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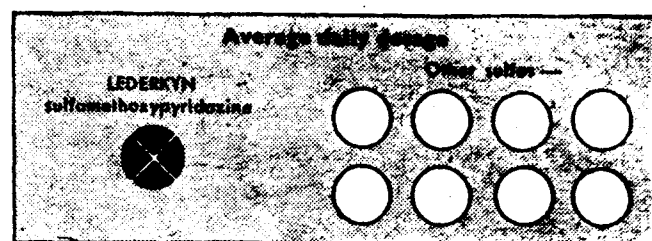


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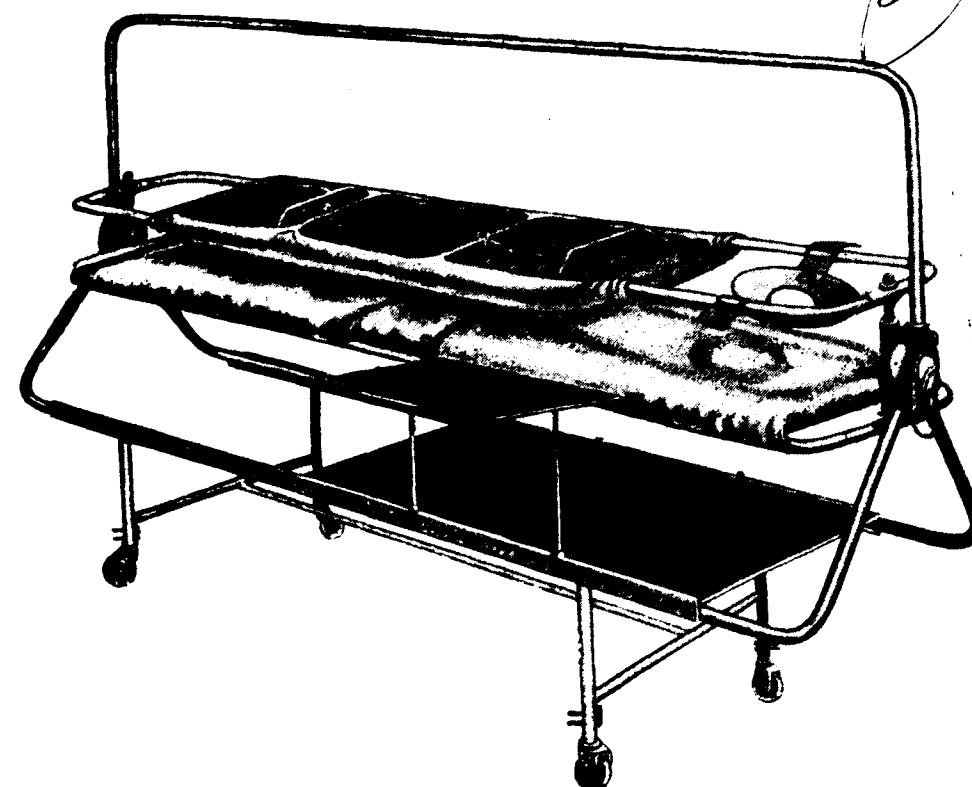
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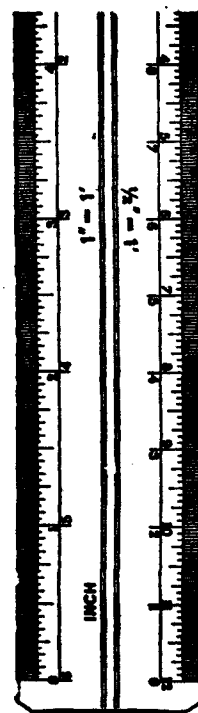
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No. 2

EXPERIENCE WITH 105 CONSECUTIVE LUNG RESECTIONS MAINLY FOR TUBERCULOSIS*

BY

P. A. BHATT, K. L. SHARMA, M. M. MIRANI and H. L. HARSHA,
Ajmer (Rajasthan).

It so happens that within a period of about one year from the date of joining the institution by the first author we carried out 105 lung resections with gratifying results. So we decided to analyse the mistakes and failures as well as good results. As one goes along from day to day it seems that there are no appreciable changes or difference in one's thinking and approach; but on reviewing one's own work it is readily apparent that changes have to be considered. The means and the methods for doing the best for the patient are shifting with advance of medical science.

Overholt⁹ in 1945 reported a large series of 196 resections with 24% mortality.

The discovery of streptomycin and replacement of the old technique of resection by meticulous hilar dissection led to a great difference in mortality and post-operative morbidity figures. Edward⁶ in 1955 reported that a series of 1023 patients treated by resections the mortality rate was 1.95%. Todd described 238 patients treated surgically by the staff Midhurst sanatorium (mainly segmental resections and lobectomies) with no deaths in post operative period.

The first important report on a series of resection for tuberculosis made by Thorton¹² and Adams shows a mortality rate of 45% after pneumonectomy and 25% after lobectomy but these were gravely ill patients unsuitable for thoracoplasty and denied the present day advantages of individual hilar dissection technique and of streptomycin. Since the publication in 1943 by Churchill¹¹ and Klopstock of the first small series of selected cases thus treated without any mortality more reports have come from different parts of world.

In our country recently Dr. Chak presented a sizable series at the All India Tuberculosis Conference 1959 consisting mainly of segmentectomy and lobectomy in military personnel with one death only. Vellore group (Betts^{1,2,3}, Thomas¹² et al) published a series with a mortality rate of 6.6%. Dr. Karai⁸ et al presented a series of 90 cases at the last conference of this association and their mortality figure was 14.4%. But their series included poor risk salvage group cases and it has been their initial group of resections in a large sanatorium. They have cautioned that the

* Presented at the 4th Thoracic Surgery Sectional Meeting, Bombay 18-19, August 1960.

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Table 1
105 Pulmonary Resections
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Particulars	Cases	Mortality
Tuberculosis ...	90	1
Bronchiectasis and Cystic disease ...	10	Nil
Lung Abscess ...	5	Nil
Total ...	105	1 = 1%

resectional surgery for pulmonary tuberculosis was not so bright as yet in our country.

In this paper we are presenting a series of 105 lung resections with one death in the immediate post operative period and one late death (one year after the operation). We wish to place on record some of our experiences and certain considerations for lowering the mortality of lung resections.

Material and Method

All these cases were operated and treated at the Madar Union Sanatorium four miles from Ajmer in Rajasthan, housing over 200 patients. Most of the beds are reserved by Government, Railways etc. So the cases from surrounding States are collected for both medical and surgical treatment. Admissions are restricted to the cases that are likely to come up for surgery after medical treatment.

On admission every patient is presented before a panel of a physician, thoracic surgeon and the resident doctors after thorough physical examination and routine investigations. The decision for the line of treatment is made at this conference in regard to chemotherapy, surgery and special investigations such as tomography, bronchography,

bronchospirometry etc. All tuberculous cases received chemotherapy for a minimum period of three months before surgery. In those cases where the organisms are found resistant to all the three known drugs they are given a course of viomycin before surgery. We routinely perform bronchoscopy in all cases that are likely to come up for surgery and we resort to endotracheal isoniazid instillation where there is endobronchial tuberculosis. We believe this helps to a considerable extent in clearing of the disease process. Selected patients are given cortisone along with anti-tubercular chemotherapy and pneumoperitoneum if indicated. On an average patients are required to stay for four months before they are operated. Non-tuberculous cases are prepared for surgery and operated early and discharged within a period of 3 to 4 weeks from the date of operation. Most of these cases are referred as pulmonary tuberculosis and have been treated outside for the same.

Within a period of about one year we did 105 resections on 104 patients. One case had bilateral resection. Ninety cases were operated for pulmonary tuberculosis and while the rest were operated for bronchiectasis and cystic disease (9 cases) lung abscess (5 cases) and bronchial adenoma (1 case).

Table 2
Age Variation

Age Group in years	Number
0 — 10	2
11 — 20	17
21 — 30	45
31 — 40	25
41 — 50	11
51 — 60	1

Table 3
Sex Variation

Particulars	Male	Female	Total
Cases ...	60	44	104
Operation ...	61	44	105

Symptoms

In tuberculous cases the outstanding symptom has been cough with fever while in non-tuberculous group it has been cough with expectoration. Haemoptysis has been found in 30% of cases. Chest pain was present in about 10% of cases and hoarseness of voice was in one case in this series. Duration of the symptoms has been on an average 34 months maximum being 22 years and minimum being 3 months.

Age and Sex incidence

Majority of the cases in this series were in their twenties and thirties. The youngest patient operated was 8 years old and the oldest was 58 years of age. Sixty were male patients and fortyfour were female patients, the approximate ratio being six to four.

Sputum

The sputum was positive for acid fast bacilli in 24 out of 90 cases at the time of admission, but in nine cases sputum remained positive during one month prior to surgery in spite of chemotherapy including viomycin.

Surgery

We prefer lung resection to thoracoplasty where surgery is indicated. During this period we performed collapse thoracoplasty on only one case who had bilateral disease with emphyema. Surgery is advised for

the irreversible structural changes of the bronchial tree, atelectasis, persistent cavity, persisting positive sputum, basal tuberculosis, destroyed lung, thoracoplasty failure and cases of empyema with or without bronchopleural fistula. We operated almost all of our cases in prone position using Overholt's table. We followed the same operative technique and post operative management as described in the paper of resections for bronchiectasis and cystic disease. (Bhatt. et al) Oxygen up-take was done in 3 of our borderline bilateral cases before subjecting them to pneumonectomy. In all these cases oxygen up-take by the affected destroyed lung was about 25% of the total uptake.

To simplify the classification we have grouped our cases of lung resections into three main groups only. There were 32 resections done for tuberculous bronchiectasis and/or atelectasis, 37 resections for cavity and atelectasis while 21 resections were done for destroyed lung. Those cases, where only the basal segment are devoid of disease process but are emphysematous and pneumonectomy has been done are included in the group of destroyed lung.

Type of Operation

Table 4 shows the various types of operations done in this series in order of frequency. Out of the 36 lobectomies 24 were done on right side and 12 on left side. While out of the 25 segment-ectomies 9 were on right side while 16 were on left side. This preponderance of one type of resection on one of the sides is understood if one considers lingula on left side as the homologue of middle lobe on right side. When left upper lobe is affected with tuberculosis very often lingula escapes and so the resection done is called segmentectomy while

Table 4
Type of Operation

Particulars		Right	Left
Lobectomy	36 (2)* ..	24	12
Pneumonectomy	30 (9)*...	15	15
Segmentectomy	25 (4)*...	9	16
Lobectomy and Segmentectomy	8 ...	7	1
Lobectomy and Segmentectomy with concomitant Thoracoplasty	3 ...	2	1
Pleuro Pneumonectomy	3 ...	2	1

*Figure in the brackets indicates non The. cases.

the same amount of lung tissue removed on right side is termed as lobectomy. In 11 cases lobectomy and segmentectomy were done and out of these 3 cases had concomitant thoracoplasty and one case had excision of emphysema pocket and decortication. Twenty one pneumonectomies were done for tuberculous cases and out of these in 3 cases had pleuro-pneumonectomy done. There were 4 cases with empyema and one case with encysted effusion and all these patients were treated with pneumo-thorax out side at one time.

In three cases we had to postpone the operation, one for severe bronchospasm second for difficult endotracheal intubation because of microstoma and the third for severe tachycardia during the operation. All these cases were successfully, operated later on.

During all these operations we had 3 major vascular accidents, two were on left side lobectomies and one was on right side pneumonectomy. Fortunately we could manage them without any fatality or sacrifice of extra lung tissue. Tear in the left pulmonary artery was sutured in one case with arterial silk and in other case with

cotton suture in the absence of arterial silk. Two of these cases had marked bradycardia during the episode of haemorrhage. This was managed by intracardiac injection of adrenaline and calcium gluconate, several cardiac compressions and quick transfusion. One case developed marked cyanosis and bradycardia while she was undergoing left pneumonectomy. No cause could be detected immediately except some resistance felt over the anaesthetist's bag. This was probably due to collected secretion and abutting of the opening of the endo tracheal tube against the tracheal wall resulting from the pull of the left hilum. The condition of the patient improved immediately on transection of the left bronchus. Two cases needed noradrenaline drip during the operation. Blood loss was replaced immediately and adequately during and after the operation. On an average 2,000 c.c. of fresh blood was given to each case the maximum being 4,000 c.c. and minimum being 1,000 c.c. In the immediate postoperative period blood loss in the drainage bottle was replaced if it were 500 c.c. or more.

Post-operative, complications

Table 5 shows the complications met with in this series. Some of these complications were concomitant and they occurred in 23 cases of 104, an incidence of 22%. Symptomatic air space problem occurred in 11 cases out of which 5 cases responded to intercostal catheter drainage connected to under water seal. While the remaining six cases developed concomitant empyema and persistent air leak which necessitated tailoring thoracoplasty besides drainage. Out of these 11 cases in one pneumonectomy for cystic disease was done and in the rest mainly segmental resection leaving raw lung surface inside the chest cavity was performed. Two cases developed empyema and one had right pneumonectomy done for pulmonary tuberculosis and the other for lung

Table 5
Early Post-Operative Complications

Particulars	Cases	Treatment
Broncho-pleural fistula	5	Inter-costal catheter.
Broncho-pleural fistula with empyema	6	Drainage & Thoracoplasty.
Empyema	2	Drainage & Thoracoplasty.
Psychosis	3	Largactil.
Hypotension	6	Nor-adrenaline & Cortisone.
Atelactasis	3	Bronchoscopic suction.

abscess. Both were treated by drainage followed by two stage thoracoplasty. The case of lung abscess developed empyema two weeks after the operation and was diagnosed rather late when he was found in severe shock with marked hypotension. Fortunately we could salvage him. Three cases developed psychosis within a week after the operation. Two were females and one was male. In two of these cases there was prolonged hypotension during and after the operation. Six cases who developed significant hypotension four cases had undergone right pneumonectomy and can be grouped

as salvage cases while two cases had lobectomy. If these cases were not diagnosed and treated in time, might have resulted in fatalities adding to mortality figures. These cases can be considered under the heading of post-operative shock. They were treated with noradrenaline drip, hydro-cortisone and blood transfusion. One of these cases of right pneumonectomy besides marked hypotension practically stopped breathing during the immediate post-operative period. This patient responded to immediate endotracheal intubation and oxygenation for fifteen minutes. Three cases developed marked

Table 6
Review of Mortality Figures

Author	Year	Mortality %
Thorton and Adams	1942	35%
Churchill Klopstock	1943 (small selected series)	Nil
Over-Holt	1945	24%
Sellors Hickey	1948	9%
Edwards	1951	2.5%
Edwards	1955	1.95%
Todd	1956 (only 2 pneumonectomies)	Nil
Betts, Thomas, and Gopinath	1956	6.6%
Karai Ghosh and Bose	1959	14.4%
Bhatt et al	1960	1%
(PRESENT SERIES)		

atelectasis and they were successfully treated with bronchoscopic suction.

