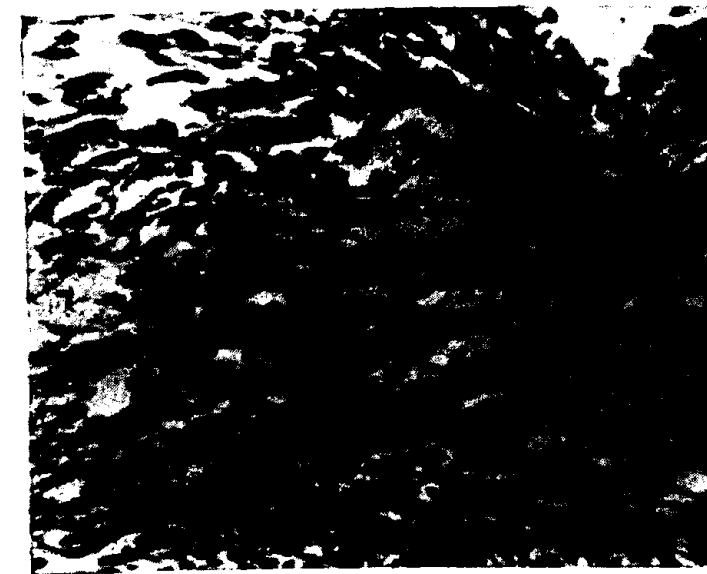


Fig. 2
Photomicrograph showing spindly tumour cells with prominent nuclei (L. P.)



Fig. 3
Photomicrograph showing tumour giant cells (H. P.)

Discussion

The connective tissue tumours of the salivary glands are very rare. Foote and Frazell² could collect only few cases from their files and from those of the Armed Forces Institute of Pathology. Their cases included occasional examples of benign neurilemmas and hemangiomas in the salivary glands. Payne³ has reported a case of lipoma of the parotid gland. Dutta-Gupta¹'s study of 72 cases of salivary gland tumours included a neurofibroma, a hemangioma and a fibrosarcoma. The latter case has not been described in detail in his paper. Vellios and Davidson⁵ came across six mesenchymal tumours in the parotid gland; out of these two were neurofibroma, two hemangioendothelioma and two cases of fibrosarcoma. In a personal communication Vellios⁴ mentions that sections from one of these cases of fibrosarcoma were reviewed by Dr. Stout who thought that the tumour might be reticulum cell sarcoma. This case later died with local recurrence and lung metastases.

In most of the connective tissue tumours of the parotid region the difficulty arises regarding the convincing evidence that the tumour has actually originated within the salivary gland. The present case reported had all the configurations of a parotid tumour, which had infiltrated the overlying muscles and had ulcerated through the skin. A generous histologic sampling of the specimen was done to demonstrate the presence of any residual parotid tissue, without any success. It appears that the tumour arose in the connective tissue frame work of the gland and obliterated the gland architecture.

The differential stains ruled out the possibility of the tumour being a myosarcoma. Histologically this case had no resemblance to anaplastic carcinoma with spindle cells, resembling a spindle cell sarcoma as reported by Willis.⁶

Acknowledgement

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IMPERFORATE ANUS WITH A REPORT OF TWO CASES, TREATED BY ABDOMINO-ANOPLASTY

BY

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Very few cases of imperforate anus treated by abdomino-anoplasty have been reported in Indian literature. In this paper, two cases of imperforate anus treated by abdomino-anoplasty in the Stanley Hospital, Madras, with a short review of the condition, are reported:

Incidence

According to Ladd and Gross, the incidence of imperforate anus is about 1 in 5,000 births. The abnormality is equally common in both sexes. A fairly good proportion of these cases have other associated congenital anomalies like Hydrocephalus, umbilical hernia, cleft lip, inguinal hernia, Multiple atresias of the small intestines, congenital heart lesions, atresia of the oesophagus and skeletal deformities. The incidence of the association of these anomalies has been 39% in Gross's series and 44% in Mayo's series.

Development

There are two different views about the development of the rectum and anal canal. The older view postulated that the hindgut ended blindly near the surface of the perineum. The skin of the perineum becomes invaginated to form a depression, the proctodeum. A membrane, the anal or cloacal membrane, separates the proctodeum from the blind end and subsequently disappears, so that the gut opens on the surface of the body.

There exists at one stage of development, a common cloaca at the posterior end of the

embryo. This divides into an anterior compartment (urogenital) and a posterior compartment (rectal) by the growth inwards of a vertical partition from each side, the folds of Rathke. According to this view, the failure of the cloacal membrane to disappear, or the imperfect fusion of the folds of Rathke lead to the various types of imperforate anus. Unfortunately this theory is not able to explain the occurrence of fistulae between the rectum and the scrotum, urethra or Perineum?

The other theory, propounded by Arthur Keith and Wood Jones states that the rectum develops as an offshoot of the hindgut. The hindgut first opens into the cloaca, above the entrance of the Wolffian duct, and gradually migrates caudally, to the epithelium of the anal pit. The various anomalies are due to agenesis and failure of migration or fusion.

Classification

It is proposed to follow the classification, laid down by Ladd and Gross here.

Type 1.—Rectum and anus have developed, but there is stenosis of the rectum and anal canal.

Type 2.—Rectum and anus have developed, but there is a persistent proctodeal membrane, not more than 1/4" thick.

Type 3.—Rectum and anus have not developed. The colon ends blindly above the pubococcygeal line. In a majority of the

cases, the blind end is connected to the urethra or vagina by a fistulous communication.

Type 4.—The upper part of the rectum is absent. The blind colon pouch is separated from a normal rectum and anus by the absence of the rectum for a variable distance.

The relative incidence of the various types are given in the table below :

		Gross.	Mayo.
Type I	...	6%	2.4%
" II	...	3%	37.6%
" III	...	87%	57.6%
" IV	...	4%	2.4%

Physical Signs and Diagnosis

The absence of a normal anal opening or the failure of the child to expel within the first 36-48 hours usually leads to the diagnosis. This is augmented by signs of intestinal obstruction like distension, vomiting, dehydration and collapse in the late stages. The condition is apt to be missed in the early stages in type IV cases, as there is an anal opening, apparently normal and the condition is thought of only after the signs of intestinal obstruction become severe.

In cases of type III associated with fistulae, diagnosis is easy, because of the abnormal outlet through which meconium escapes.

In a new born child, the perineum must be inspected for any evidence of a dimple or small opening. The urethra, and vagina must be examined for excluding fistulae. If the child has not passed meconium, pass a lubricated 7 size rubber catheter through the anal opening, to see if it is patent and to see if it gets stained with meconium. The child must be examined for other associated anomalies like congenital heart

disease, skeletal deformities and other conditions.

A plain x-ray of the abdomen and pelvis with the child held up by its legs, with an opaque object marking the site of the anal dimple, as advised by Wangenstein and Rice is very useful. The distance of the gas bubble in the distal blind end of the colon, from the opaque object is measured. If the distance is more than 2 cm., then surgery by the abdominal route is indicated, as the rectal pouch is high up and cannot be reached by a perineal approach.

Treatment

Treatment depends on the type of anomaly.

(1) In type I cases, simple dilatation daily, till the child passes motions normally is done. The ultimate results in this type are good.

(2) In type II cases, where there is a marked bulging in the anal site, or when the child cries, a simple incision over the bulge followed by dilatation gives good results.

(3) In type III cases, associated with fistulae, rectal drainage is already present, and there is no immediate danger to life. The operative treatment is postponed, till the child is four to eight years of age.

In type III cases, without fistulae, there are different views as to the proper operative procedure.

A few authorities advocate a perineal approach, if the distal blind end is within 2 cm. of the anal dimple. A vertical incision is made at the level of the anal dimple up to the coccyx. The blind end is brought down, opened and the wall stitched to the skin. The disadvantages are stricture due to

scarring and incontinence due to repeated dilatations. In some cases, the final result is satisfactory.

The alternative approach is the abdomino-perineal operation, abdomino-anoplasty, done either in one or two stages. The rectal blind end is first mobilised after a laparotomy ; then, through a small opening made in the anal dimple, an artery forceps is passed through the levator ani and pelvic floor, the tip of the blind end is caught by the artery forceps and the end pulled down to the anal opening. Then it is opened and the edges of the opening stitched to the anal margin. The peritoneum is stitched around the rectum. The levator ani acts like a sphincter.

Gross advocates a one stage operation, soon after birth, unless contraindications to major surgery are present. Others believe in a preliminary transverse colostomy, followed by the plastic procedure when the child is one to two years of age. The post-operative complications met with in some cases are anal stenosis, urinary dribbling and incontinence. Gross reports 77 operations of which 20 were one stage and 57 second stage.

In type IV cases, abdomino-anoplasty is the only procedure recommended, done either in one or two stages. The results are good, as there is an already intact external sphincter.

As regards the two stage procedure, Gross recommends sigmoidostomy, followed by repair at the age of 1-2 years ; whereas Denis Browne recommends a transverse colostomy, first, because it will not hinder any subsequent approach, and is also capable of safe and easy closure. The abdomino-anoplasty is done as a second stage, at the age of 1-2 years. According to Mayo, the mortality rate after initial

colostomy is 18.5%. Yet others advise a sacrococcygeal approach.

Case Report

Two cases of imperforate anus, treated by two stage abdomino-anoplasty are given below :

Case 1.—Sundari, girl aged 8 years, was admitted in the professorial unit (Dr. G. A. Rao) on 2-9-58 for treatment of inability to pass faeces through the normal anal opening.

At birth, the child had an apparently normal anal canal but did not pass any meconium, even after twenty-four hours. After about a day, it developed signs of intestinal obstruction, and examination revealed that the anal canal was patent upto a depth of 1½" only. So, a left inguinal colostomy was done to relieve the obstruction.

The parents of the child brought the child only after eight years, even though they were advised to bring the child after a year.

The girl was moderately nourished : examination of the perineum revealed a wellformed anus, with normal puckering of skin. A finger could be passed upto an inch. No impulse was felt on coughing. There were no external fistulae. Stimulation of the perianal skin, by pinching, resulted in contraction of the sphincter.

Barium, when injected through the colostomy opening, showed the blind end of the colon lying in the left iliac region (Fig. 1).

Preoperatively the girl's general condition was improved with iron, and high protein diet.

On 7-11-58, the abdomen was opened by a left lower paramedian incision (Surgeon: Dr. G. A. Rao). The descending colon was found to be stopping short at the left iliac region, and the colostomy was terminal. The descending colon was mobilised by careful dissection on the lateral aspect of the gut and by dividing the superior haemorrhoidal vessels. The terminal end of the colon was dissected from the colostomy opening leaving behind the redundant mucous membrane of the colostomy externally. The mobilised colon could be brought down to the anus, without much tension. An opening in the lower anal pouch was made, and an artery forceps introduced through it. The lower end of the colon was caught, pulled through and stitched around the anus by interrupted sutures. The abdomen was closed in layers: postoperative progress was uneventful.

On 28-11-58, the redundant mucous membrane of the colostomy left behind was dissected and the opening in the skin closed. The anus was dilated by finger. There was no stricture. Subsequently the girl was periodically dilated. She was fully continent and passing motions normally, when discharged on 17-12-58.

Post-operative barium enema shows a normal descending colon with normal anal opening (Fig. 1 & 2). Patient was followed upto two months. Weight had increased. She was passing motions normally.



Fig. 1
(Case i) Preoperative Ba. enema.



Fig. 2
(Case i) Post operative Ba. enema.

Case 2.—Child Pichumani, male, one year old, was admitted on 27-1-59 in this unit for inability to pass motion through the normal anal opening. At birth, child had an apparently normal opening, but no meconium was expelled even after 24 hours. On examination at the District Head Quarters Hospital at that time the anal canal had been found to end blindly at a depth of $\frac{1}{2}$ " from the skin margin and a left iliac colostomy, had been done.

The child was anaemic, poorly nourished and was covered with chronic scabies. The distal colon had

prolapsed through the colostomy opening to a length of 3". The anal canal was $\frac{1}{2}$ " in depth, the sphincter was normal. No other congenital abnormalities were present. The scabies were treated and the child's general condition built up.

On 9-3-59, under general anaesthesia the abdomen was opened by a left paramedian incision (Surgeon: Dr. V. Sankaran). The distal blind end of the colon was found prolapsing out, and was reduced by enlarging the colostomy opening and pulling the loop inside. Then the colostomy was dissected all around and closed by suture and pushed back into the peritoneal cavity. The blind end was found to be markedly thickened and dilated. The anal opening was dilated, an incision made in it, and an artery forceps was introduced between the levatores ani and through the pelvic floor and the blind end of the loop pulled down. But the blind end would not come down, because of its bulk. So it was excised upto the original colostomy opening and the mobile descending colon brought down and its edges stitched to the anal margin with $\frac{1}{2}$ " of mucous membrane protruding, to enable it to retract properly. A rubber tube was left in upto a depth of 6". The abdominal incision and colostomy wound were closed in layers. Post operative progress was uneventful. Subsequently, the anus was kept dilated once a week. The patient had full continence and has been passing normal motions upto the time of writing (30-6-59) (Figures 3 & 4).



Fig. 3
(Case ii) Preoperative Ba. enema.



Skiagram 4
(Case ii) Post-operative Ba. enema.

Discussion

The points of interest are that the lower end of the colon near the colostomy was thickened and bulky in the second case and

had to be excised. The presence of an iliac colostomy did not produce the expected adhesions and consequent difficulty in mobilising the loop. Both the children were fully continent and the results were really good and satisfactory. The peritoneum was not stitched around the mobilised colon in both cases but this did not result in any untoward sequelae.

Summary

1. A short review of imperforate anus is made.
2. Two cases treated by abdomino-anoplasty are reported.

My thanks are due to Dr. S. Balasubramaniam, M.S., Dean, Stanley Hospital for permission to use the hospital records. My thanks are also due to Professor G. Athmarama Rao, for permitting me to report one of his cases and to Dr. S. Venkataraman and S. Rangarathnam for their help.

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A CASE OF VEGETABLE INTRA-BRONCHIAL FOREIGN BODY

BY

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Inhaled foreign bodies, especially in children under three years of age, are a real source of serious illness. Robinson and Mushin reported that in 1956 the total deaths from inhaled foreign bodies in England and Wales were as follows :—

Pharynx and Larynx	...	443
Digestive tract	...	29
Trachea Bronchus and lung.		11

Inhalation of foreign material in the unconscious, drugged or bed ridden patient is a well known hazard but in the conscious patient the protective mechanism of the cough reflex comes into play and violent cough follows in an effort to expel the intruding foreign body but during the phase of inspiration that precedes the cough and during which the larynx opens wide, a foreign body can slip through the larynx. Children are frequent victims owing to their habit of putting pins, tacks, staples, small toys, in their mouth and swallowing peanuts and the like as whole instead of chewing them.

Case Report

A boy age 2½ years was admitted as an emergency to the hospital on 30th October 1959 at 8 p.m. History revealed that child was quietly sitting in his cot eating custard apple (*Annona squamosa*) when his uncle arrived and started fondling the boy. The relative tried to kiss him on the ear when the boy giggled and whatever pieces of fruit he had in mouth were inhaled. The child suddenly coughed and choked; there was change in colour. The boy was immediately brought to the hospital. On examination patient was dyspnoeic and screening revealed emphysema on the right side. Bronchoscopy was done, soon after admission, under local anaesthetic combined

with paraldehyde narcosis. Several pieces of fruit peel were removed from right lower lobe bronchus and this was followed by marked improvement in child's colour and breathing. Clinically both lungs were fully expanded but there were few crepitations in right lower lobe. Screening next day revealed normal chest. Child was kept under observation for 48 hours, and was discharged home with advice to report at intervals to the outpatients. Patient was seen once at the outpatient clinic and though looked quite well there were persistent crepitations at right lower base.

On 17th November child was playing at home when after a violent cough he suddenly choked and changed colour. He was rushed to the hospital and was immediately taken to operation theatre; child had stridor and was in a moribund state. There was no resistance to bronchoscopy and pharynx and larynx looked normal but as bronchoscope was further passed it seemed that respiration had failed and child was cold and clammy. An immediate tracheostomy was done and as soon as trachea was opened a fair size mucous plug popped out of the opening and there was sudden improvement in colour and respiration restarted. Tracheostomy tube was introduced. Next morning the child was radiographed and the chest film was normal (Figure 1). Patient was nursed in a humidified atmosphere. On the third day tracheo-bronchial secretions became very thick and instillation of a few drops of streptomycin-streptokinase solution into the trachea made a dramatic difference to the consistency of secretions, this instillation prior to aspiration was repeated couple of times. Clinical auscultation still revealed persistent rales and crepitations in right lower chest and tracheal catheter suction in the direction of right lower lobe, on several occasions, brought out several pieces of custard apple peel and on one occasion the Custard apple seed also presented itself (Figure 2). The tracheostomy tube was removed on the tenth day as child was doing very well. Some days later the patient was radiographed and to our surprise a large right pneumothorax was demonstrated (Figure 3). The air was withdrawn and complete reexpansion obtained. The tracheostomy closed satisfactorily on its own. Chest x-ray prior to discharge (Figure 4) showed fully