Results

Patients stayed for a period of four and half months on an average, in the sanatorium after the operation. During these period they received the chemotherapy and regular X-Ray check. Two cases showed the reactivation of the disease on the contralateral side after about six months. No case showed new focus or spread of the disease after the operation. We cannot give the results of follow-up as sufficient time has not elapsed since the operation.

There were in all two deaths in this series of 104 cases. One case died 3 days after the operation and the other over a year after the operation. So the operative mortality can be considered as 1% while over all mortality will be about 2%. The immediate death resulted from pulmonary oedema. This patient was an adolescent who had bilateral disease. He had undergone resection of upper lobe, sup seg of the lower lobe and wedge of middle lobe on the right side concomitant thoracoplasty. The other case had right pneumonectomy as a salvage case under the coverage of viomycin. He was discharged as an arrested case six months after operation. He was readmitted in some other sanatorium where he died after some operation for empyema on the operated side.

Discussion

In our series relative low mortality can be attributed to the co-ordinated team work and a good sanatorium regime, study of the case by the physician, surgeon and anaesthetist coupled with the close watch by the same team residing in the hospital premises. Secondly we feel that the adequate blood replacement is one of the important factors in lowering the mortality as a result of post

operative shock. Blood loss is more than expected in cases where the lung is adherent and one has to do extrapleural mobilization. One should not be worried of over transfusion in a young person even in cases of pneumonectomy. We have given 3,000 c.c. of blood to cases of pneumonectomy without any untoward effects of over transfusion. The view of various workers in this field are equivocal in regard to post resection thoracoplasty. Though we are not doing post resection conversion thoracoplasty routinely we feel that it will be advantageous to do a thoracoplasty following pneumonectomy and particularly on right side to avoid incipient empyema whose treatment later on becomes a difficult problem. In this series we had conversion thoracoplasty in 3 cases only following upper lobectomy to avoid the future complication of an asymptomatic apical air pocket. Milloy⁹ et al are claiming marked reduction in space problem by doing pre-resection tailoring thoracoplasty. We believe that the air space problem is related to the presence of raw lung surface, the volume of the lung tissue removed, and the expansion of the residual lung which is difficult to predict, specially if it were originally diseased. The majority of our cases who had undergone lobectomy and segmentectomy or wedge resection developed air space problem. Though we have done concomitant thoracoplasty in three of our cases we feel that it is not advisable. The only case that we lost in this series during immediate post operative period had undergone concomitant thoracoplasty.

We did not have the complications like generalized oozing or haematoma and this benefit may be attributed to the fresh blood transfusions, meticulous haemostasis and the two drainage tube apical and basal connected to continuous suction pump.

Summary

Our experiences with 105 lung resections done at Madar Union Sanatorium, Madar, Ajmer, from March 1959 to March 1960 have been reported. Ninety resections were for pulmonary tuberculosis and 15 were done for cystic disease, lung abscess and bronchiectasis. The breakdown of the extent of resections is as under :

Pleuro-pneumonectomy	...	3
Pneumonectomy	...	30
Lobectomy & Segmentectomy	...	11
Lobectomy	...	36
Segmentectomy	...	25

Bronchial fistula occurred in about 11 cases and of this 5 cases responded to intercostal catheter drainage only. There was only one death in this series. This patient died on third post-operative day from pulmonary oedema.

Acknowledgement

Our thanks are due to Dr. Sherwood Hall, Medical Superintendent and Business Manager, Madar Union Sanatorium, Ajmer, for providing ample facilities for working and permitting the use of hospital record. We appreciate the excellent services of our anaesthetist Dr. Bhanu B. Gandhi for piloting all these cases successfully without any complication.

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EXCISION OF SACCULAR ANEURYSMS OF THE UPPER ABDOMINAL AORTA

BY

A. G. FLETCHER, Jr., K. BANERJEE and S. B. TRIVEDI, Wanlesswadi.

Aortic aneurysms have long challenged and fascinated the surgeon. Many courageous attempts at excision of these inexorably fatal lesions have been recorded in the earlier annals of surgery¹. However it is only in recent years that the feasibility of resecting practically all types of aneurysms, including those of the aortic arch, has been demonstrated by De Bakey and others². Unfortunately, the wider application of such methods is limited by the fact that complicated and highly-specialized techniques and equipment are involved, including complete cardio-pulmonary bypass, temporary shunt by-pass, hypothermia, and replacement with homografts or with prostheses made of nylon or other fabrics. This has greatly limited the resection of aortic aneurysms in India, with the exception of those of the lower abdominal aorta, where temporary occlusion, resection and replacement by a fairly simple graft is possible.

It is the purpose of this article to call attention to a much simpler technique, which is applicable in certain cases of aneurysms of the saccular type. This technique involves the transection of the neck of the sac and reconstruction of the aorta by sutures of its wall. It was described and illustrated by a number of case reports by Bahnson in 1953.¹ Bahnson showed that the method could be used for certain saccular aneurysms of the thoracic aorta, where it was possible to clamp across the neck of the aneurysm, cut away the sac and then suture the wall of the aorta with the

clamp in place, without interrupting blood flow through the aorta. A second type of case is that in which the aneurysm is situated in the lower thoracic or upper abdominal aorta at a level at which it is safe to occlude the aorta for 30 minutes or so without the use of hypothermia or by-pass shunts. In such a case, the aorta is temporarily cross-clamped, the aneurysm is cut off at its neck and the defect in the wall of the aorta is sutured before releasing the clamps and restoring blood flow through the aorta.

In the Thoracic Surgery Section of the Wanless Tuberculosis Sanatorium three patients falling into the second category described above, have been operated upon by the technique of excision and suture without grafting or other elaborate techniques or equipment. Two patients had an excellent result and one died in the post-operative period after what appeared to have been a satisfactory operation. Since the use of this technique has not been reported previously by surgeons in India, it seems worth-while to report these three cases in some detail.

Case Reports

Case No. 1.—Purushottam, WTS. No. 8343, a thirty-year-old Hindu farmer, was admitted to the Thoracic Surgery Section of the Wanless Tuberculosis Sanatorium on 19th March, 1959. He was referred by Dr. K. A. Koshal, F.R.C.S., Professor of Surgery of the Medical College at Jabalpur, with a diagnosis of aneurysm of the abdominal aorta. The patient complained of pain in the left lumbar region and the left leg for about six months and a noticeable swelling in the left hypochondrium and the left flank for about five months. There was a history of a previous

venereal infection. On examination, there was a pulsatile mass, 6-8 inches in diameter, occupying the entire left flank area. The mass could be felt both anteriorly and posteriorly. Skiagram of the lumbar spine revealed erosion of the transverse processes and the bodies of the second and third lumbar vertebrae on the left side. The Kahn test and the V.D.R.L. reaction were both highly positive. An attempt to do a trans-lumbar aortogram was not successful, since the aorta was displaced and could not be entered with the needle. The pre-operative diagnosis was saccular aneurysm of the abdominal aorta, of luetic etiology, probably arising from the posterior aspect of the aorta.

Excision of the aneurysm was carried out on 24th March 1959 under endotracheal ether and oxygen anaesthesia. The patient was placed in the lateral position and a left thoraco-abdominal incision was used, entering the pleural space through the bed of the resected 10th rib. This provided excellent exposure for the entire procedure. The relations of the aneurysm are shown diagrammatically in (Fig. 1). The neck of the sac coming off the posterior aspect of the aorta, was about three inches in breadth. The aneurysm itself measured about 10 inches from its cephalad to its caudad end, 8 inches in the antero-posterior diameter and 8 inches from side to side.

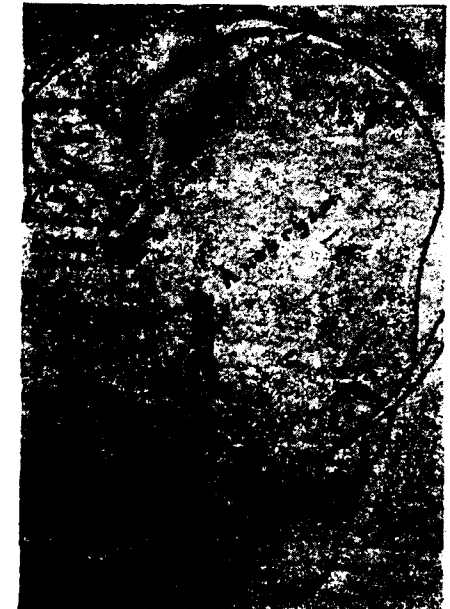


Fig. 2

Case No. 1 - Surgical exposure of the aneurysm and other branches of the aorta. Patient in left lateral position.

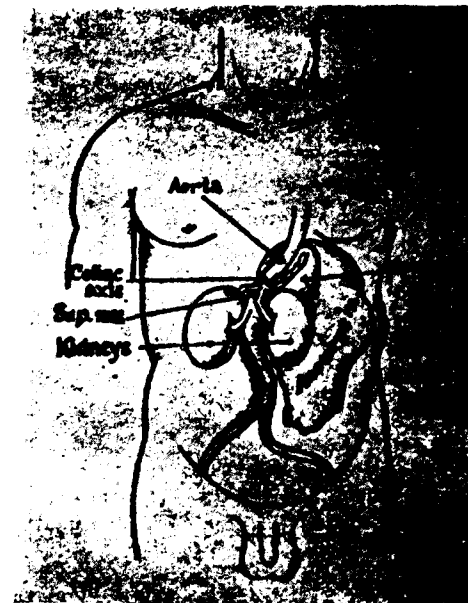


Fig. 1

Case No. 1 - Diagram showing relations of Aneurysm.

The cephalad end was pushing the diaphragm upward and the caudad end extended down into the iliac fossa. Since the aneurysm was attached posteriorly, the major branches of the aorta were not involved.

Without attempting to dissect out the aneurysm peripherally, the aorta was encircled by tapes above and below and the celiac axis, the superior mesenteric artery and the renal arteries were likewise dissected free and controlled by tapes, shown in (Fig. 2). The aorta was then occluded by means of Crafoord clamps proximally and distally and the tapes were tightened to control bleeding from the branches. The neck of the sac was now transected (Fig. 3) and the resulting defect in the wall of the aorta was closed with a row of mattress sutures and a continuous running suture of 000 arterial silk (Fig. 4). The clamps were now removed, re-establishing the flow of blood through the aorta after a period of occlusion of 34 minutes. The sac of the aneurysm was now dissected out as completely as possible, although the small portion extending to the right of the midline could not be removed. There was very little bleeding, since the attachment of the aneurysm to the aorta had been divided. The lumen



Fig. 3

Case No. 1 - Neck of aneurysm transected after temporary occlusion of aorta and its branches.



Fig. 4

Case No. 1 - Suture of wall of aorta. Aneurysm removed showing eroded vertebrae. Actually the suture was completed before removal of the aneurysm.

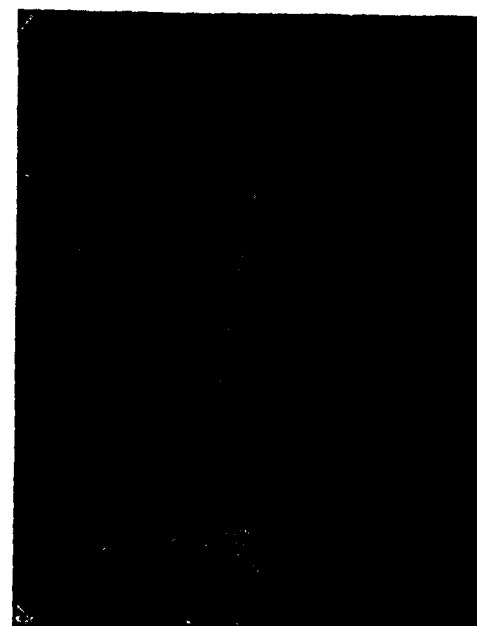


Fig. 5

Case No. 1 - Post-operative aortogram showing nearly normal condition of the aorta.



Fig. 6

Case No. 1 - Post-operative photo of patient showing the anterior part of the thoraco-abdominal incision.

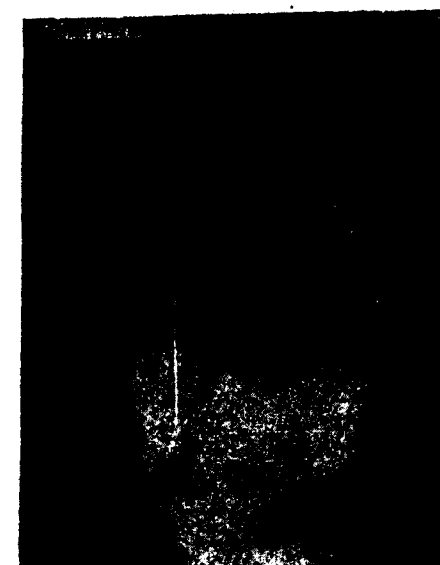


Fig. 7

Case No. 2 - Pre-operative X-ray of stomach after barium swallow showing distortion of stomach by the aneurysm.

was filled with clots and posteriorly it was noted that these clots were in direct contact with the eroded bone of the vertebrae, thus illustrating the great danger of peripheral dissection before the aneurysm is centrally controlled. The incision was closed in the usual fashion, leaving tubes in place for suction-drainage both above and below the diaphragm.