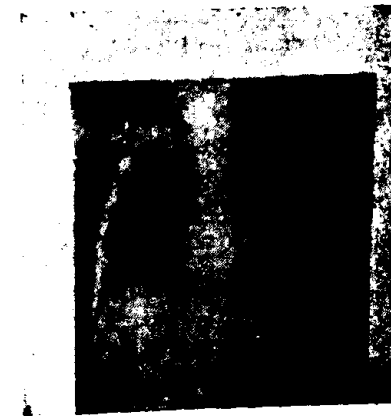


Fig. 1

P. A. view of Chest:
within normal limits.

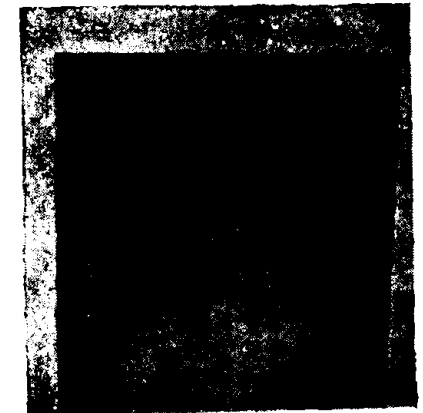


Fig. 3

P. A. view of Chest:
showing right pneumothorax.

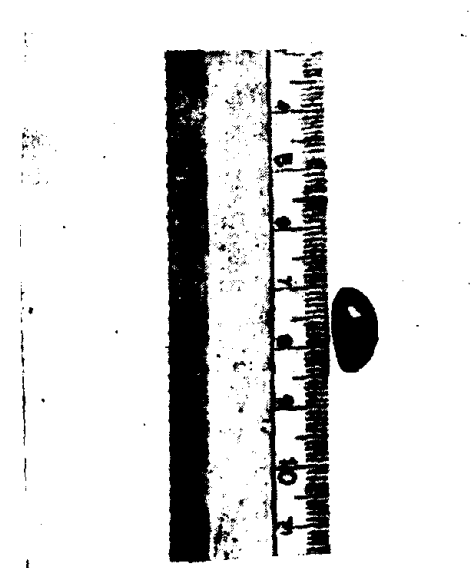


Fig. 2

Custard apple seed removed from the right
bronchial tree during tracheostomy
phase of treatment.



Fig. 4

P. A. view of Chest: showing well
expanded lung fields.

expanded lungs and clinically no rales of crepitations were heard in any part of the chest.

Patient was discharged on 17th December and remains well and asymptomatic.

Discussion

The effect of a foreign body in the respiratory passages depends not only on its position, but upon its nature, degree of obstruction and length of time it has been present. Jackson and Jackson (1950) noted that inhaled foreign bodies of vegetable origin caused more rapid permanent damage than relatively inert material such as metal, teeth and bone. Weinberg (1937) agrees with this and in his experience with vegetable foreign bodies, artificially introduced into the bronchi of rabbits he found obstructive emphysema occurring in the first twenty minutes, infection and collapse in 6 to 42 hours, followed by bronchiectasis in 14 to 58 days.

Vegetable material is an irritant and sets up laryngotracheobronchitis shortly after inhalation, the inflammation is clearly seen at bronchoscopy, the respiratory mucosa being congested, swollen and covered with an inflammatory exudate. The danger of post endoscopic laryngeal obstruction is thus considerable particularly in infants. If vegetable material is not removed then laryngotracheobronchitis is a common and often fatal sequel. In Clerf's (1940) series there were 12 deaths from laryngotracheobronchitis even after removal of the foreign body.

In the present case the child inhaled pieces of Custard apple (*Annona squamosa*) it is an aggregate fruit consisting of a collection of simple fruitlets. Inhaled pieces travelled down to the right lower lobe bronchus and few pieces were removed at the first bronchoscopy and child went home though with

some residual signs in right lower lobe. Possibly due to irritant effect of the remaining vegetable material there followed a mucous bronchitis and sudden dislodgement of mucous plug, during play, nearly obstructed the trachea causing sudden dyspnoea and readmission to the hospital. Usually the stridor in such cases is due to laryngotracheobronchitis but in this case it was clearly due to a tenacious mucous plug. A close examination of this mucous plug did not show any remnants of vegetable matter.

The explanation of the pneumothorax is probably the rupture of an emphysematous bulla. Holinger and Rigby (1946) state that the bullae can form beneath the visceral pleura and rupture as a result of obstructive emphysema. Presumably with the prolonged respiratory obstruction in this patient, obstructive emphysema developed, with bullae and rupture occurred. MacGowan (1959) also describes a case where a child, with a history of inhaling a peanut, was admitted and had normal chest film on admission. Endoscopic removal of foreign body, however resulted in laryngeal oedema and demanded a tracheostomy. Some days later, when radiographed, a large right pneumothorax was demonstrated.

During management of tracheostomy importance of humidification cannot be overstressed; and at times use of enzymes for liquifying secretions is immensely useful (Corner 1959). Tracheostomy tube can become blocked and must be cleared regularly. A small rubber catheter should be passed frequently and suction applied. If this is not attended to a fatality may easily occur at this stage from a blocked tracheostomy tube or accumulated secretions in respiratory passage. In Clerf's (1940) series 12 patients who had undergone tracheostomy after endoscopy died.

Tracheostomy tube, in cases of laryngotracheobronchitis, is removed in about a fortnight's time but in the present case where larynx was normal it was removed on the tenth day. The wound heals rapidly with little scarring.

Summary

1. A case of inhaled foreign body of vegetable origin is described.
2. An obstructive emphysema on the side of impaction was present in this case of partial obstruction.
3. The Development of spontaneous pneumothorax on the side of obstructive emphysema is described and discussed.

4. Pieces of foreign material may be easily left behind if due precaution is not observed.

5. The subsequent development of mucous bronchitis in this case demanded an urgent tracheostomy when a fair sized mucous plug gushed out of the tracheostomy opening with immediate relief.

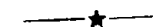
6. The management of tracheostomy is discussed.

My thanks are due to Dr. C. B. Singh, F.R.C.S. (Eng.), Professor and Head of the Department of Surgery for his permission to publish this case report and to the nursing staff, of Ward VIII of L. L. R. Hospital, Kanpur, for their untiring efforts in the management of tracheostomy.

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VASOSPASTIC ELEMENT IN POLIOMYELITIS

BY

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It is a common knowledge that the circulation in a limb, shortened and weakened by poliomyelitis, is decreased as compared with that in the normal or less involved limb. The loss of blood supply was thought to be proportionate to the loss of muscle power, and shortening of the limbs to decreased blood supply. In clinical practice, however, it is quite common to find minimal shortening with extensive paralysis and marked shortening with very little muscle involvement. Taking shortening as an index of reduced blood supply it seems probable that some factor, other than disuse and paralysis alone, may be associated in reducing the blood flow and growth of paralysed limbs.

A few patients complained that they felt more chill and discomfort in cold weather on the affected side, while others with similar weakness did not. The affected limbs of such cases felt clinically cold and clammy. These cases also had appreciable shortening suggesting considerable reduction in blood flow. Similar observations were made by other observers like (Charls W. Peabody, 1950).

Unilateral lumbar sympathectomy, on the shortened limb side, has been performed by many surgeons (as Harris, Barr, Reid) in the hope that the resulting increased blood-supply would reduce the limb-length discrepancy. The method did succeed but the results seemed to be variable and unpredictable. This could partly be explained by practical difficulty in getting a complete

unilateral sympathetic denervation, but probably it was also due to differences in the pre-sympathectomy blood flow of the limbs.

Thus, it appeared that reduction in blood flow in polioparalytic limbs was not entirely explainable due to weakened and paralysed muscles. The other possible factor associated could be altered vasomotor tone. It was, therefore, decided to study the blood flow and vasomotor tone in polio paralytic limbs.

Methods and Material

20 cases mainly with involvement of lower extremity were studied, with a view to study the changes in vascularity and sympathetic control if any.

Two methods of study were employed—

- (1) Oscillometry.
- (2) Skin temperature records.

Spinal anaesthesia was utilised to abolish sympathetic control completely but temporarily thus avoiding the uncertainty and disadvantages of operative denervation. Readings were taken before and after spinal anaesthesia. The anaesthesia was utilised for operative interference if required in a case after the above recordings.

The observations were made simultaneously on the two limbs under constant surroundings. One limb of the patient served as control for another. Most of the patients were young children and $\frac{1}{2}$ c.c. of pantocain sufficed for full spinal effect.

Oscillometry

The oscillometer used in this work consisted of a blood pressure cuff connected through one tubing to an aneroid capsule to which is connected a needle which flickers over a scale. The cuff is connected on the other end through a tube to a pumping rubber-bulb.

The changes in the volume of the limb produced by arterial pulsations are shown on the scale by the flicker of the needle. The readings were recorded at mid thigh and calf before and after spinal anaesthesia.

Skin Temperature Records

Skin temperature is a recognised index of vascularity of a part. If the external factors governing heat loss *i.e.* environment remains relatively constant it is reasonable to assume that a rise in skin temperature represents an increased blood flow (Vasodilatation) and a fall in skin temperature, indicates decreased blood flow (Vaso constriction).

This method, of course, will be unreliable at extremes of vasoconstriction when skin temperature will correspond to the environmental temperature. Reversely the maximum temperature that skin attains after full dilatation of blood vessels is about 35° to 36°C. Any further increase in blood flow inside, cannot be recorded as increase in skin temperature. However, even so, this is a fairly accurate method of study.

The mechanism of study of skin temperature has to be sensitive to give accurate findings. In this work a sensitive devise using thermo-couple of iron-constantin junction was utilised. This thermocouple was connected by a three-way distributor to a very sensitive galvanometer governing a streak of light which falls on the scale as a pointer.

The other end of the wire is attached to a thermocouple of same material immersed in water at room temperature in a thermosflask as control.

The temperature was recorded in all cases on arbitrarily chosen 11 points on the two limbs, before and after spinal anaesthesia. The records were graphically charted for comparison.

Observations

Anaesthesia.—The children behaved remarkably well under spinal anaesthesia. The patients were brought under sedation of barbiturates and often slept while the recording was done or even when operative interference was carried out. In no case any untoward reaction was noted.

Oscillometry.—For this method to be successful the patient must lie absolutely still. Even minor movement of muscle flickers the needle due to volume changes. The patients which were studied in this series ranged from 2 years of age to 11 years, a larger number of cases coming from the lower age group. It was extremely difficult to get them still. The oscillometric index showed a variation of only 2-3 in both pre and post anaesthetic recordings. As the difference was not significant the method was discarded as not being helpful and sensitive enough after a study on 8 cases.

Skin Temperature

There was no difficulty in recording pre-anaesthetic temperatures on both the limbs.

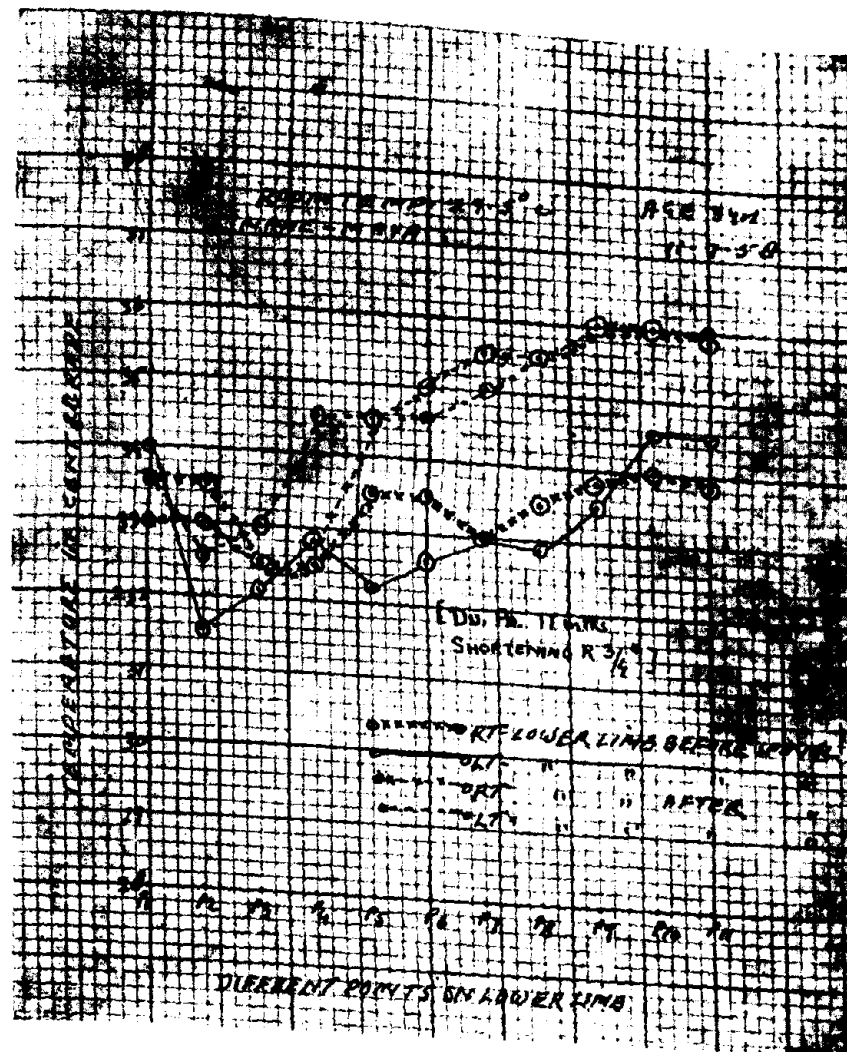
Repeated temperature records at 5 minute interval after spinal anaesthesia showed gradual change in the reading till it was maximum and fixed after 15 minutes. This reading was taken as the post anaesthetic reading and charted on the graph.

The observations may be summarised as follows :

(i) The preanaesthetic readings showed a gradient from about 33° c. at groin level gradually going to about 25-27° c. but it gradually rose to 36° c. at the tip of the toes. Thus showing dilatation due to release of vasomotor tone. These trends were observed in all the limbs whether paralysed or normal.

Post Anaesthetic

A further analysis of post anaesthetic records showed that the readings of all the limbs irrespective of paralysis, and initial temperature record, were similar, that is, the tip of toes has a temperature of about 35 to 36°, the readings of the two limbs of the same patient often overlapped. This shows that there is no organic change in the



Group I

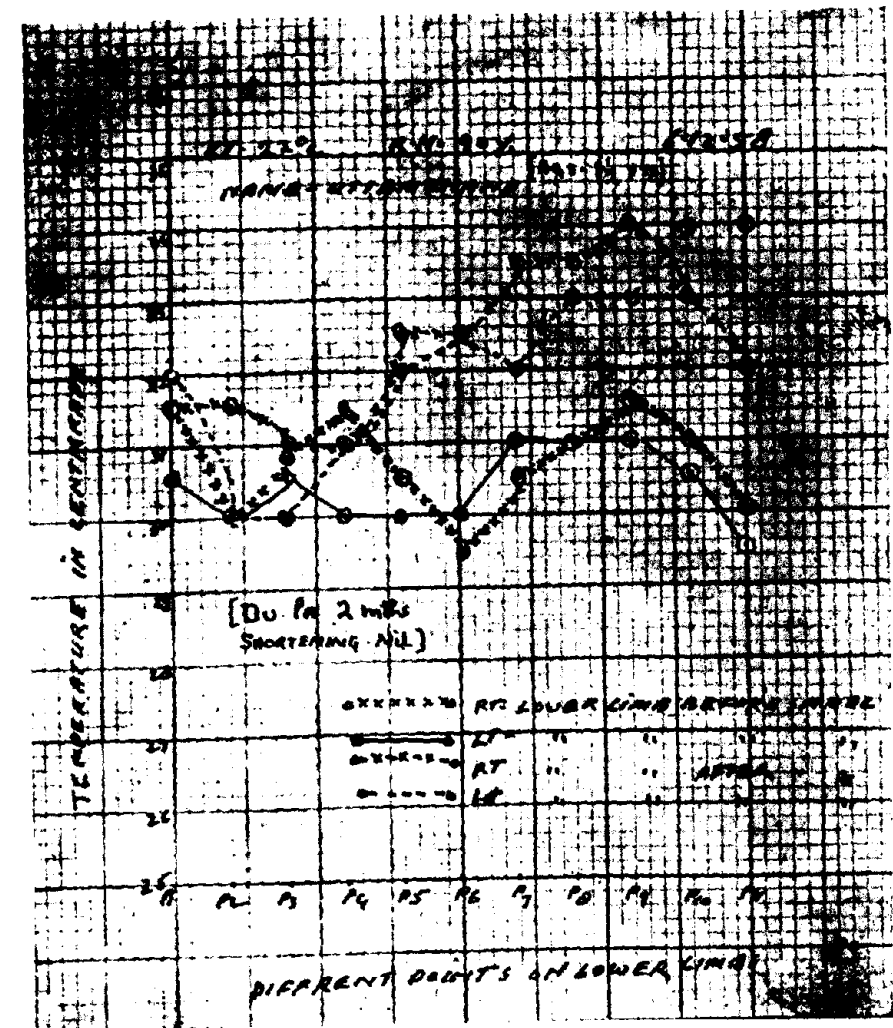
blood vessels of a paralysed limb as the vessels capable of as much dilatation and increased blood flow as on the normal side.

One case was exception to this generalisation. This case showed post anaesthetic temperature lower than the preanaesthetic level. This child was very restless during the recordings and had struggled violently during lumbar puncture for anaesthesia. The lowering of temperature, after anaesthesia was probably due to perspiration.

Preanaesthetic Temperature Record

The preanaesthetic records however, showed a variation. Two groups of cases could be recognised.