The operation required 7 hours. Measured blood loss was 2,000 c.c. and 2,800 c.c. of whole blood was given. The patient remained in satisfactory condition throughout.

The post-operative course was uneventful. The patient experienced immediate relief from pain and was able to walk about within a few days. About one month after operation an aortogram was performed by injecting the contrast medium through a catheter passed upward through the femoral artery (Fig. 5). It showed a normal contour of the aorta except for a slight bulging where the neck of the sac had not been cut off flush with the aortic wall. The patient was well and free of symptoms when heard from about three months after the operation. (Fig. 6), and also in Aug. 1960, about six months after operation.

The pathologist's report on the resected specimen was "Saccular syphilitic aneurysm of the aorta".

Case No. 2—Bhimrao, WTS. No. 9447, a 48 year-old Hindu, Clerk, was admitted to the Thoracic Surgery

Section of the Wanless Tuberculosis Sanatorium on 25th March 1960, referred by Dr. S. G. Chopade, of Miraj. He gave a history of intermittent vomiting for 2½ years. For two months he had experienced more frequent vomiting and severe pain in the back. There was no history of venereal infection. Examination revealed a pulsatile mass in the epigastrium which was estimated to be about 3½ inches in diameter. An aortogram performed in the lateral position revealed an aneurysm originating from the anterior wall of the abdominal aorta just proximal to the superior mesenteric artery, which appeared to be intact (Fig. 7). The Kahn test was negative. The pre-operative diagnosis was saccular aneurysm of abdominal aorta, of doubtful etiology, arising from the anterior aspect of the aorta in the region of the celiac axis.

The aneurysm was excised on 9th April 1960 under endotracheal ether and oxygen anaesthesia by Dr. S. K. Bose. The patient was placed in the supine position with the left side elevated to an angle of about 45 degrees. A left thoraco-abdominal incision was used, extending across the upper abdomen and upward over the lower part of the left chest along the eighth inter-space. The left pleural space was entered and the diaphragm was incised. Excellent exposure was obtained. The spleen, tail of the pancreas and splenic flexure of the colon were mobilized



Fig. 8

Case No. 2 - Pre-operative aortogram showing aneurysm at the level of the celiac axis with intact superior mesenteric artery.

and reflected toward the right, in order to expose the mass retroperitoneally. The relationships of the aneurysm are shown diagrammatically in (Fig. 8). The sac measured approximately $4\frac{1}{2}$ inches in the cephalo-caudad direction and $4\frac{1}{4}$ inches in breadth and antero-posterior diameter. It originated from the anterior aspect of the abdominal aorta in the region of the celiac axis. The neck of the sac was about 2 inches in breadth. The superior mesenteric artery was intact and could be separated from the caudad aspect of the aneurysm. The renal arteries were intact. The left gastric, splenic and hepatic arteries could be identified issuing from the anterior surface of the aneurysm.

The aorta was isolated and encircled by tapes proximally and distally. The renal arteries and superior mesenteric artery were controlled by tapes (Fig. 9). The aorta was now occluded by means of Craford clamps proximally and distally and the neck of the sac was transected flush with the wall of the aorta (Fig. 10). The resulting defect in the wall of the aorta was then closed by a continuous running suture of 000 arterial silk. The clamps were then removed, re-establishing the flow of blood through the aorta after a period of occlusion of 24 minutes. The clot-filled sac of the aneurysm was now dissected out. The splenic artery and the left gastric artery were separately clamped and ligated. Splenectomy was performed. Arterial circulation to the liver was re-established by an anastomosis between the distal stump of the hepatic artery and the side of the superior mesenteric artery, using 00000 arterial silk (Fig. 11). A satisfactory anastomosis was obtained. The total period of occlusion of the hepatic artery was 2 hours. The thoraco-abdominal incision was closed in the usual fashion.

The operation required $6\frac{1}{2}$ hours. Measured blood loss was 2,280 c.c. and 2,350 c.c. of whole blood was given. The patient remained in satisfactory condition throughout.

The post-operative course was smooth. The patient experienced immediate relief of back pain and was soon able to take food without vomiting. He was discharged one month after operation in good condition. He was last seen five months after operation, at which time he was free of symptoms and was doing his usual work. Two attempts were made to obtain a trans-lumbar aortogram post-operatively, but without success. The needle entered the aorta but good visualization by means of the contrast medium was not obtained.

The report of the pathologist on the resected specimen was "Aneurysm of the aorta, sacular, etiology undetermined". There were no changes characteristic of either syphilis or arteriosclerosis. It is possible that this might have been a congenital aneurysm of the origin of the celiac axis, similar to the congenital aneurysms of the splenic artery, which have been described by various authors.

Case No. 3.—Govind, WTS No. 9642, a 35 year old Hindu tailor was admitted to the Thoracic Surgery Section of the Wanless Tuberculosis Sanatorium on 20th July 1960. He was referred from another institution as a case of tuberculosis of the spine, because of low back pain for $1\frac{1}{2}$ years and the X-ray finding of erosion of the bodies of the 10th, 11th and 12th thoracic vertebrae and partial destruction of the 11th and 12th ribs on the left. There was a history of a chancre on the glans penis fifteen years before. On examination a pulsating mass was palpable in the left costo-vertebral area. The presence of a sacular aneurysm was confirmed by an aortogram made by injecting the contrast medium through a polythene catheter introduced *via* the right femoral artery (Fig. 12). The Kahn test was negative. The pre-operative diagnosis was sacular aneurysm of the abdominal aorta, of luetic etiology, probably arising from the posterior aspect of the aorta.

The aneurysm was excised on 6th August 1960 under endotracheal ether and oxygen anaesthesia. The patient was placed in a semi-lateral position with the left side elevated about 45 degrees. A long thoraco-abdominal incision was used, extending transversely across the upper abdomen and up over the left chest. The pleural space was entered through the bed of the resected 9th rib. Excellent exposure was obtained. The spleen, left colon and left kidney were reflected medially to expose the aneurysm in the retroperitoneal area. The relationships of the aneurysm were almost exactly as described in Case No. 1 and illustrated in Fig. 1, except that the aneurysm was somewhat smaller, measuring $8 \times 5\frac{1}{4} \times 4\frac{1}{4}$ inches. It originated from the posterior aspect of the aorta and extended somewhat to the right as well as to the left. The neck of the sac was about 3 inches in width and its distal margin was about at the level of the superior mesenteric artery.

The same technique was used in excising the aneurysm. The aorta and its branches were temporarily occluded, the aneurysm was cut off at its neck, and the wall of the aorta was reconstructed by a linear sutureline, using a continuous over-and-over suture of 000 arterial silk. The blood flow through the aorta was re-established after 28 minutes of



Fig. 9

Case No. 2 - Diagram showing relation of aneurysm of the celiac axis region. Note branches issuing from the aneurysm and the intact superior mesenteric artery just distal to it.

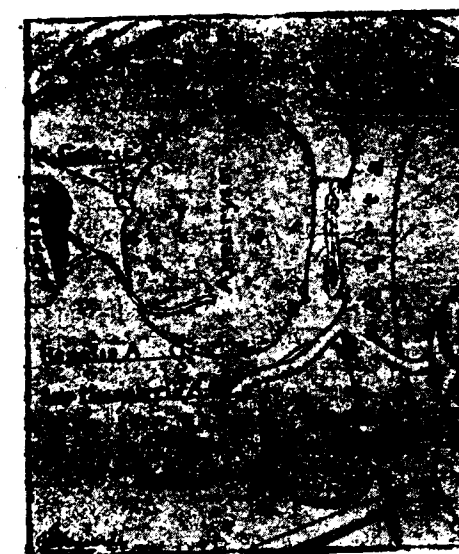


Fig. 11

Case No. 2 - Neck of aneurysm transected and wall of aorta sutured.



Fig. 10

Case No. 2 - Aneurysm exposed at operation by left Thoraco-abdominal incision. Aorta and branches temporarily occluded.



Fig. 12

Case No. 2 - Aortic suture completed. Aneurysm resected. Anastomosis of hepatic artery to superior mesenteric artery completed.

occlusion. However, one important difference was noted in this case. There was extensive calcification of the neck of the aneurysm. To remove all of this calcified tissue and to obtain healthy tissue for suture, it was necessary to excise a considerable amount of the wall of the aorta. The result was that, after suture, the lumen of the aorta was narrowed to only a little more than half of its normal diameter. A definite thrill was palpable as the blood passed through this area. However, distal pulsations were good and it was felt that the blood supply should be adequate. The sac of the aneurysm was now excised as completely as possible, leaving only a small amount on the right side, which was adherent to the inferior vena cava. This dissection caused a lot of bleeding posteriorly, where erosion of the ribs and vertebra had taken place. Finally, the incision was closed in the usual fashion, partly reconstructing the diaphragm and placing a tube in the pleural space for suction-drainage.

The operation required 5½ hours. Measured blood loss was 3,460 cc. and 3,350 cc. of whole blood was given. The patient remained in good condition throughout and at the close of the operation the blood pressure was 130/90 and pulse rate was 112/min.

Post-operatively the patient remained in good condition throughout the day of operation. The next day the pulse rate increased to 150 per minute and in the evening the blood pressure suddenly dropped, but rose again after appropriate treatment. The pulse rate remained rapid and on the second day after operation the blood pressure again dropped suddenly at noon. Hyperpyrexia was also noted. The pulse rate was 180 per minute. Cedilanid and intravenous corticosteroids were given without effect. The blood pressure was maintained with nor-adrenaline. The femoral pulses were palpable on either side. The condition continued to deteriorate. At mid-night of the second day after operation the abdominal incision was re-opened but there was no evidence of haemorrhage or gangrene. The patient expired 2½ hours later, early in the morning of the third day after operation. The urine output was 600 cc. on the day of operation, 250 cc. on the next day and nil on the second day after operation. No post-mortem examination was allowed and the cause of death remains obscure. Suppression of urine occurred, but this seems to have been the result of shock, rather than the cause of it. Post-operative haemorrhage or gangrene are ruled out. Massive corticosteroid therapy produced no response. The patient was conscious and there was no evidence of cerebral damage. Infection was combatted with massive

doses of broad-spectrum antibiotics. In spite of the narrowing of the aorta by suture, distal circulation seemed to be quite adequate.

The pathologist's report of the resected specimen showed a saccular syphilitic aneurysm of the aorta with considerable calcification of the wall.

Discussion

Our purpose in presenting these three cases is to call attention to the fact that many saccular aneurysms of the abdominal and lower thoracic aorta may be satisfactorily excised by this method without the necessity of complicated techniques or equipment. We have not employed hypothermia in these cases, but it is possible that the margin of safety might be somewhat increased by using a moderate degree of hypothermia. This would afford additional protection to the liver and the kidneys. However, our own experience, and that of others, seems to show that the aorta can be cross-clamped above the celiac axis for periods upto one hour without fear of any serious reaction. If the level of the aneurysm were in the upper thoracic aorta, hypothermia would be essential to prevent damage to the spinal cord. If the aneurysm were in the region of the arch of the aorta, one would have to use temporary by-pass shunts or else clamp across the neck of the sac, as described by Bahnson¹.

The important principle in dealing with any of these aneurysms is that the lesion must be attacked centrally, rather than peripherally. The peripheral wall of the aneurysm is very thin and friable and sometimes does not exist at all. Dissection in this area will lead to rupture of the wall and fatal haemorrhage. On the other hand, the tissues in the region of the neck of the aneurysm and its origin from the wall of the aorta are thick and tough. Surrounding tissues may be somewhat adherent, but dissection in this area can be carried out with confidence and safety. Once the neck of the aneurysm has

been divided and the aortic wall sutured, one can safely dissect out the wall of the aneurysm at leisure. This dissection is often somewhat difficult but the experience of Bahnson¹, and others quoted by him, indicates that the sac should be removed as completely as possible to prevent the danger of post-operative infection.

In all the three cases reported here, including the one in which the celiac axis was involved, excision by the method described was technically satisfactory. It is unfortunate that death occurred in one patient due to undetermined causes. However, on the basis of our experiences with these three

patients, we feel that we can strongly recommend this technique for application in suitable cases.

Summary

Three patients with saccular aneurysms of the upper abdominal aorta were operated upon. In each case the aneurysm was successfully excised by the technique of temporary occlusion of the aorta, transection of the neck of the aneurysm, suture of the aorta and subsequent excision of the aneurysmal sac. Two patients recovered and have remained well. One patient died on the third day after operation, due to unexplained causes. The method is recommended for further application in suitable cases.

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DIVERTICULUM OF THE FEMALE URETHRA

BY

JAYANT M. JALUNDHWALA, Miss S. C. PANDYA and R. C. SHAH,
Ahmedabad.

Diverticulum of the female urethra has been an almost forgotten problem. Interest in this subject was aroused in various American Centres by the very good papers of Higgins and Roem (1943), Cook and Pool (1949), Wharton and Kearns (1950), Mackinnon, Pratt and Pool (1959) etc. It has been observed that where no cases were found prior to such reports, a number of cases came to light subsequently, as has been found in the experience of Johns Hopkin Hospital, Cleveland Clinic etc. Even in British literature, the subject received but scant attention and not many reports of the condition are found. Even in the teaching programmes, there has been a complete lack of interest in the subject. Victor Lane (1957) from the Meath Hospital has recorded the first case in British literature. References to this type of lesion in Indian literature are few. One author, (Pandya, 1956) has reported a case of this type. It is of interest to note that in the short space of three years, three more cases have been diagnosed and treated at this hospital. This appears to be in keeping with the experience of the American Centres.

Etiology

The etiological factors responsible for the causation of a diverticulum of the female urethra are varied. That congenital diverticula do in fact exist has been suggested by Counsellor (1949) and this is supported by the report of Johnson (1938) of a female diverticulum in a neonatal infant and also a case in a virgin reported by Jareki (1914). However, a number of authors appear to favour the acquired origin. Notable among them are Furniss (1935) and Engel (1941).

They believe that a retention cyst formed in a paraurethral gland gets infected; this subsequently bursts open into the lumen of the urethra, forming a diverticulum.

The part played by trauma during child-birth is, however, undisputed, since a very large majority of cases are in parous women and in some, a history of a difficult labour is also obtained.

Pathology and complications

The diverticulum is usually about 2-3 cms. in diameter with its opening situated on the floor of the urethra, about its middle. This opening may be situated either in the anterior third or posterior third of the urethra. Occasionally, there may be multiple ostia. The diverticulum may extend into the base of the bladder and may extend between the urethra and the subpubic region. Although the lining membrane is initially of a transitional type, most the diverticula when excised are seen to be lined by granulation tissue due to infection in the sac. These diverticula cause symptoms because of the infection. According to Gilbert and Cintron (1954), the infection is mainly of the B. coli type in all the cases, while Pinkerton (1956) found non-specific organisms in six cases but no gonococci. Infection is the most common complication which demands treatment of the diverticulum. Calculi have been found in it occasionally as in our case No. 2. Wharton and Kearns (1950) have found it in ten percent of their cases and Herman and Greene (1944) found it in seventeen percent of cases. Mackinnon, Pratt and Pool (1959) found in one of their cases ten

faceted stones. Very rarely carcinomatous change has been seen in the diverticulum as reported by Hamilton and Leach (1951) and Wishard and Nourse (1952). Scott and Ekas (1946) have found four cases in the literature of urethro-vaginal fistula but this is very rare.

Diagnosis

Most of these patients are seen by Gynaecologists or Urologists for repeated attacks of frequency, burning micturition and dysuria. Dyspareunia and strangury are found in some of these cases, but the most important part of the history is the complaint of a mass in the anterior vaginal wall, which would empty on pressure or after voiding. There may be a definite history of discharge from the meatus on pressure over the mass.

The diagnosis becomes more clear when the mass is found in the anterior vaginal wall, which on pressure exudes pus or urine from the urethra. The mass may be firm due to induration from infection. The condition may be mistaken for cystitis or a Gartner's cyst or a cyst in the vaginal wall and occasionally a large cystocole may also be mistaken for the same. Carcinoma of the urethra may also present itself as a tumour mass but such a condition may be found in the diverticulum itself as well. Many of the patients describe a sense of fullness in the urethra which disappears is along with and disappearance of the spasmodic pain or is relieved by pressure on the anterior vaginal wall.

Not infrequently, patients will have dribbling of urine after the completion of the act of micturition. A few patients have difficulty in voiding and the stream is also narrow probably as a result of distortion of the urethra due to the distended diverticulum. Other symptoms may be incontinence of urine or haematuria. Some of the

patients have recurring bouts of infection of the urinary tract. These bouts continue until the correct diagnosis is made and treatment carried out (Mackinnon, Pratt and Pool, 1959).

Early diagnosis depends primarily on the clinician being alive to the possibility of the existence of this condition and confirmation by two important investigations *viz.* Radiological demonstration and cystourethroscopy. Prior to this, if massage of the anterior vaginal wall and the urethra produces a purulent discharge from the urinary meatus or a palpable mass is present in the anterior vaginal wall, a diverticulum is likely to be present.

The diverticulum can be outlined by means of a radio-opaque dye. In the method of Robert (1952), a micturating cystourethrogram is taken using sodium iodide. This method was used in our case No. 1. It demonstrated the presence of a urethral diverticulum. Another method designed to the same end is Taylor's (1950) method of introducing the radio-opaque material in the diverticulum by using a Foley's catheter with an opening proximal to the bag while the tip is closed off. Yet another method is to locate the orifice of the urethral diverticulum by a direct vision cystoscope and introducing a 4F opaque catheter into the diverticulum which is made to coil in the cavity; radio-opaque material is injected through it to outline the diverticulum and to demonstrate its size and also as to whether it is multilocular.

The presence of a calculus can be revealed by a straight skiagram of the abdomen and pelvis. The shadow, however, must be distinguished from that of a bladder stone. In our case No. 2, the presence of a calculus in the diverticulum was missed due to the error of not including the pubic area in the plain skiagram.

The most important diagnostic procedure is cystourethroscopy by a panendoscope or by a direct vision cystoscope. It has been found that the usual cystoscope (used in urological procedures) does not permit a view of the urethra. Massage of the anterior vaginal wall during the examination may sometimes result in the expression of toothpaste like material from the orifice of the diverticulum.

Treatment

All authors agree that the symptomless diverticulum should be left alone. Downer and Virgillio (1945) have advised the use of dilatation of the ostium and administration of antibiotics in a small diverticulum. This is helpful, although it is likely to be only palliative. Parmenter (1941) treated a case of extensive diverticulum by incision and drainage through the vagina. However, the treatment of choice is the excision of the diverticulum with repair of the defect in the urethra over a catheter by fine chromic catgut avoiding the urethral mucosa in the sutures. Transvaginal approach through a vertical incision over the main portion of the diverticulum and with an 18 or 20 Foley catheter in the bladder to give accurate definition to the urethra is the method of choice. A number of reports with this type of treatment have been published by various authors, notable among these being Counseller (1949), Gilbert and Cintron (1954), Pinkerton (1956) etc. This operation should be followed up by an indwelling catheter for 5-6 days. Pinkerton (1956), however, tried a vaginal cystostomy in one of his cases but he found the method of an indwelling catheter more satisfactory in his subsequent cases.

Elick (1957) has used another method, viz., partial excision of the sac, curettage of the mucosa of the ostium and packing the ostium with oxycel gauze so as to obliterate

it, a catheter being left in the urethra. In his hands this method has given good results in 7 cases and may be useful in cases where there is a very large and adherent sac.

Stress incontinence, urethro-vaginal fistula and occasional recurrence have been reported by a number of authors following the treatment. Occasionally, stricture of the urethra may develop. In a small percentage of cases, even after surgical extirpation of the diverticulum, symptoms may persist. They may even have persistent urethritis. They do not need further surgical procedures but improve under medical treatment.

Case Reports

Case No. 1.—H. B., a Hindu female, aged about 25 years was seen in the Outpatient Department on 27-10-'58 with the complaints of severe burning at the external urethral opening, frequency of micturition, every half to one hour day and night and a painful swelling in the region of the urethra. There was purulent discharge from the external urethral meatus and fever with rigors. The duration of these complaints was eight days. She also complained of having vague abdominal pain for the last one month. There was a sense of fullness in the region of the urethra, till the pus was expressed out of the swelling. The pain at the external meatus and the swelling used to subside after the expression of purulent discharge, but the other symptoms used to persist. On further inquiry, the presence of dysuria and occasional strangury was also elicited. There was no history of dyspareunia or incontinence but she used to have leakage of a few drops of urine after voiding. She had three full term normal deliveries and her periods were regular. The last delivery was two and a half years ago. Three months before every delivery, she used to get burning and frequency of micturition and these symptoms used to subside soon after delivery without any treatment.

On examination, a tense tender swelling was found under the urethral opening, from which pus came out on pressure. The uterus was anteverted and normal in size but fixed. Cardio-vascular and Respiratory symptoms were normal. Micturating urethrogram done on 29-10-58 with 12.5 percent sodium iodide showed the presence of a urethral diverticulum. Urine analysis on 31-10-'58 showed acidic urine with stray epithelial cells, R.B.C. and a few uric acid crystals. There were no pus cells.

With a tentative diagnosis of the diverticulum of the urethra, she was operated on, on 30-10-'58, under spinal anaesthesia.

A swelling 3.75×3.75 cms. in size was present under the urethra. When it was squeezed, purulent turbid fluid welled out from the urethra. With a fine sound passed through the small mouth of the diverticulum in the floor of the urethra, the diverticulum was exactly localised. After its withdrawal, a self-retaining rubber catheter was introduced into the bladder, through a midline incision on the anterior vaginal wall, the diverticulum was exposed with its opening about the middle of the urethra. This was dissected away from the vaginal wall. The sac was excised and the opening closed by interrupted 00 chromic catgut avoiding the urethral mucosa. Redundant anterior vaginal wall was excised and the wound was sutured with vertical mattress catgut sutures. A self-retaining catheter was left in to drain the bladder. Post-operatively she was given crystalline penicillin 5 lacs units and streptomycin (gm. $\frac{1}{2}$) twice a day for 7 days. The catheter was removed on the 7th day. For the first five days, bladder wash with silver nitrate 1:10,000 was given daily. After removal of the catheter, she was instructed to pass urine every hour. She had no difficulty in passing urine. There was no leak at the site of the operation. She was put on alkaline mixture and a course of sulphadiazine and was discharged home.

Histological examination of the excised diverticulum showed a urethral wall, infiltrated by chronic inflammatory cells and lined by granulation tissue.

When seen after two months; she had frequency of micturition but no other symptoms, and there was no recurrence of the diverticulum.

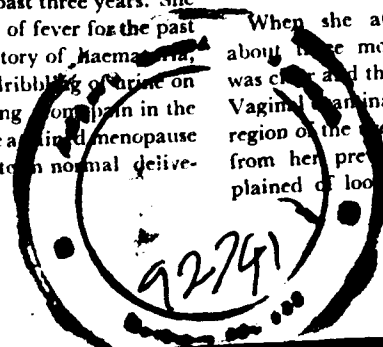
Case No. 2.—M. M., a Hindu female, aged about 45 years was seen in the Out-patient Department on 1-9-58 for a gradually increasing swelling in the region of the urethra for the last five years. On pressure over the swelling, purulent discharge came from the urethra. She also gave a history of pain at the beginning of micturition and severe burning sensation during voiding, accompanied by hourly frequency of micturition for the past three years. She used to have recurrent attacks of fever for the past twelve months. There was no history of haematuria, pain in the hypogastrium, or dribbling of urine on standing. She had been suffering from pain in the left loin for the last 15 years. She attained menopause 3 years ago. She had eleven full term normal deliveries.

Local examination under general anaesthesia revealed a hard, tender swelling 3.75 cms. in diameter in the suburethral region. The uterus was small, atrophic and retroverted; the fornices were clear. Abdominal examination revealed a nodular lump in the left loin. Radiograph of the abdomen and pelvis taken to exclude calculus in the urinary tract showed no significant abnormality. (Unfortunately the pubic area was not included in this x-ray and thus a stone which was present in the urethral diverticulum was missed in this investigation. A diagnosis of urethral diverticulum containing a stone was made. An alternative possibility of malignancy of the urethra was kept in mind. The swelling was explored on 4-9-'58 under spinal anaesthesia. It was found to be a urethral diverticulum. A sound passed in the diverticulum confirmed the presence of a calculus. The diverticulum was about 4 cms. in diameter and extended on both the sides upto the pubic arch. Through a midline incision $1\frac{1}{2}$ inches long on the anterior vaginal wall, starting $\frac{1}{2}$ inch away from the external urethral meatus, the diverticulum was approached, dissected free from the urethra and bladder upto the pubic arch on either side laterally. It was incised longitudinally and the calculus removed. The whole of the diverticulum was then excised and the defect in the urethra repaired by 00 chromic catgut continuous suture. The vaginal incision was closed by No. 1 chromic catgut by vertical mattress sutures avoiding any tension. A self-retaining catheter was left in the bladder at the end of the operation. The same post-operative care was given as in case No. 1. The post-operative course was uneventful.

Pathological Report.—1. An oval stone 2.2×1.8 cms. with yellowish white rough surface. At one place on the surface is seen a depression to suggest the dislodgment of a spike like projection. On the cut surface, are seen loosely packed yellowish brown urates with greyish white phosphates. No nucleus can be identified on the cut surface.

2. Section of the diverticulum shows the characteristics of a fibromuscular wall lined with squamous epithelium with evidence of ulceration, haemorrhage and chronic inflammation.

When she attended for follow-up on 10-12-'58 about three months after the operation, her urine was clear and the catheter could be passed easily. Vaginal examination revealed no abnormality in the region of the urethra or bladder. She was also free from her previous symptoms. However, she complained of loose motions with blood and mucus for



the last two months with pain in the left hypochondrium. She also said that the pain in the left hypochondrium had been present for the last three years but had increased since one year. It was associated with recurrent attacks of fever. On examination, she presented the appearance of an emaciated, anæmic woman with oedema of both the lower limbs and face. Abdominal examination revealed a fixed tender lump 4 × 6 inches in size in the left loin. It was in relation with the kidney. (B. P. was 110/70 m.m. of Hg. and pulse was 86/minute. Respiratory and cardiovascular systems were normal. Haemogram revealed Hb. 28 per cent, R.B.C. 3.2 mill./cmm., W.B.C. 11,000/c.m.m. Blood group was O-IV). Urine analysis showed faint traces of albumin, plenty of epithelial cells and pus cells, no R.B.C. or crystals.

Report on Excretory Pyelography on 19-12-'58.—A large soft tissue shadow was seen in the left lumbar region and no dye was excreted on the left side. Right kidney and bladder were found to be normal. On exploration on 5-1-'59, left kidney was found to be enlarged, hard and markedly adherent to surrounding structures, thus making its mobilization difficult. Therefore, only a biopsy was taken from it and the wound was closed in layers. She went downhill very rapidly after the operation and was discharged after a few days at her request.

Histopathological report on biopsy: Section shows squamous cell carcinoma Grade II.

Case No. 3.—H. E., a Moslem female, aged about 37 years was admitted on 30-11-'60 for irregular profuse bleeding per vaginam of about one year duration. Her other complaints were dysuria, burning micturition and a painful swelling in the sub-urethral region with discharge of pus from the external urethral meatus on pressure over the swelling. She had these symptoms also for one year. There was no frequency of micturition or haematuria. She had six full term normal deliveries. On vaginal examination, uterus was retroverted but normal in size and both the fornices were clear. Speculum examination revealed the presence of a urethral diverticulum. On squeezing the diverticulum, pus came out of the external urethral meatus. Thus the clinical diagnosis of the presence of a diverticulum was made pre-operatively.