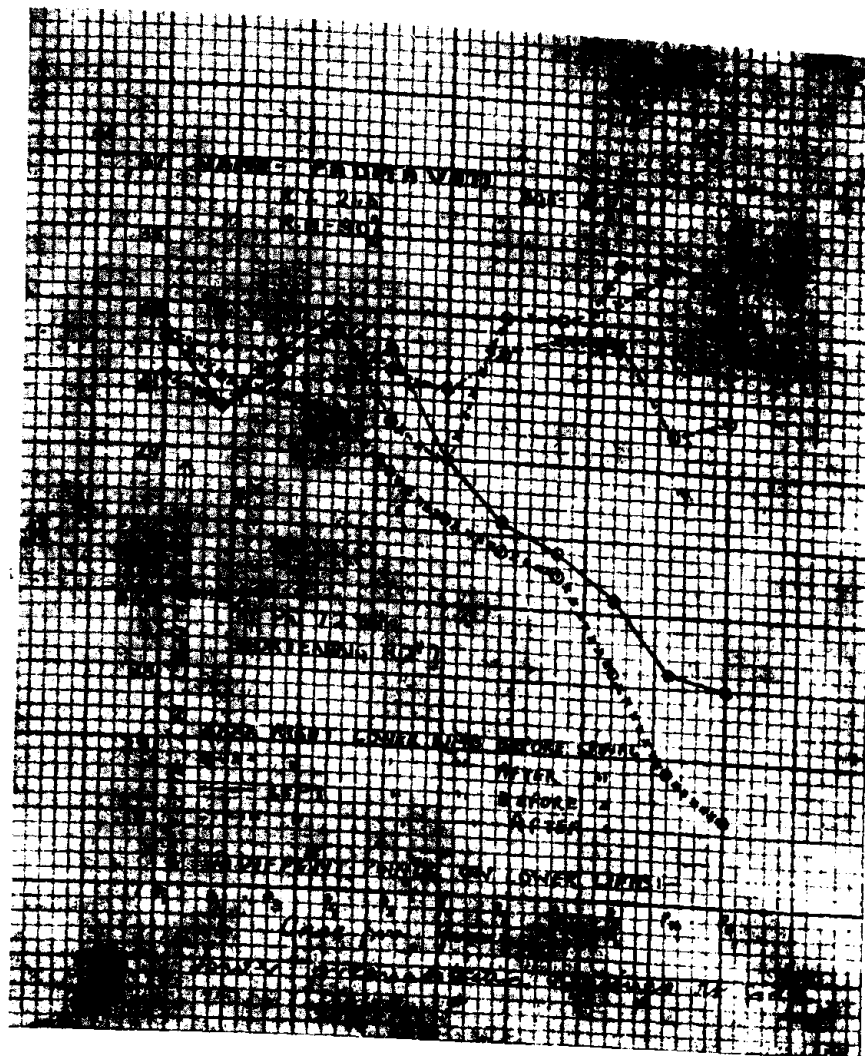
Group No. 1.—In this group preanaesthetic temperature records of both the limbs showed either overlapping or near about equal values, suggesting, thereby an equal vasomotor tone on the two sides. This group consisted of 10 cases.



Group I

Group No. 2.—In this group the preanaesthetic temperature gradient in one limb was significantly lower than in its counterpart, both the readings having been taken at the same time and under same circumstances. This shows that the vasomotor tone on one side was more than on the other. This group consisted of 9 cases.

A clinical analysis of cases of group I showed that 5 cases had a bilateral involvement, rest 5 had a unilateral lesion. The duration of paralysis ranged from 2 months to 4 years. Only 4 cases showed clinical shortening. Strikingly in none of them the shortening was of more than 5 inches. The details are summarised in table I.

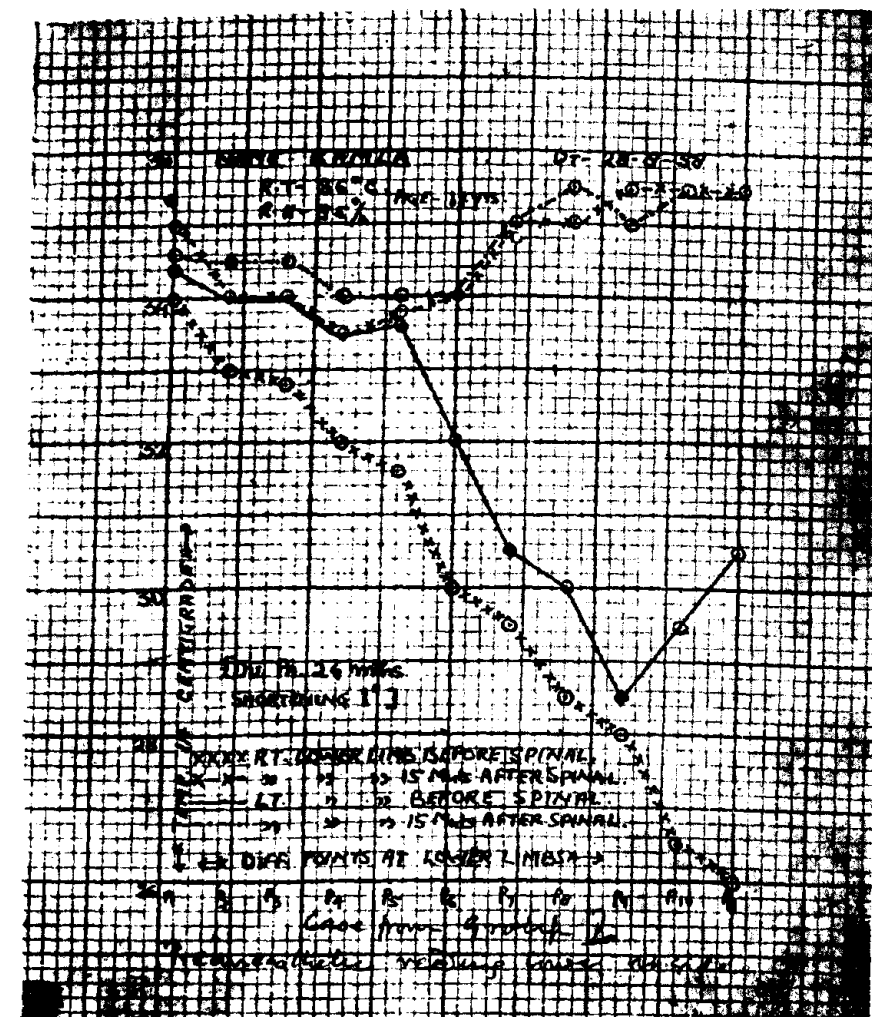


Group II

An analysis of cases of group II showed that 7 out of 9 cases had a unilateral involvement. Strikingly in all these cases the involvement was of the side which showed lower preanaesthetic temperature gradient. The remaining two cases who had a bi-lateral involvement, the lower temperature gradient pertained to the side having more extensive involvement. Seven cases had a duration of paralysis of more than 6 months. And six

of them had a shortening of 5" or more. The range was from 5" to 2". This last finding is significant for it tends to correlate the lower preanaesthetic temperature gradient or decreased blood flow due to increased vasomotor tonus, to the shortening in a paralysed limb.

The clinical analysis of the cases of group II is summarised in table 2.



Group II

Table 1

Cases with minimal vasomotor tone difference and negligible shortening

S. No.	Name.	Age.	Sex.	Duration of paralysis.	Side of involvement.	Amount of paralysis.	Shortening.
1	Na	3 yrs.	M.	6 mts.	L.	Moderate	Nil.
2	Sh	4 yrs.	M.	36 mts.	RL.	R. Moderate L. Minimal	5"
3	PS	8 yrs.	M.	8 mts.	RL.	R. Moderate L. Moderate	Nil.
4	Ma	3 yrs.	F.	9 mts.	L.	L. Moderate	25"
5	Sm	5 yrs.	M.	10 mts.	R.	R. Severe	4"
6	GI	5 yrs.	M.	2 mts.	RL.	R. Severe L. Severe	Nil.
7	Ch	6 yrs.	M.	3 mts.	R.	R. Moderate	Nil.
8	Uc	1½ yrs.	M.	2 mts.	RL.	R. Severe L. Moderate	Nil.
9	Ka	7 yrs.	F.	48 mts.	R.	R. Moderate	5"
10	Ma	3½ yrs.	F.	8 mts.	RL.	R. Severe L. Severe	Nil.

Table 2

Cases with different vasomotor tone and marked shortening

S. No.	Name.	Age.	Sex.	Duration of paralysis.	Side of involvement.	Amount of paralysis.	Amount of shortening.
1	Sn	3 yrs.	F.	15 mts.	L.	L. Moderate	L. 5"
2	SR	5 yrs.	F.	5 mts.	L.	L. Moderate	Nil.
3	Ka	11 yrs.	F.	24 mts.	RL.	R. Moderate L. Minimal	R 1"
4	RK	7 yrs.	M.	2 mts.	R.	R. Moderate	Nil.
5	PV	8 yrs.	F.	72 mts.	R.	R. Moderate	R 2"
6	Mi	3 yrs.	F.	11 mts.	R.	R. Moderate	R 3"
7	Vi	4½ yrs.	M.	12 mts.	R.	R. Minimal	R 1"
8	Va	6 yrs.	F.	48 mts.	RL.	R. Severe L. Moderate	R 1"
9	KB	3 yrs.	F.	9 mts.	L.	L. Moderate	L. 25"

Discussion

This study, though on a limited number of cases, tends to show that in certain cases of polioparalysis one limb may have marked diminution of blood flow as shown by lower temperature gradient on that side when compared to its counterpart. That this occurs without any organic change in blood vessels or without diminishing the capacity of its blood vessels for a greater blood flow. This is apparent from the dilatation of its blood vessels equal to the normal side after spinal anaesthesia.

This diminished blood flow is more closely associated with shortening of the limb. The findings tend to suggest that increased vasomotor tone may be the reason of this marked diminution of blood flow.