On 1-12-'60, Abdominal Total Hysterectomy with left Salpingo-oophorectomy and right Salpingectomy was performed for menorrhagia, through a right lower para median incision. There was hydrosalpinx on left side. The Appendix which was elongated and coiled and lying in pelvis was also removed. The

patient was then placed in the lithotomy position and a self-retaining catheter introduced into the bladder. Exposure, dissection and excision of the diverticulum and repair of the defect in the urethra etc. were carried out as in the other two cases. The diverticulum was 2 cm. × 1.25 cms. in size. Post-operative course was uneventful and the patient was passing urine normally when she was discharged on the 14th day with the wound healed. There was no leakage of urine from the vaginal wound and she had no urinary or other symptoms.

Pathological Report.—1. Diverticulum: The section shows squamous epithelium and mild chronic inflammation.

2. Uterus: Section reveals endometrium in secretory phase with mild secretory activity.

There is no follow-up study as the time elapsed since discharge is too short.

Discussion

The three cases that are reported here were seen soon after the first case reported elsewhere by one of us (Pandya, 1956). In the previous 25 years, not a single case was noted while in the three years after the first reported case, three more cases were added. The Indian literature on the subject is scarce. All the three cases were in multiparous women. The clinical history in all these cases was suggestive of this pathological entity. It has been the experience of many workers that the clinical history is spread out over many years in these cases as in our case No. 2 where the symptoms were present for five years. Not infrequently the diagnosis is missed even after extensive investigations. The specific points which must be remembered before a diagnosis can be made are the awareness of the existence of the disease entity on the part of the clinician and the confirmation of the diagnosis by radiographic demonstration. However, the most important investigation which gives the clue is cystourethroscopy using either a panendoscope or a direct vision urethroscope. The presence of a diverticulum as in cases of diverticulosis elsewhere in the body,

is associated with retention of secretions, infection etc. In our case No. 1, the urine culture showed *B. coli*. A number of other organisms may be grown if a culture is taken from the diverticulum as has been reported by Pinkerton (1956).

The basic principle of treatment remains the same as elsewhere *viz.* excision of the diverticulum and closure of the defect in the organ from which it arises. In case No. 2, there was an associated calculus in the diverticulum. Such an association has been noted in about 17 per cent of cases in the literature. In our cases reported here, the diverticulum was excised completely and the defect in the urethral wall was closed by catgut sutures. This method has been found safe and reliable. Other methods, where the diverticulum has been partially excised followed by oxycel gauze pack, has been described. In a very extensive diverticulum, the method of Ellik (1957) may be of some use. In case No. 2, the patient had a lump in left loin which

subsequently turned out to be a squamous cell carcinoma of the kidney. This variety of renal neoplasm is normally associated with either a calculus or infection of the kidney. Some of the symptoms in this patient, however, did not subside following excision of the diverticulum as they were probably due to renal neoplasm.

Summary

Three cases of diverticulum in the female urethra are reported with a brief review of the literature. One of the cases had an associated calculus in the diverticulum and a squamous cell carcinoma of the left kidney.

Acknowledgments

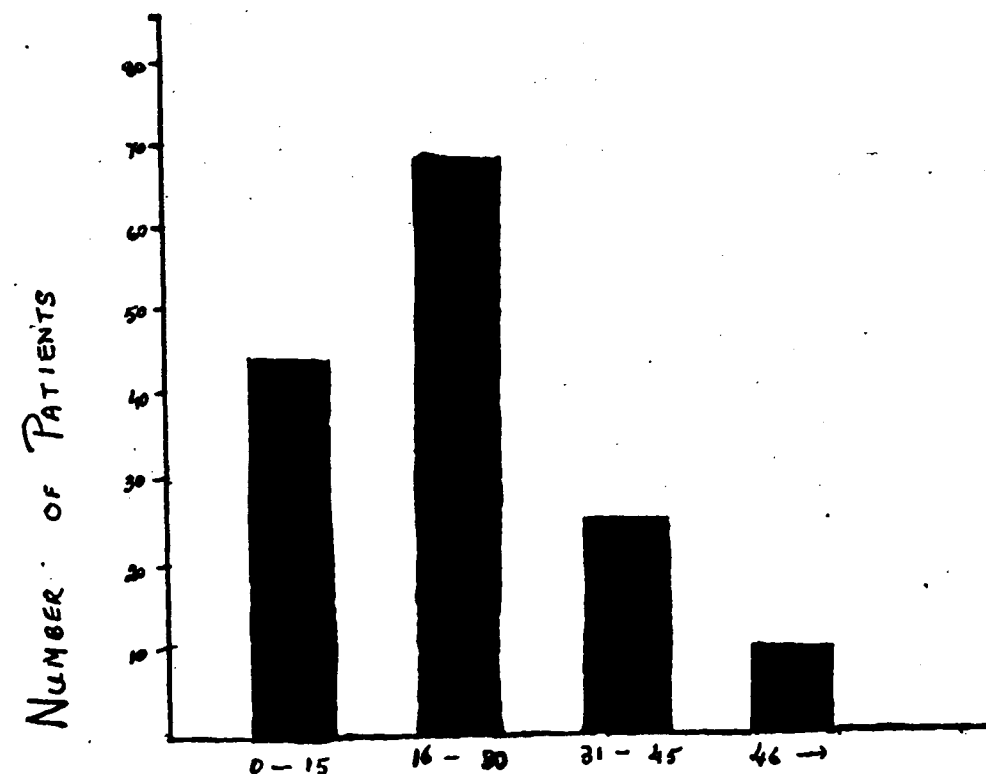
We are indebted to Dr. M. D. Desai, Superintendent of the Hospital, for permission to publish the above case-reports. Our thanks are also due to Dr. M. S. Kanvinde for the histopathological reports and other colleagues for assistance.

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TABLE No. 1



Age period—Age incidence in cases of intestinal obstruction.

ETIOLOGICAL AND CLINICAL SURVEY OF THE 145 CASES OF INTESTINAL OBSTRUCTION

BY

P. VIRMANI, New Delhi.

This survey is of the cases operated on in the Department of Surgery, Lady Hardinge Medical College and Hospital, New Delhi, during the period 1st June, 1958 to 31st May, 1960.

Interest in this subject was aroused by the fact that the commonest causative lesion in our series of cases of intestinal obstruction is abdominal tuberculosis, whereas during a stay of 4½ years in the U.K. one has encountered only one case of tuberculous abdomen. Tuberculosis has been so often the cause, especially of sub-acute and chronic intestinal obstruction in this hospital that it is easy to obtain a wide experience in this subject in a very short period.

Only the operated cases where we had clinical, radiological, operative, and, in most cases histopathological evidences to confirm the diagnosis, have been included in this series.

The total number of admissions in the Department of Surgery during this period was 2459 and the cases operated on for intestinal obstruction 145 (about 6%).

Sex Incidence

It must be pointed out that in our adult series we are unable to give sex incidence as this hospital admits only female patients with the exception of children. In the neonatal period (-0-1 year) the ratio is 11:20 (F:M). From 1-15 years the ratio was 10:4 (F:M).

It is shown in Table No. 1 that the highest incidence of intestinal obstruction in this series is between 16-30 years i.e., 67 cases were in the age group of 16-30 years, 43 cases belonged to the 0-15 years' group, 25 cases in the 31-45 years' group and only 10 cases were above 46 years. As will be seen from Table No. 5 this high incidence is due to 45 patients in this age group (i.e. 16-30 years) having tuberculous abdomens.

Causes of Intestinal Obstruction in this series

As will be seen from tables No. 2, 3 and 4 the cases have been divided into Acute obstruction (which are again divided into Neonatal group, children and adults) and Sub-acute and chronic obstruction.

Under 'acute obstruction' the total number of patients is 76 (52.5% of the total series). Out of these the neonatal obstruction cases total is 20 (i.e. 13.8% of the whole series).

Sub-acute and chronic obstruction cases are 69 in number (i.e. 47.5% of the whole series).

Under 'neonatal acute obstruction' are included patients who presented themselves with congenital anomalies in the neo-natal period. The case of oesophageal atresia is included in this group of obstruction according to the classification given by G. H. Macnab.

TABLE No. 2
Congenital Acute Obstruction
Total Number of Patients 20 (13.8%)

			No. of Patients
Congenital Intestinal obstruction	Intrinsic 5	Oesophageal atresia ...	1
		Duodenal atresia with imperforate anus ...	1
		Intestinal atresia.	3
	Extrinsic 2	Exomphalos with obstruction ...	2
Anorectal malformations requiring operation ...			13
Total ...			20

TABLE No. 3
Acute obstruction in Children and Adults
Total Number of Patients 56 (38.6%)

Particulars	No. of Patients	Total
1. Strangulation Obstruction:		
(a) Strangulated Hernias ...	3	
Femoral 1		
Umbilical 1		
Inguinal 1		
(b) Rupture uterus prolapse intestine resulting in strangulation of the Intestine ...	1	
(c) Volvulus ...	8	
(d) Intussusception ...	4	
Total ...		16
2. Simple mechanical Obstruction:		
(a) T. B. Abdomen ...	12	
(b) Bands and Adhesions ...	9	
(c) Cancer Rectum with Acute Obstruction ...	1	
Total ...		22
3. Paralytic ileus due to Peritonitis...	18	18

TABLE No. 4
Subacute and Chronic Obstruction
Total Number of Patients 69 (47.5%)

Particulars	No. of Patients
1. T. B. Abdomen	56
2. Glands pressing on the gut	4
3. Pyloric Obstruction	4
(a) Hypertrophic Pyloric Stenosis	2
(b) Carcinoma Pyloric end	2
4. Carcinoma Rectum	3
5. Retrorectal Tumour	1
6. Recto-Vaginal Fistula with imperforate Anus	1
Total	69

The incidence of intestinal obstruction in a newly born baby has been estimated at about once in 1,500 births (Evan, 1951).

Ano-rectal malformations were present in 13 cases out of 20 neonatal acute obstructions. The incidence of atresia of the anal canal or the lower portion of the rectum is about once in every 5,000 births (Wangenstein).

The sex incidence in ano-rectal malformations was 8:5 (M:F). The males predominate. Imperforate anus with fistulous communication was present in 2 cases and both were females.

One case in this series of imperforate anus cases was associated with Duodenal atresia. This diagnosis was made pre-operatively by radiography. A plain x-ray of the abdomen showed a double gas shadow. At Laparotomy the diagnosis was confirmed; gastro-jejunostomy and restoration of the anal canal were performed.

Intestinal atresia was present in 3 cases. This anomaly is relatively rare occurring

once in 20,000 infants (Wangenstein). In all these cases there was atresia of the whole of the large intestine.

In the rest of the acute obstruction group the case of special interest was the case of rupture of the uterus—a young woman of 26 years who had abortion at home and who came in a very collapsed state with distension of the abdomen and vomiting. On Laparotomy rupture of the uterus and gangrenous of the small intestine were seen. The loop of small bowel involved in this was the ileum 10" proximal to the ileo-caecal junction. Resection of the small intestine with end to end anastomosis was done.

There was nothing special about any other case in the acute obstruction group.

In the sub-acute and chronic obstructions the case mentioned as retro-rectal tumour was of special interest. A young woman of 26 years was admitted with a history of difficulty in defaecation and micturition. She had to strain much and the complaint was becoming worse. The history of chronic constipation dated back to one year and now she passed a stool once in 2 or 3 days. No masses were felt on abdominal examination but on rectal examination a large hard mass was felt posterior to the rectum; the upper limit of the mass could not be defined. The rectal mucosa was intact. On vaginal examination only one finger could be introduced with difficulty, the mass was felt posteriorly, and the vaginal wall was intact. The patient had retention of urine, and a metal catheter could be passed with difficulty, but a supra-pubic cystostomy had eventually to be performed. A biopsy of the tumour was done from behind by an incision extending from below the tip of the coccyx to the anus. The tumour was found to be very vascular. The biopsy report was teratoma and it was found to be

inoperable. Deep x-ray therapy was given. The tumour became smaller in size. The supra pubic cystostomy was closed.

The group of cases which are interesting are those due to Tuberculous abdomen. A acute obstruction due to tuberculous infection was present in 12 cases (Table No. 5) and sub-acute or chronic obstruction in 56 cases, making a total of 68 cases of tuberculous abdomen - a percentage of 47 (Table No. 6). If we exclude cases of congenital anomaly the percentage becomes 54.4% i.e. more than half the operated cases were tuberculous. Histological evidence of tuberculosis was obtained in 51 out of the 68 cases.

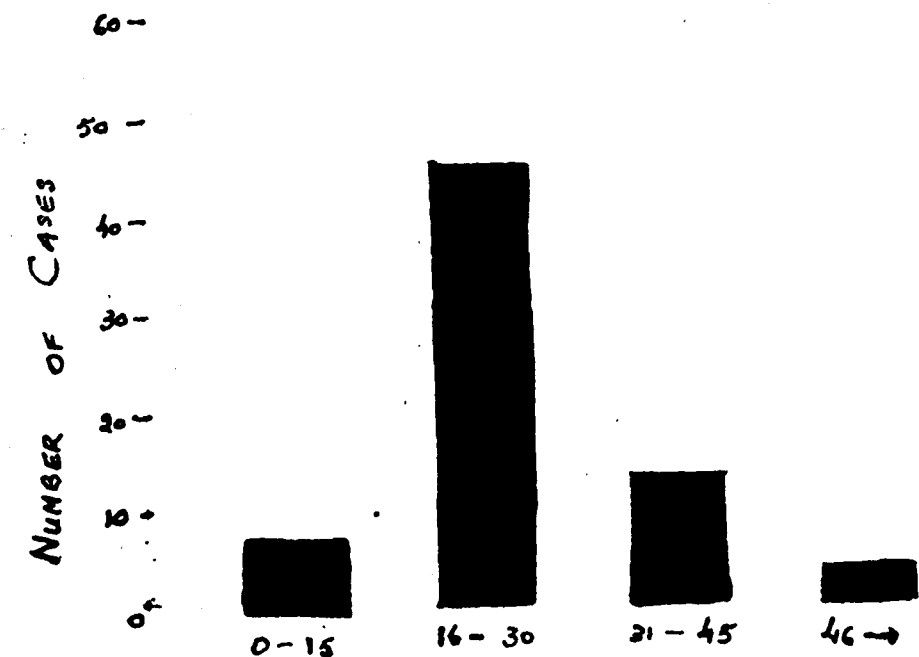
Age incidence

The highest incidence is between 16 and 30 years. The youngest case recorded in this series was 10 years of age.