Without trying to explain these findings, I may quote Harris, who in 1930 significantly argues "whether destruction of the anterior horn cells in the lower dorsal and lumbar segments of the cord by Virus of anterior poliomyelitis does not also result in destruction of or damage to the closely

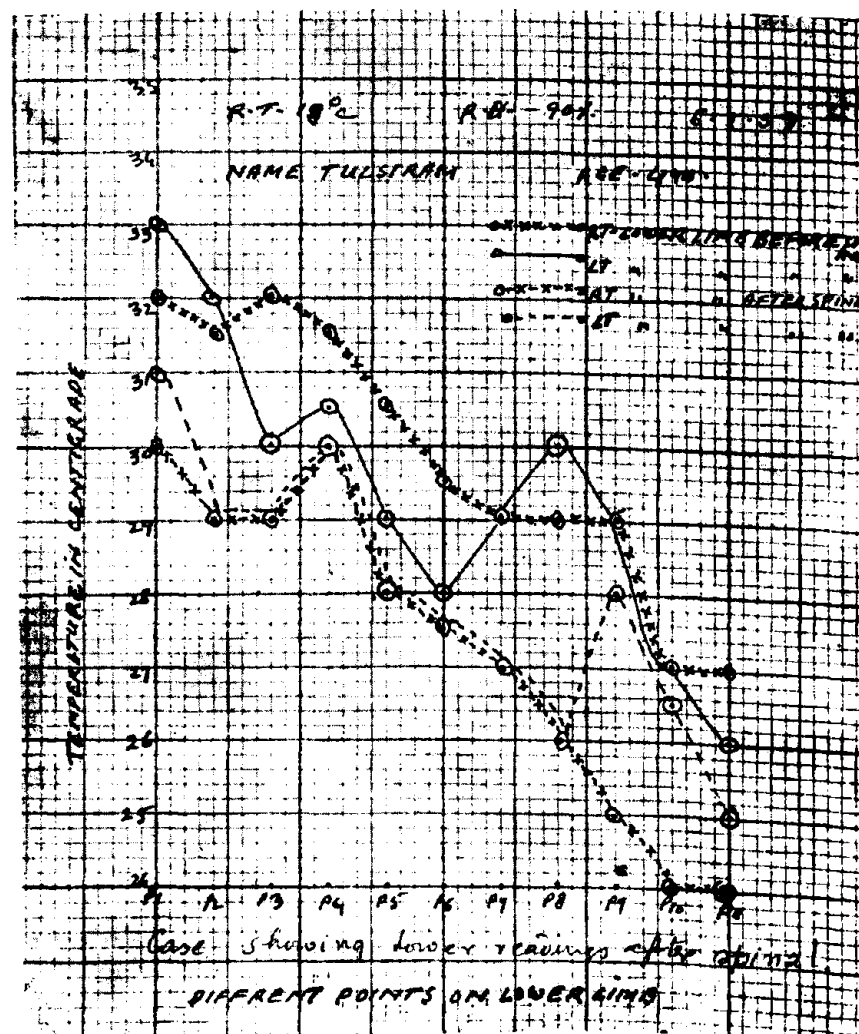


Group II

related cells which give rise to the sympathetic flow".

Whatever the reason of this increased vasomotor tone, an ipsilateral sympathectomy on such cases is likely to result in greater increase in the amount of blood flow through the limb. This naturally is likely to give a greater gain in limb length. Thus by this harmless method of temperature

record we may be able to pick up cases who are likely to gain in length by sympathectomy before the actual operation. Confirmation of this idea can only come from study of larger number of cases, and particularly by the results of sympathectomy on patients chosen by this method. Lastly this method of study may give useful information in predicting the future shortening in a recently paralysed limb.



Group II

Summary

The state of blood supply and vasomotor tone in the lower extremities of 20 cases of polioparalysis was studied. Oscillometry, before and after spinal anaesthesia was done to record the volume changes due to arterial pulsations. The method gave insignificant readings and in-conclusive results. Skin temperature before and after spinal anaesthesia were recorded to study the vasomotor control.

The skin temperature records showed that some cases of polioparalysis have an increased vasomotor tone, probably associated with notable limb-length shortening. The vessels of these limbs are free from organic changes.

It is suggested that ipsilateral sympathectomy is likely to increase the length considerably in cases selected by this method.

The method of study may also give an useful information in predicting the future shortening in a recently paralysed limb.

The method deserve further and more extensive observations.

Acknowledgements

I am grateful to Prof. B. N. Rao for his kind help at all stages.

My thanks are due to Dr. A. S. Mishra, Superintendent, J. A. Group of Hospital, Gwalior, for his kind permission to use hospital records.

...I owe gratitude to my numerous colleagues and assistants, particularly to Dr. A. P. Singhal my anaesthetist colleague for handling the delicate children with spinal anaesthesia and Dr. A. S. Chhabra and others for their invaluable help in recording for preparation of this paper.

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A CASE OF HYDATID DISEASE OF TIBIA

BY

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Echinococcus disease is endemic in every continent of the world, especially so, in Australia, South America and New Zealand. Its prevalence bears a very close relationship of sheep to the local population and frequency with which the dogs eat the viscera of the sheep. In South India Hydatid disease though not very common is not rare, and cases have been reported from time to time. Mahadevan and Menon reported eight cases of Hydatid disease for the whole of the Madras Presidency for the ten year period 1923-32. Subsequently up to the end of 1952, Dr. Reddy and Anguli have reported thirty three cases which have been examined by them in the Department of Pathology, Madras Medical College. In 1957 Reddy et al. reported nine cases of Hydatid disease from Guntur.

Hydatid disease of almost all the organs of the body have been reported, with the involvement of the liver being the maximum. Reddy and Anguli, in a series of thirty three cases, examined by them, gave the location of the disease as follows:—

Liver	...	12
Lung	...	1
Intra Peritoneal	...	4
Mesentery	...	1
Retro Peritoneal	...	1
Abdominal Wall	...	2
Parotid	...	3
Neck	...	1
Thyroid	...	1
Breast	...	2
Inner canthus of the eye	...	1
Upper extremity	...	2
Inguinal region	...	2

Though in this series there is only one case of pulmonary Hydatid disease, lungs are the commonest site of Hydatid disease next to the liver. Betts has reported a series of twenty eight cases of pulmonary Hydatid disease, and Bhat and Carman, have reported thirty nine cases of Hydatid disease of the liver. Bone is one of the rarest sites of Hydatid disease and in the above series of Reddy and Anguli, studied over a period of twenty years, there is not a single case of involvement of the bone. Search of Indian Medical literature shows very few cases of Hydatid disease of the bone and in the last twenty years, there has been no report of bone involvement from South India.

Bone involvement occurs in about 1% of all cases of Hydatid disease. The larger series of reports of Hydatid disease of bones in world literature show the following distribution:—

Pelvis	...	26%
Spine and Sacrum	...	30%
Femur	...	17%
Humerus	...	14%
Tibia	...	11%

A case of Hydatid disease of Tibia is presented here.

Case Report

Mr. M. aged 46 years, Sepoy by profession, reported to this Hospital on 7-8-1959 with a complaint of severe and persistent pain in the lower third of the left leg for a period of seven months. The patient had difficulty in walking and was unable to stand on the left leg. The complaint started as a sudden shooting pain in the left leg while he was on duty about seven months back, and the pain had persisted since then. There was no history of injury or fever. The patient gave history of a fracture of both bones

of right fore arm about five years back. He was also treated in this Hospital for an attack of Coronary Thrombosis about two years back.

General examination showed a fairly well-nourished man, not anaemic and not jaundiced. There were no enlarged glands. Clinical examination of all the systems was normal.

Local examination of the leg did not reveal any obvious difference as compared to the opposite leg. There was no sign of inflammation. There was bony tenderness over the Tibia at the junction of the middle and lower thirds of the left leg. There was no evidence of expansion of the bone. The cortex was intact and there was no evidence of any fracture. The regional glands were not enlarged.

A provisional diagnosis of a cyst or a tumour of the bone was made and the following investigations were done:—

R.B.C.	...	3-82 millions per C.M.M.
H.B.	...	75%.
T.C.	...	9,200. P. 66. L. 26 and E. 8.
Urine	...	N.A.D.
Motion	...	N.A.D.
E.S.R.	...	10 M.M. in one hour.
E.C.G.	...	Evidence of irreversible changes of myocardial ischaemia.
B.P.	...	130/80.
X-Ray. Left Tibia. (Fig. 1)	...	Cystic area of destruction at the junction of lower and middle thirds with irregular margins. No periosteal reaction. No evidence of fracture.

In view of the X-Ray appearance, a secondary deposit in the bone was also thought of and a close search of the patient was made for any evidence of a primary tumour. There was no evidence of it. X-Ray of the skull, vertebra, pelvis and chest were all normal.

With a tentative diagnosis of a benign cyst of the bone it was decided to do a biopsy. In view of the heart condition, the operation was done under local regional block, on 10-8-1959. An incision about four inches long was made on the antero-medial surface of the tibia and the anterior cortex of the bone was removed. It was found that medullary cavity was completely destroyed and was lined by a whitish membrane to which were attached a number of vesicles. There was about 10 C.cs of whitish opalescent fluid. A naked eye diagnosis of Hydatid cyst was

made. The membrane was fully removed, the cavity washed thoroughly with saline and the wound was closed. The leg was protected with a posterior slab. The patient made an uneventful recovery.