Sex incidence

The disease is more common in females than in males. Dutt and Gupta (1958) reported 14 females in a series of 25 cases. Wig (1956) reported 28 females out of 42 cases. All cases reported in this series were females for reasons already given. Tables 6 and 7 show the type of lesion found and the number of cases proved histopathologically in each group.

TABLE No. 5



AGE INCIDENCE IN TB ABDOMEN CASES

TABLE No 6

Acute Obstruction due to T. B. Abdomen

Type of Lesion	Total No. of Patients	Histopathology		Report not available
		T. B. + ve Report	T. B. — ve Report	
1. Miliary Tuberculosis with or without adhesive Tubercular peritonitis ...	11	9	—	2
2. Ileo-caecal Tuberculosis ...	1	—	1 Non-specific-granuloma	—
Total Number of Patients ...	12	9	1	2

TABLE No. 7

Subacute and Chronic Obstruction due to T. B. Lesion

Type of Lesion	Total No. of Patients	Histopathology		Report not available
		T. B. + ve Report	T. B. — ve Report	
Ileocaecal Tuberculosis ...	23	19	4	—
Ileocaecal Tuberculosis with Stricture ilium ...	6	5	—	1
Ileocaecal Tuberculosis with Tubo-ovarian masses ...	1	1	—	—
Ulcerative lesion of caecum and whole of the colon ...	1	1	—	—
Ulcerative lesion of caecum and whole of the colon with enterolith ...	1	1	—	—
Stricture of transverse colon ...	1	1	—	—
Stricture of small Intestine ...	14	8	4	2
Miliary T. B. with or without adhesive Tubercular peritonitis ...	6	4	—	2
Enlarged mesenteric para-aortic or pyloric Lymphnodes ...	3	3	—	—
Total ...	56	43	8	5

There are a few cases in our series where a young patient with acute obstruction gives a previous history of sub-acute obstruction, evening rise of temperature and general weakness for a few months to a few years. Although tuberculous abdomen is suspected preoperatively patients do not improve with conservative treatment. They do well after Laparotomy though nothing can be done at the time of operation; a diagnosis is established and antitubercular therapy is carried out post-operatively.

A very small percentage of these cases, after discharge, keep coming back with further attacks of sub-acute or acute obstruction. The majority of these patients came from rural areas and cannot continue anti-tubercular treatment as energetically as one would like to give them.

In all cases of ileo-caecal tuberculosis the diagnosis was made pre-operatively by history, clinical findings and on radiological examination.

Out of 23 cases diagnosed pre-operatively as ileocaecal tuberculosis (Table No. 7) in 19 cases the diagnosis was confirmed by histopathological examination. Five cases out of this group showed non-specific granuloma. Out of 6 cases of ileo-caecal tuberculosis with stricture, 5 were confirmed by histopathological examination - one case of ileo-caecal tuberculosis with a tubo-ovarian mass was also confirmed histopathologically.

The 5 cases in this group of ileo-caecal tuberculosis reported on as non-specific granuloma might have been cases of healed tuberculosis or of regional ileitis (4 cases out of these 5 had already been given anti-tubercular treatment). As has been suggested by Wig et al. (1956), cases reported

as regional ileitis and nonspecific granulomata near about the caecal region are probably just the healed stages of active tuberculosis of the caecal area.

Comments

The commonest symptoms of the patients with ileo caecal tuberculosis consist of:—

Abdominal pain, vomiting, a mass in the abdomen either in the right iliac fossa or right lumbar region, or a moving mass in the abdomen (Patient referring to the visible peristalsis) and diarrhoea, or constipation or diarrhoea and constipation alternating. Sometimes all or a few of the above symptoms may be present. In addition to these, patients mostly give histories of loss of weight, fever, weakness and night sweats. The statement made by Hoon, Dockerty, Pemberton, and Dej (1950) "There is no pathognomonic symptom or syndrome in any form of intestinal tuberculosis" is quite true. It is the combination of the symptoms, signs and radiological and laboratory findings, that suggest a tubercular lesion.

The common clinical finding in this group is a mass either in the right iliac fossa or the right lumbar region. All the cases except one belonging to this group presented with subacute or chronic obstruction. As reported by Hoon and others (1950) this hypertrophic type of tuberculosis runs a chronic course characterized pathologically by a recurrent process of destruction and repair, with extensive formation of fibrous tissue. As a result progressive thickening and scarring of the bowel wall occurs, giving it a tumorous appearance. It is this tumorous appearance which is felt as a mass.

In all of these cases, Barium-meal or Barium enema showed a filling defect in

the caecum or ascending colon and, in a few, narrowing of the terminal ileum or ballooning of the ileum proximal to the ileo-caecal junction. In the majority of these cases, the caecum was situated high up.

In two of the cases, where pre-operative diagnosis of ileo-caecal tuberculosis was made and Barium-meal and Barium Enema showed a filling defect in the caecum, on laparotomy no lesion of the ileo-caecal region was found but patients had chronic appendicitis.

Patients with tubercular stricture of the ileum present themselves with sub-acute obstruction usually and their history differs

from that of cases with ileo-caecal tuberculosis in that they have more severe colicky pain and vomit during the attacks of obstruction, distension of the abdomen is more marked and visible peristalsis is observed during attacks. The patient describes the attacks so accurately that there is no difficulty in making a diagnosis from the history alone.

Acknowledgement

My special thanks go to Dr. M. Chaudhuri, F.R.C.S. (Eng.) (Professor of Surgery) and my colleagues in the Department of Surgery for allowing me to have access to their case records. I heartily thank Dr. L. R. Pathak (Professor of Clinical Surgery) for his suggestions and help.

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LESIONS IN THE URINARY TRACT

(Kidney and ureter (congenital))

BY

AMALENDU ROY and BINOY CHAKRABORTY, Calcutta.

'Congenital anomalies of the urinary system' is a subject of much interest. It is not rare for a member of the medical profession to come across such abnormalities either when the anomaly itself becomes responsible for a disease or it reveals itself accidentally during an investigation for some other condition.

In this paper the authors present some lesions relating to the urinary tract which have been chosen from a collection of several years.

In the early stages of development, the kidney lies in the pelvis at the level of the second sacral vertebra, in close contact with the opposite kidney, but soon it passes towards the loin and as the ureteric bud lengthens, it grows headwards and by the time the embryo has attained a length of 13 mm. (5th month, its expanded pelvis lies on a level with the second lumbar vertebra. The hilum which was originally pointing forwards rotates medially.

Congenital absence of one kidney is found in 1 in 4000 autopsies. Males are more commonly affected than females and the left kidney is more often absent than the right. Other congenital abnormalities may be present in more than 70% of cases. The single remaining kidney enlarges in compensation; it is always larger than normal and is usually considerably elongated or globular. The solitary kidney is said to be prone to diseases especially to hydronephrosis, due to a stone or an aberrant vessel.

In the case presented the left kidney is absent and the solitary right kidney is larger, hydronephrotic and there is lack of normal ascent and rotation. There is no evidence of any calculus to explain the hydronephrotic changes. This case had in addition a spina bifida in the sacrum (Fig. 1).

There is a group of abnormalities of position which results from disturbances in the migration of the kidney. One of the kidneys



Fig. 1

I. V. Pyelogram. The left kidney is absent, solitary right kidney shows hydronephrotic changes with lack of normal ascent and rotation. Spina bifida of the sacral vertebrae present.

may ascend over the common iliac arteries and remain lodged in the pelvis. It may, however, be found anywhere in its course from its early to its final situation. Fixed misplacements are always congenital - movable ones usually acquired. The position of the ectopic pelvic kidney may be at the aortic bifurcation, on the sacral promontory, over the sacro iliac synchondrosis, in the iliac fossa or in the sacral hollow. The vessels are usually abnormal in origin, number and distribution. The renal artery may spring from the bifurcation of the aorta or from the iliac artery. The low position is likely to interfere with ureteral drainage. Pain, infection and stone formation are common results. The incidence of single unilateral ectopia is about 1 in 1000 autopsies.

The left kidney is commonly affected. It is usually smaller and deformed. A pyelogram shows the low position of the affected

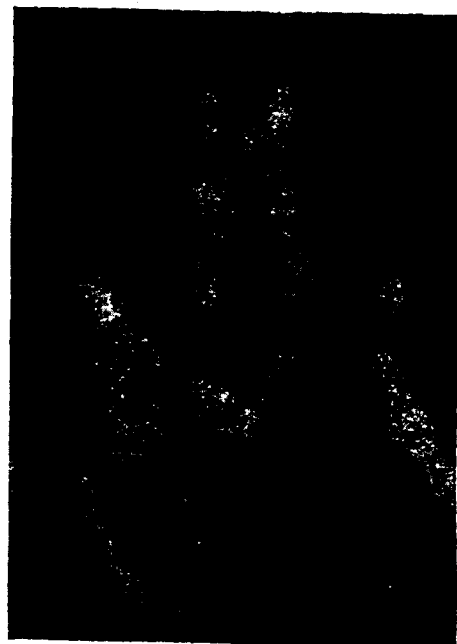


Fig. 2
Retrograde pyelogram shows the right kidney at the level of second sacral vertebra. The ureter is short and the renal pelvis is deformed.



Fig. 3
Retrograde pyelogram showing the right kidney in the pelvic cavity with short ureter and deformed renal pelvis.

kidney and to distinguish it from a mobile kidney a retrograde pyelography is essential to demonstrate the short ureter. In one of our cases (Fig. 2) ectopia affected the right side, which is less common. The kidney is fixed at the level of the 2nd sacral vertebra i.e. the original foetal position. There is deformity of the renal pelvis and the ureter is short. In the other case the ectopia was also present on the right side and here the kidney was fixed low down in the pelvis (Fig. 3).

In the early part of the development, possibly as the two kidneys are crowded close together, they may become fused to each other, and so remain, as they continue their ascent. The highest degree of fusion is found where the two kidneys are indistinguishably fused in a single mass, and the lowest where the two kidneys are united by a fibrous band.

The most common and the smallest degree of fusion is found in a horse shoe kidney where the band of union is in the lower pole passing across the aorta and the vena cava; more rarely the upper ends are fused. Very rarely indeed in their ascent both kidneys may be thrown over to the same side of the midline and fuse to form a large irregular unilateral renal mass which is of the shape of an S or L or a disc or a shield or one long kidney. When both the pelves face medially it is a long unilateral kidney with two ureters; when they face in opposite directions it is S shaped and when one joins transversely to one pole of the other it is L shaped. Disorders due to stasis *viz.*, obstruction, infection and stone formation are especially liable to occur in these.

In a pyelogram the fusion is well demonstrated and it can be ascertained if the fusion

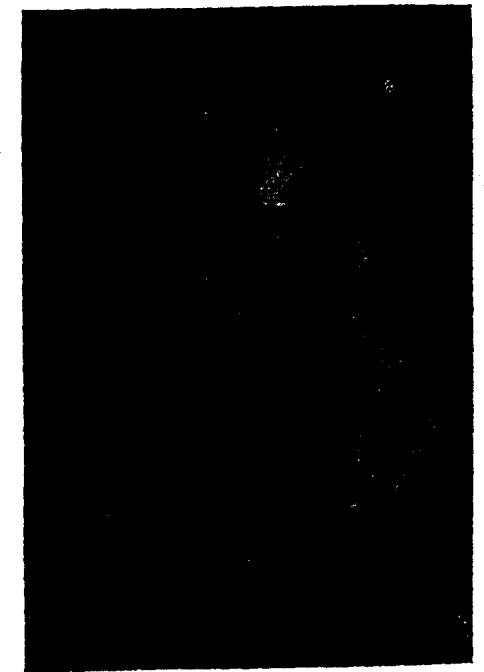


Fig. 5
Ascending pyelogram shows dye in the right kidney and also in the left side of the mass - presumably in the left kidney which is fused with the right.



Fig. 4
Barium enema showing the descending colon pushed to the left by the renal mass (extrinsic pressure).

is globular or S or L shaped or a "horse shoe" with rotation of the pelvis. One patient in our series came with a mass in the left iliac region. A barium enema (Fig. 4) showed that the mass had no relation with the colon but the descending colon was pushed to the left. An ascending pyelogram through the right ureter demonstrated beautifully the pelves and calyces of both the fused kidneys (Fig. 5). It was not clearly understood how dye through the right side filled up both the renal pelves. Possibly there was communication between both the pelves in the fused renal mass. An attempt was made to demonstrate the vascular supply of the misplaced fused kidneys and an aortography was done; possibly the vessel marked with an arrow in (Fig. 6) was the feeding vessel. The other case presented with a lump in the right hypochondrium

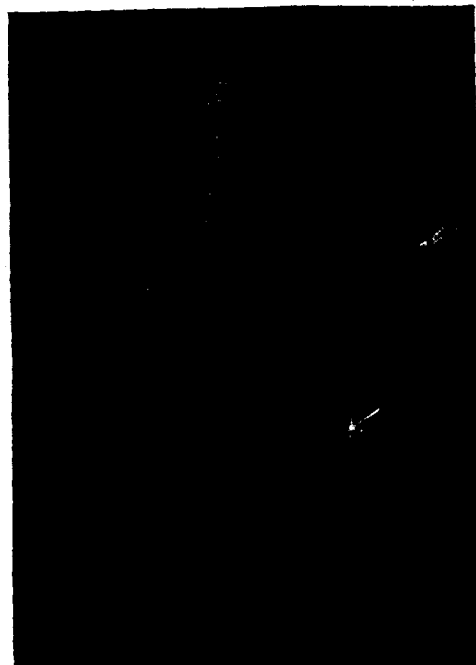


Fig. 6

Abdominal aortogram shows the vessels of supply to the fused renal mass (marked by arrow).

and on investigation the intravenous pyelogram (Fig. 7) demonstrated both kidneys fused in to a single mass on the right side of the median plane.