An examination of the fluid and cyst wall showed a number of scolices and hooklet, (Fig. 4 & 5) and the diagnosis of Hydatid cyst was confirmed. The cyst wall also showed the characteristic laminated membrane.

In view of the almost full destruction in that region of a weight bearing bone, it was decided to fill the cavity with cancellous bone chips.

On 28-9-1959, the second operation was done under spinal anaesthesia. A curved incision about five inches long was made parallel to the first incision. It was found that a bit of the cyst wall was left behind. So the opening in the bone was made bigger and the cavity thoroughly curetted out. It was then washed with 10% formalin and finally washed clean with saline. Cancellous bone chips from the left iliac crest were packed in the cavity and the wound was closed. The leg was protected with a posterior slab.

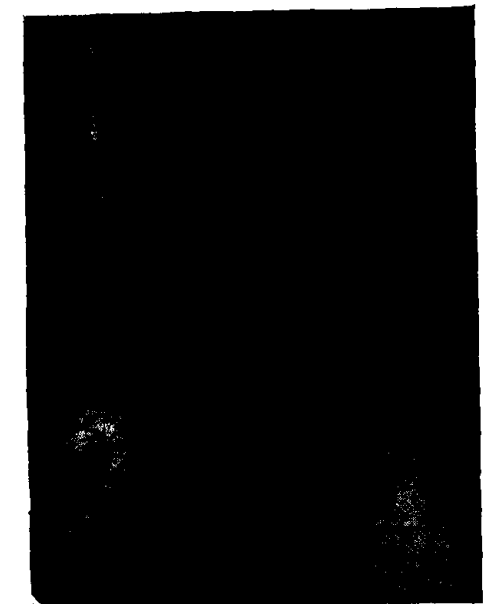


Fig. 1

Pre-operative X-Ray A. P. & Lateral views of left tibia, showing the irregular cystic area of destruction of bone at the junction of lower and middle thirds of the bone. There is no periosteal reaction and there is no evidence of fracture.



Fig. 2

X-Ray, eight weeks after the operation, showing that the bone graft has taken up.

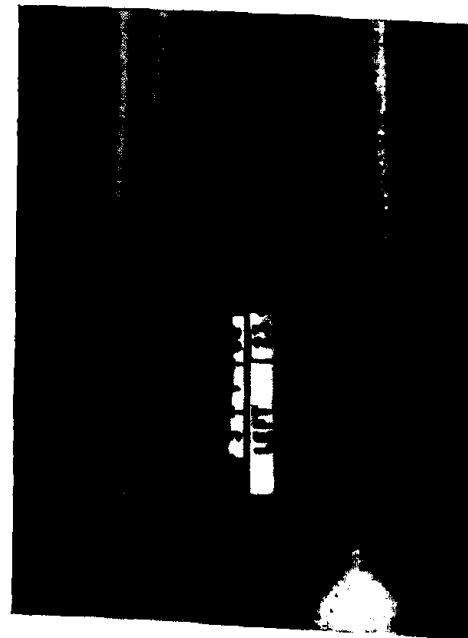


Fig. 3

X-Ray taken 14 weeks after operation, showing good consolidation of that area of bone.



Fig. 4

A Micro-Photograph of the Scolices. Demonstrated from the case.

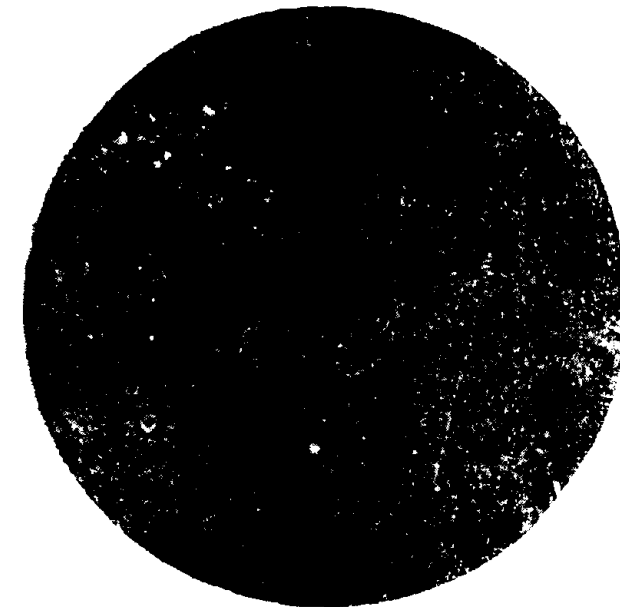


Fig. 5

A Micro-Photograph of a hooklet. Demonstrated from the case.

The post-operative course was uneventful and the wound healed by primary intention. X-Ray (Fig. 2) taken at the end of eight weeks showed that the bone graft had taken up. The posterior slab was removed. There was no local pain or tenderness. The patient was asked to start walking slowly and he was discharged from the Hospital on 11-12-1959. He reported again on 11-1-1960 and was doing well. There was no pain and the patient was able to walk freely. X-Ray (Fig. 3) taken at that time showed good consolidation of that area of the bone.

Discussion

Hydatid infection in man occurs either by direct contact with the parasite infested dogs (which are the most common definitive hosts of *Taenia Echinococcus*) or by the use of water or vegetables which have been fouled by the faeces of the infected dogs. The former is more common in children while the latter is more common in adults. When the ovum of *T. Echinococcus* reaches the small intestines, the alkaline medium sets free the

hexacanth embryo which by penetration through the villus enters the capillary system of the Portal vein. So that the first organ of invasion is the liver where more often it gets arrested and grows into the larval form, the Hydatid cyst. Those that manage to filter through the liver enter the right side of the heart and pass through the pulmonary arteries to the lungs, which act as the second filter. The lung thus becomes the next frequent site for the Hydatid infection. The embryos that do not get arrested in the lungs enter the left side of the heart and through the arterial system are carried to any organ in the body and develop into Hydatid cysts. As some of the embryos can get arrested in more than one location, when the infestation is very heavy, multiple Hydatid cysts can occur in organs wide apart. Reddy et al. have reported a case in which there was involvement of the liver, lung, spleen, kidneys and psoas muscle.

Bone is one of the rarest sites for Hydatid disease. The disease usually begins in the cancellous bone. The initial cyst excites only a minimal cellular reaction so that no adventitia is formed outside the laminated membrane. As the cyst enlarges it insinuates itself into the interstices of the marrow. Osteolysis is predominant and it slowly extends towards the cortex. The lesion in the bone does not retain the cystic characters that are seen in the liver or lungs, and the margins of the Osteolytic area are very irregular giving an impression of multiloculation. There is no periosteal reaction unless the cortex is broken or there is secondary infection. The parasite may remain viable as long as forty years or may die either spontaneously or due to infection. When the parasite dies the cyst wall may get calcified. Usually in the bone, the germinal layer is not seen and the daughter cysts are also not found unless there is super added infection. When infection occurs, sequestra may also form.

Pain is the most common symptom of Hydatid disease of the bone and is usually not severe. Due to the slow progress of the disease there may not be any symptom at all for a long time and when the spine is involved the only symptom which may be present may be a paraplegia. There may be a pathological fracture and it may be followed by non-union. There may be anaphylactic symptoms due to the slow absorption of the fluid.

The characteristic radiological feature are (1) ill-defined margins of destruction of that area of bone, (2) absence of periosteal reaction, (3) absence of local expansion, (4) pathological fracture.

Laboratory tests which are helpful in the diagnosis of Hydatid disease are (1) examination of blood for eosinophilia, (2) complement fixation test, (3) Casoni's test. Eosinophilia is not a constant feature and

its absence should not rule out the existence of the disease. The complement fixation test is based on the same principle as Wassermann Test. Here too the result is by no means constant and it has been found to be negative in forty per cent of cases of Hydatid disease. Casoni's Test is positive in nearly 90% of proved Hydatid disease. For this test 0.2 to 0.6 C.Cs of sterile bovine or human Hydatid fluid is injected intra dermally on the fore arm. An urticarial papule appears after about 10 minutes and by the end of 20 hours an extensive oedema with redness of the skin is observed if the patient has Hydatid disease.

A definite pre-operative diagnosis of Hydatid disease of bone is not easy to make and is made more often on the operation table. It should be thought of if there are the typical findings in the X-Ray along with a positive Casoni's Test or if there is involvement of the liver or lungs by the disease. In the differential diagnosis the following conditions should be thought of:—Giant Cell Tumour, Osteogenic Sarcoma, Fibrocystic disease of bone, Cystic type of tuberculosis, and a secondary deposit.

In this case, a simple cyst of the bone was diagnosed after ruling out the other conditions. In view of the fairly typical X-Ray findings, a Hydatid cyst of the bone should have been thought of, but unfortunately there was no supportive evidence. Casoni's Test and Complement Fixation Test could not be done due to the non-availability of the fluid. There was no Eosinophilia and there was no evidence of Hydatid disease anywhere else.