In another case the I. V. P. showed marked rotation of the pelvis and calyces of the right kidney and the left kidney shadow superimposed on the spine with some degree of hydrocalycosis; the diagnosis of a horse shoe kidney was made (Fig. 8).

The pathogenesis of cysts of the kidney is obscure. Although different theories such as inflammation and epithelial proliferation have been put forward still the theory of failure of junction between the straight collecting tubules and the secreting uriferous tubules postulated by Hilderbrandt is the most popular one of the day. Under

such circumstances, the blind tubules continue to develop forming glomeruli which even begin to function. Accumulation of urine in such tubules soon converts them into tense fluid filled vesicles. Each blind tubule thus becomes a fluid filled cyst. Cystic disease takes three principal forms:—Solitary cysts, unilateral polycystic disease and bilateral polycystic disease. Solitary serous cysts thin walled, spherical cysts containing clear fluid. Cysts such as these may cause local pain or intra-abdominal pressure symptoms. The cyst occasionally ruptures spontaneously and sometimes an intracystic neoplasm may develop. Abdominal aortography, now-a-days, offers a more certain means of differentiating these masses from kidney cancer. While polycystic disease of the kidney is almost always congenital and bilateral, it is sometimes unilateral. Many of these patients



Fig. 7

I. V. P. showing fused both kidneys lying in the right side with calyces directed medially - unilateral fused kidney.

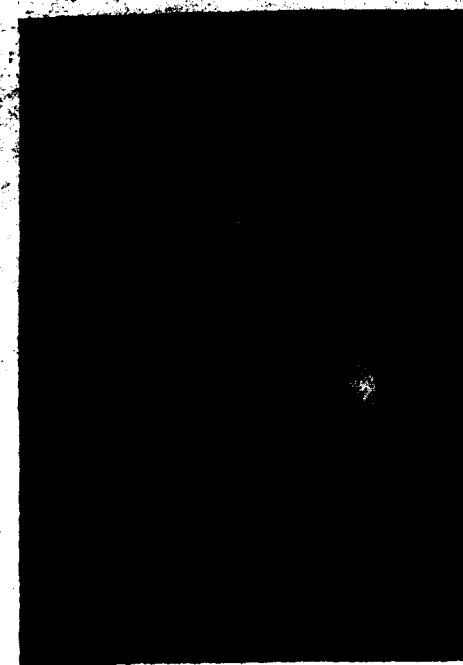


Fig. 8

Both kidneys are fused in the midline with rotation of the calyces and pelves in both sides-horse shoe kidney (arrow points to the calyces of the left kidney).

have palpable enlarged nodular kidneys and they subsequently present themselves with hypertension and renal failure.

In a case of solitary cyst an intravenous pyelogram shows a deformity of the calyces with displacement, as they are pushed aside by the cyst; in the case shown here (Fig. 9) the lower and middle calyces are pushed medially. There is no evidence of distortion or displacement of the renal pelvis. This case gave an operative finding of a solitary cyst in the lower pole of the right kidney.

A polycystic kidney in an I. V. pyelogram gives poor concentration of dye due to functional impairment and in these cases a retrograde pyelography is the method of choice. The pyelogram shows smooth curved indentations on the pelvis and major calyces,

minor calyces appear to be stretched out—commonly termed as 'spider leg deformity'. This is well shown in the presented case (Fig. 10).

The ureter is sometimes divided so that there are two ducts. It is present in 3 or 4 per cent of the patients that come for pyelography or post mortem. This multiplicity is dependent on the division of the ureteric diverticulum arising from the Wolffian duct. The pelvis of the kidney may be double and the two ureters which drain the parts of the pelvis may unite to form a single channel before entering into the bladder or they may remain separate in their whole course. The ureter which drains the upper part of the kidney usually crosses that from the lower part and opens lower on the trigone (Weigert Mayer law). Sometimes

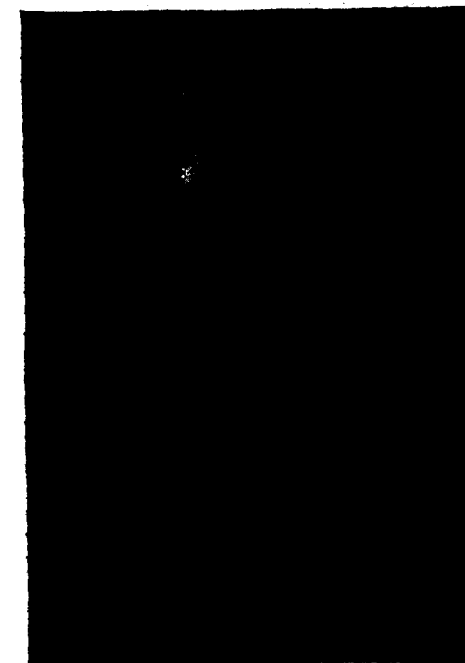


Fig. 9

I. V. P. shows deformity of the calyces with displacement by a large cyst in the lower pole of right kidney (operative confirmation).

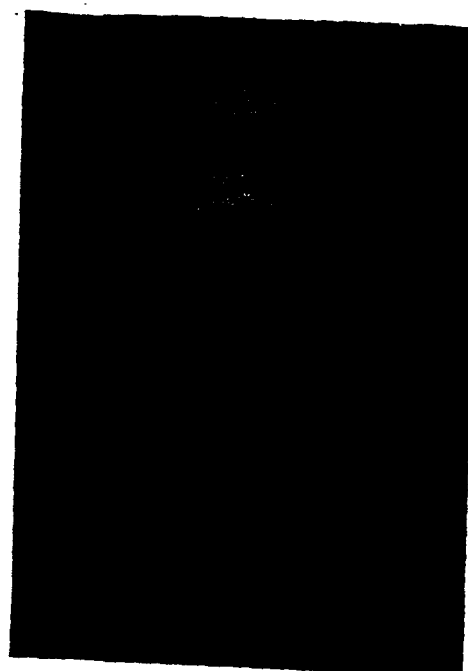


Fig. 10

Retrograde pyelogram showing bilateral "spider leg deformity" of the calyces—Polycystic kidneys Both kidneys are low in position.



Fig. 11

I. V. P. shows Duplex kidney with double ureter in the right side. Left kidney is normal.



Fig. 12

Duplex kidney with double ureter; lower end of the upper ureter shows a stone impacted, causing hydronephrosis in the upper calyx with hydroureter.



Fig. 13

I. V. pyelogram showing bilateral Duplex kidneys with double ureters. A very rare condition. Ureters of the left side are pushed further to the left by a huge retroperitoneal sarcoma.

both ureteral openings are ectopic. Calculi are often found in kidneys which have a double pelvis and ureter. Bilateral double ureters are the rarest of rarities.

These cases of ureteral multiplicities can easily be demonstrated by an I. V. pyelogram. The upper pelvis represents the upper major calyx, the lower pelvis represents the remaining two thirds of the normal renal pelvis. In one of our cases the right kidney had a duplex ureter (Fig. 11). In another case both the ureters opened in the bladder separately and the upper had a stone impacted in its intramural part causing hydroureter and hydronephrosis (Fig. 12). The most interesting case of bilateral ureteral duplex came to our notice while

investigating a case of huge abdominal lump which later turned out to be a retroperitoneal sarcoma—the pyelogram shows nicely the outlines of both the ureters; the pelvis of the left side is pushed further to the left due to the retroperitoneal lump (Fig. 13).

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COMPLETE RECTAL PROLAPSE - TREATMENT BY GRAHAM'S OPERATION

BY

B. R. KALKE and A. V. GONDHALEKAR, Bombay.

Complete rectal prolapse is not peculiar to human beings: it is also to be found in quadrupeds and several feet of colon may prolapse in the adult horse. The condition, however, is much more common and much more serious in primates due to the adoption of the erect attitude.

True prolapse of the rectum still challenges the ingenuity of surgeons as evidenced by the wide variety of procedures advocated for its correction. The large number of procedures only indicates the vast number of disappointed patients and dissatisfied surgeons. The condition being uncommon, personal experience with large series of cases is unusual. About fifty odd operations have been advocated to-date for the correction of various types of prolapse, but none possibly has proved to be a method which is able to correct all types of rectal prolapse at all ages. Any rational procedure for its cure would entail a thorough understanding of the anatomy and pathogenesis of the condition. In this connection, Shann writes, "It is quite possible that some of the operative procedures described in the literature would not even have been attempted, or certainly would not have been adopted by others, if the normal anatomy of the rectum and its relationship to adjacent structures had been given serious thought."

It is intended in this communication, not to propose a new operation but to discuss the value of Graham's operation in the treatment of complete prolapse of the rectum. A resume is given of a series of 16

consecutive cases of complete rectal prolapse operated on by Graham's technique with follow up of 13 cases. A summary of the history of the development of the surgery of prolapse of the rectum is given and an attempt is made to outline the importance of the anatomical factors which form the basis in the causation of the condition. The merits and demerits of various other operative procedures are also discussed.

History

Rectal prolapse has attracted the attention of surgeons from ancient times because of its obvious humiliating signs. In difficult irreducible cases, Hippocrates advised, "the Patient, hanging by his heels, be shaken, for so the gut by that shaking will return to its place". Ambroise Pare' in 1634 in a chapter on "Of the falling down of the Fundament" says, "the sphincter which ingirts the Fundament is relaxed and cannot sustain the weight of the gut. The Levator Ani, the lifter up of the Fundament cannot bear the weight of the belly. This effect is occasioned by a strong endeavour to expel hard excrements, sitting on cold stone, or a palsic of nerves which goe from the Holy - bone to the Muscles, the lifter up of the Fundament." In 1617 John Woodall described the use of "Album Graecum" (The Greek-white prepared powder of dog dung); in difficult cases the surgeon was to "bestrew the gut fallen down with Album Graecum well powdered and fine for this is precious though a homely medicine". Fredrick Salmon, the founder of St. Mark's Hospital,

published in 1831 his "Practical Observations on Prolapsus of the Rectum". After discussing conservative methods of treatment, he describes excision of the mucosa after the prolapse is fixed by two large pins, and then the rectum dressed with "sweet oil" and replaced. In 1848, Dieffenbach attempted posterior wedge resection of the rectal wall.

Mikulicz in 1888 described a successful series of 6 cases of circular amputation of the prolapsed rectum. The credit of popularising and establishing the operation on a sound footing goes to Ernest Miles (1933) who performed "Rectosigmoidectomy" on 31 cases with excellent results in 29 (1 died and 1 recurred).

It was left to Moschcowitz to give the first classical account of the pathogenesis of prolapse of the rectum. In 1912, he propounded the ingenious theory that the condition is nothing else but a "sliding hernia" of the rectum through the weak pelvic floor. Moschcowitz laid more stress on the pelvic fascia; he did not consider that the integrity of the levator ani was more important. Based on his theory, he suggested the operation for obliterating the hernial sac by an abdominal approach. The Moschcowitz theory has now been generally accepted and many surgical procedures are described with this as the basis.

Various procedures to fix the mucosa to musculature and the musculature to perirectal tissues were suggested. Many other operations plicating the sphincter, and narrowing the rectal and anal wall have been described over the past half a century. Most of them are now obsolete except a few like Thiersch's, Rehn-DeLorme's and Lockhart Mummery's procedures.

A significant and epoch-making contribution to the treatment of complete rectal prolapse was made by Roscoe Graham

in 1942. He treated it as a straightforward case of sliding hernia and used the abdominal approach for the repair of the pelvic floor and excision of the sac. Herman Shann (1959), in his thorough study of the literature on complete rectal prolapse writes, "Graham was the first and the only surgeon, as far as the author can determine, to treat prolapse of the rectum on correct anatomic principles." Goligher (1958) using Graham's operation in a modified form in 23 patients reports good results.

Various sigmoidopexy procedures have been described for many years and have been again put to the forefront on the thesis that it is the loosely-attached rectum that is at fault. The defects of the pelvic floor and the increased intra-abdominal pressure are incidental factors which allow the loosely-attached rectum with long mesentery to prolapse (Pemberton). More recently, because of the work of Gaston proving the important role of an intact rectum for adequate anal continence, and because of the high recurrence rate after perineal excision, the abdominal approach with excision of the redundant recto-sigmoid (anterior resection) with pelvic floor repair, and with high fixation of the colon is gaining popularity (Muir 1955).

Altmeier (1952) suggests an entirely new concept that complete prolapse is essentially an intussusception starting just above the level of the anal ring. He advocates a combined abdominal and perineal operation for its correction.

Castro (1958) subscribes to the view expressed by Altmeier and suggests that prolapse of the rectum is similar in its mechanism to an intussusception which may (external intussusception or prolapse) or may not (internal or concealed intussusception) protrude through the anal canal. He advocates anterior resection with

the removal of the pouch of Douglas as the surest way of accomplishing a cure. Out of 26 cases treated, 2 died and 3 had recurrence.

Nigro (1958) advocates a sling operation using a strip of fascia lata which is swung around the lower rectum and stitched to it just above the external sphincter while the free ends are sutured on each side to the inner surface of the bony pelvis.

Before discussing the various supports of the rectum, it will now be proper to define prolapse.

Definition

Prolapse is the abnormal descent of the rectum through the anal canal. It is classified into:

- (1) *Partial or First Degree Prolapse*.—In this, the prolapse consists only of mucous membrane.
- (2) *Complete Rectal Prolapse or Procidentia or Second Degree Prolapse*.—In this, the entire thickness of the rectal wall prolapses.
- (3) *Third Degree Prolapse*.—This is really an intussusception of the sigmoid colon through the rectum.

It is intended to restrict the present discussion only to complete rectal prolapse in adults. In order to understand the pathogenesis of the condition, it is desirable to have the anatomical background of the normal supports of the rectum.

Normal supports of the Rectum.—These are discussed below in order of their importance.