After the biopsy was made, a further questioning of the patient revealed that he used to come in contact with a pet dog. The infection might have occurred either directly from the dog or from ingestion of articles of food or water contaminated with the dog's faeces.

No drug has been found which will safely get rid of the disease by any method of administration. X-Rays are not useful. Excision of the cyst has yielded the best results and this is to be employed wherever it is possible. The cyst wall should be completely removed and spillage into the soft tissues has to be avoided to prevent any recurrence, or any danger of anaphylactic reaction. In this case the second operation did reveal remnants of the cyst wall left behind. They were removed and the cavity was touched with formalin and then filled with bone chips. This was done in view of the extensive destruction of the bone at that site. The filling up of the cavity with bone chips has definitely minimised the disability of the patient, and to a very great extent minimised the danger of a pathological fracture.

Summary

(1) A case of Hydatid cyst of bone treated by excision and bone grafting has been reported.

(2) Medical literature of Hydatid disease in India is briefly reviewed and attention is drawn to the fact that Hydatid disease is fairly common, though involvement of the bone is very rare.

(3) The pathology, diagnosis and the treatment of Hydatid disease of bone are briefly discussed.

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Our thanks are due to Dr. P. A. Menon, F.R.C.S., D.P.H., Chief Medical Officer, Southern Railway, for granting us permission to report this case. Our thanks are also due to Dr. Krishnan, M.B.B.S., D.T.M. & H., Assistant Medical Officer, Railway Hospital, and to Dr. Venugopal Shetty, M.D., Pathologist, Hospital for Women and Children, Madras, for all the help rendered in preparing the slides.

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THE XXII ANNUAL CONFERENCE

The 22nd Annual Conference of the Association of Surgeons of India will be held at the B. J. Medical College, Poona, from the 27th to 30th December, 1960. Dr. L. B. Joshi, F.R.C.S., is the Local Secretary, who is making arrangements for the Conference.

The main subjects for the scientific discussion at the Annual Conference are as follows:—

1. **Reconstructive Surgery of the Biliary Tract.**
by Dr. S. J. Mehta, Bombay.
2. **Clinical and Experimental Studies in Keloids.**
by Drs. K. K. Ghosh and J. L. Sinha.

SHORT PAPERS

Besides this, a few "Short Papers" will also be read at the Conference. Members desirous of presenting short papers at the Conference are requested to inform the Hony. Secretary before 10th September, 1960 of their intention to do so. **3 Copies** of the summary of the Short paper (of about 500 Words) should reach the Hony. Secretary before the **30th September, 1960** and the complete paper before the 15th October 1960.

As the summaries have to be circulated to a panel of referees, (consisting of three) who will decide about the acceptance or otherwise of the short papers and since the list and summaries of accepted short papers have to be intimated to all members 1 month before the Annual Conference, members are specially requested:

- (1) to Send **3 Copies** of the Summary (of about 500 words) on or before **30-9-1960.**
- (2) to send the complete Paper by the **15th of October, 1960.**

Short Papers for Sectional Meetings

Members desirous of reading Short Papers at the Sectional meetings which will be held at the time of the Annual Conference are requested to send their papers to the respective Sectional Secretaries, well in advance. For information the following are the names and addresses of the various Sectional Secretaries.

ORTHOPAEDIC SURGERY SECTION

Hony. Secretary

Dr. B. Mukopadhaya, M.B., F.R.C.S., M.Ch. Orth.
Khuda Bux Library Road, Bankipore, Patna.

THORACIC SURGERY SECTION

Hony. Secretary

Dr. A. K. Basu, M.S., F.R.C.S., Dept. of Surgery,
Institute of Post Graduate Medical Education and Research,
244, Lower Circular Road, Calcutta-20.

PLASTIC SURGERY SECTION

Hony. Secretary

Dr. R. N. Sinha, F.R.C.S.,
Abul Aas Lane, Patna-4.

SUBJECTS FOR THE MAIN SCIENTIFIC DISCUSSION AT THE XXV ANNUAL CONFERENCE IN DECEMBER, 1963.

The 25th Annual Conference of the Association of Surgeons of India will be held during December, 1963. Subjects for the main scientific discussions at the above conference will have to be selected by the General Body at its annual meeting at Poona in December this year. Members are requested to send in the titles of their subjects, if any, so as to reach the Hony. Secretary not later than 30th of November, 1960.

SUBJECTS FOR DISCUSSION AT FUTURE MEETINGS

23rd Meeting (1961)

1. (a) **Injuries of the Hand.**
by Dr. Subir K. Chatterjee, Calcutta.
- (b) **Early repairs of Hand Injuries.**
by Dr. C. Balakrishnan, Nagpur.
2. **Spinal Cord Tumours.**
by Dr. R. Chatterjee, Calcutta.

24th Meeting (1962)

1. Tumours of Urinary Bladder.

by Drs. K. K. Ghosh and H. K. Sarkar, Calcutta.

2. Management of Burns.

by Dr. Anjali Mukherji, Calcutta.

3. Experiences in the Use of Extracorporeal circulation for Cardiac Surgery.by Dr. A. K. Basu, Calcutta, P. K. Sen, Bombay and Dr. S. N. B. Roy
Calcutta.**4. Septic and Suppurative Arthritis of the Hip.**by Dr. B. Mukopadhaya, Patna,
and**5. A Paper on Anaesthesia (to be decided in due course).**

* * *

FELLOWSHIP EXAMINATION (F.A.S.I)

OF THE

Association of Surgeons of India.

The last date for receipt of the applications at the Office of the Association of Surgeons of India, 164, Poonamallee High Road, Madras-10, is 1st December, 1960. The date of the Examination will be announced later.

* * *

NOTICE**ORTHOPAEDIC SURGERY SECTION**

Short Papers for the Annual meeting of the Orthopaedic Section of the Association of Surgeons of India must reach the Secretary, Dr. B. Mukopadhaya, Khuda Bux Library Road, Patna-4, before the 15th October, 1960 and a summary of the Paper must be submitted before the 15th Nov. 1960.

—★—

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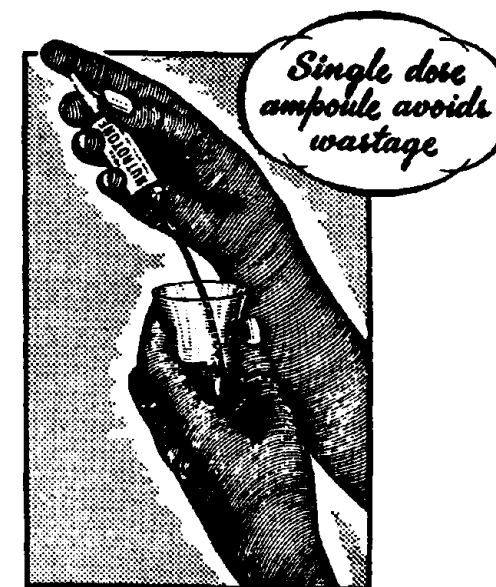
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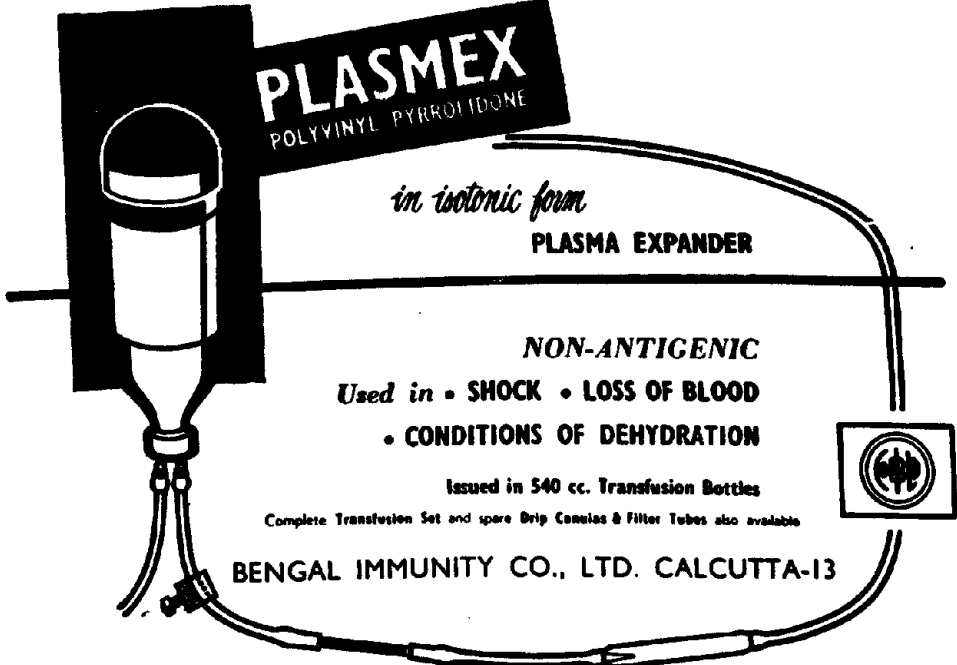
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