1. *The Levator Ani Muscles*.—The importance of the levator ani in the normal support of the rectum cannot be exaggerated. The levator ani muscles, the coccygei muscles, and the pelvic fascia form the pelvic diaphragm which plays an important

part in resisting the intra-pelvic pressure and in maintaining the pelvic viscera in position. It is essential to understand the anatomy of the midline of the pelvic floor, and to see how the levator ani on the two sides help to maintain the integrity of this part. The levator ani is composed of three parts, viz. iliococcygeus, pubococcygeus and puborectalis. The anterior fibres which support the prostate in males (levator prostatæ) or form an additional sphincter for the vagina in females (Sphincter vaginae) are inserted into the perineal body which is a substantial fibro-muscular node and which plays an important role in maintaining the integrity of the pelvic floor. The successive fibres (pubo-rectalis) pass backwards and downwards across the side of the prostate or vagina and the upper end of the anal canal (in the region of the ano-rectum) and turn medially at the anorectal flexure to become continuous with the corresponding fibres of the opposite side, but a number of them are lost in the anal canal giving the rectum a substantial anchorage at the anorectal flexure on its lateral and posterior aspects. Thus the pubo-rectalis which is the thickest part of the levator ani (Milligan and Morgan, Courtney) forms a muscular sling posterior to the bowel at the point at which it changes its direction as it penetrates the pelvic floor and holds the rectum upto the symphysis pubis maintaining the ano-rectal flexure and opposing the downward thrust produced by an increase in intra-abdominal pressure. In addition, posteriorly the rectum rests on and is supported by the ano-coccygeal raphe (fascia of Waldeyer intervening) in which are inserted the fibres of the iliococcygeus and pubococcygeus parts on the two sides. The ano-coccygeal raphe is a strong median fibrous raphe which stretches between the coccyx and the anorectal flexure. It will thus be apparent from the foregoing discussion (and the discussion to follow regarding

the pelvic fascia) that the rectum is very well anchored and supported posteriorly and on the two sides but not so anteriorly and weakness exists in the anterior wall and its adjoining region at the anorectal flexure. Therefore, when the predisposing and precipitating factors tend to drive the peritoneum of the rectovesical pouch or pouch of Douglas downwards, the weakly supported anterior rectal wall at the anorectal flexure yields, and due to the firm attachment of the peritoneum to this wall, a sliding hernia starts, first as an indentation of the anterior rectal wall and then gradually as it progresses of the entire circumference of the rectum.

It will be interesting to note that the iliococcygeus and pubococcygeus parts, in lower animals, are responsible only for the movements of the tail. With the gradual disappearance of the tail these muscles are set free, and due to the adoption of the upright position they are utilised to meet the increasing need for a more perfect pelvic floor.

2. *The Pelvic Fascia - Parietal and Visceral Layers, Lateral Ligaments and Fascia of Waldeyer*.—The parietal layer which covers the pelvic diaphragm and the walls of the pelvis is membranous and strong; the visceral layer of the rectum - fascia propria and other organs in the pelvis is connective-tissue-like (a sheath-like membranous condensation is denied by Berglas and Rubin) (1953). This visceral layer has no firm attachment to the parietal layer but is continuous with the retroperitoneal tissues and cannot afford much support to the rectum. The structures which furnish substantial support are the lateral ligaments and the fascia of Waldeyer. The lateral ligaments or rectal stalks (Smith) are dense fibrous cords and are formed by the condensation of the parietal pelvic fascia and connective

tissue round the middle rectal (haemorrhoidal) arteries and extend from the sides of the third piece of the sacrum to the rectal wall about 1" above the levator. They keep the rectum tethered to the side wall of the pelvis, but they become stretched and attenuated in cases of prolapse and their repair alone is insufficient to cure the rectal prolapse and prevent recurrence.

The fascia of Waldeyer is a strong band of parietal pelvic fascia which extends from the periosteum over the anterior aspect of the third or fourth piece of the sacrum to be attached to the posterior wall of the rectum at the ano-rectal junction. It forms an important additional attachment of the rectum at the anorectal junction and it supports and anchors the rectum on its posterior and postero-lateral aspects. The fascia over the anterior and antero-lateral aspects at this level is thin and it is this fascia which yields first when the hernia starts descending.

It is doubtful whether the rectovesical fascia which is attached to the rectum by loose areolar tissue, can provide any appreciable support to it.

3. *The Peritoneal Reflections over the Rectum, Sacrum Bladder and Vagina*.—Normally the peritoneum and subperitoneal connective tissue by incomplete investment keep the rectum braced against the sacral concavity. In cases of rectal prolapse the rectum is found to have a more extensive peritoneal covering like the sigmoid with a loose mesorectum. The rectum being more loosely fixed posteriorly can be moved easily from side to side and can be very easily separated from the sacrum. The peritoneum from the anterior rectal wall is reflected on to the bladder in males forming the rectovesical pouch and on to the posterior wall of the vagina and uterus forming the rectovaginal pouch or the pouch of Douglas in females. Because of its more complete investment of

the rectum and because of downward descent in prolapse, the peritoneal pouch extends deeper downwards forming a deep *cul-de-sac*. Both these points, *viz.*, loose sacral fixation of the rectum and the presence of a deep peritoneal pouch were noticed at operation in all our cases. It is difficult to say whether these factors are the causes or the effects of procedentia. Muir believes that these are predisposing causes.

4. *The flexures of the Rectum and Sigmoid.*—In animals the rectum is a straight tube which has led it to be named 'intestinum rectum'. Prolapse of the rectum is a normal phenomenon during defaecation in horses because the peristaltic rush from the colon simply pushes it inside out. This, however, is not the case in human beings. Apart from following the sacrococcygeal curve, the rectum takes a zig-zag course having two curves on the right and one on the left. These curves are accentuated on the inner side of the rectum and constitute the valves of Houston. In human beings, the peristaltic rush is stopped first by the rectosigmoid flexure and then at Houston's valves and the terminal forward horizontal curvature of the rectum joining the anal canal at the anorectal junction; these to a great degree obviate any tendency to prolapse. When, however, the rectum loses the accentuation of these curves due to loose attachment to the sacrum, it can be carried down easily by the peristaltic rush, more so if other exciting factors such as straining at stools are also present (Cromer). In recto-sigmoidectomy all these flexures and valves are removed turning the rectum into a straight tube thus partly explaining the high recurrence rate after this operation. Graham's operation does not interfere with these, but establishes the normal forward ano-rectal curve.

5. *The Anal Sphincters.*—Laxity of the anal sphincters leads to incontinence. Patients

who have been previously operated on for fistulae and in whom the sphincter has been inadvertently cut, have incontinence and partial prolapse as their main complaints; they rarely have complete prolapse. In cases with complete prolapse, the laxity of the sphincters is seen rather as an effect than as a cause, for many patients with complete prolapse have a fair degree of sphincter action and continence, and all patients in whom sphincter action is lost do not develop prolapse. All the patients in the present series had good sphincter continence though with some, there was laxity of sphincter tone. A good sphincter can hold the influx of the prolapse for a short while but ultimately yields and becomes lax due to repeated stretching by the prolapsing bowel.

6. *The Sacral Curve.*—A diminished curve in the sacrum will tend to bring about prolapse as the anorectal forward curve is lost and the rectum lies more vertically.

Pathogenesis

The generally accepted view is that of Moschcowitz who in 1912 suggested that complete prolapse of the rectum is a "sliding hernia" occurring through the defect in the pelvic floor. It will be interesting to study the mechanism of this hernia formation.

Hernia occurs at places where the vessels and viscera make their exit through the muscles or fascial condensations since these form the weak points which are liable to yield to increased intra-abdominal pressure. The peritoneum of the recto-vesical pouch in males or the pouch of Douglas in females is driven down by increased intra-abdominal pressure through the weakness in the pelvic fascia. The perineal body offers resistance to direct downward descent and directs it posteriorly to the anterior wall of the rectum which is inadequately supported (*vide supra*). The anterior rectal wall yields by

indentation and as the hernia progresses it follows the line of least resistance in a downward and backward direction through the external sphincter to appear finally through the anal canal. Though the hernia starts at the anterior rectal wall and hence involves more of this wall, the lateral walls and finally the entire circumference of the rectum follow. The repeatedly-prolapsing bowel widens the defect in the musculo-fascial pelvic diaphragm and makes the attachment of the rectum to the sacrum more and more loose. Thus it follows that patients with repeated prolapse of long duration will have a wide musculo-fascial defect and a loose attachment of the rectum to the sacrum; and conversely, once these occur the prolapse comes down even on the slightest provocation. Both these points, *viz.*, musculo-fascial defect and loose attachment of the rectum to the sacrum were observed in all our cases at operation.

It follows from what has been discussed above that the opening of the prolapsed bowel should point in a backward direction. This point was confirmed only in five of our cases though the fact that the anterior wall starts prolapsing first was seen in all the cases.

The hernia theory was propounded on the important observation that "if after reducing the prolapse the patient strained while the examining finger is pressed anteriorly over the musculo-fascial defect (the internal ring) the prolapse would not recur, whereas with posterior pressure it recurs immediately." This observation was confirmed in all the cases of the present group.

The second theory was that propounded by Ernest Miles (1933) who believed that the prolapse begins at the anal margin as an eversion of this part and that the condition progresses with the passage of time. According to him, when only a portion prolapses, it

is a partial prolapse, and when the entire length protrudes, it is a complete prolapse.

Altemeier (1952) suggests an entirely new concept that complete rectal prolapse is essentially an intussusception which starts at a level slightly above the anal ring. Castro (1958) also subscribes to Altemeier's view that prolapse is similar in its mechanism to an intussusception.

All these observations, *viz.*, that the prolapse does not descend on straining when pressure is exerted on the anterior wall of the rectum in the region of the musculo-fascial defect (the internal ring) but it does descend when pressure is exerted at other places, that the anterior wall starts prolapsing first and it prolapses much more than the lateral and posterior walls, that the prolapse has only a double layer of bowel wall and not a triple layer, and that there is a sac present anteriorly which sometimes contains coils of small intestine, suggest that the prolapse is a sliding hernia through the musculo-fascial defect in the pelvic diaphragm.

Predisposing and Precipitating Factors

Some conditions like loose attachment of the rectum in the sacral hollow, less pronounced sacral curve, palsy of the muscles of the pelvic diaphragm (Butler), straining at stools, bad and irregular bowel habits, anal coitus, and injury to the perineum due to previous operation may act as predisposing factors. Chronic constipation, chronic cough, urethral stricture, and enlarged prostate which tend to increase intra-abdominal pressure may act in the same way. Injury to the perineum and the sphincter muscles at parturition may be contributory, but is not a very important predisposing factor. In fact, Hughes found

a relatively high incidence in females who had never been pregnant. Thompson suggests some speculative possibilities such as localised poliomyelitis affecting the anterior horn cells supplying the pelvic muscles or some form of venereal infection which is not yet recognised.

Sudden loss of weight, prolonged attacks of frequency of stools, loss of the ischio-rectal pads of fat, rapid increase in weight particularly with deposition of excessive amount of fat in the abdominal viscera (omentum, pelvic colon and its appendices epiploicae) especially when associated with straining at stools or at micturition, act as precipitating factors when the predisposing factors are operating already.

Intraluminal pathology in the rectum or sigmoid colon (such as ulcers, stricture, polyp or carcinoma) is more likely to give rise to intussusception rather than procidentia.

About two-thirds of our patients gave histories of dysentery sometime before and some of these had attacks of frequency of stools off and on. Straining at stools was present in most of them. Only two patients had perineal operation done previously. All patients were otherwise active and healthy.

Age Incidence

Prolapse of the rectum is more common in children than in adults due probably to bad bowel habits, absence of the sacral curve, frequency of gastrointestinal upsets with diarrhoea etc., but most of them respond well to conservative treatment. In some cases of complete prolapse in adults, however, it is a legacy of childhood and three patients in the present series had prolapse right from childhood. It is difficult to decide just in how many cases prolapse in childhood is responsible for prolapse in adults. In this

connection, it is interesting to note that in Graham's report of three cases, the prolapse started in childhood and progressed gradually to complete development during adulthood. Miles states that in males, it is most common in the first and after the fourth decade in life. Many authorities give the highest peak between 40-60 years of age (Pemberton, etc.) whereas in a review of cases from St. Mark's hospital (Wright) the highest incidence recorded is in the second and third decades. In a series of six cases reported by Phadke, the average age was 26 years. In all the cases in this series, the age of onset was below 40 years, the highest peak being round about 25 years (Fig. 1, A and B).

Sex Incidence

It is interesting to note that in reports coming from Indian authors there is an overwhelming majority of males over females who suffered from procidentia. All the 6 cases reported by Phadke are males.

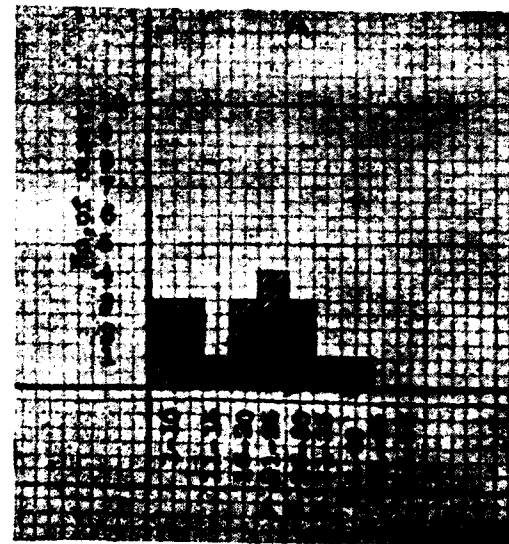


Fig. 1-A

Graph showing the age of onset of prolapse in the present series.



Fig. 1-B

Graph showing the age at which the patients reported for treatment.

In a series of 31 cases reported by Munsif 22 have been males and 9 females. Desai has come across only 2 cases in females in about 30 cases he has treated. In the series of 16 consecutive cases reported here, all are males. All reports from abroad, however, give distinctly higher incidence in females, the ratio of females to males being 6:1 (Barrett, Hughes, Gabriel, etc.). This low incidence in Indian Women is remarkable and the gynaecologists in India (Purandare; Shirodkar) also confirm that they hardly see any cases of rectal prolapse, though damage to the perineum and prolapse of the uterus and rectocele are extremely common. It is difficult to account for such a disparity and we at least are not in a position to provide any explanation.

Symptoms and Signs

It has been our observation that usually patients seek advice very late although they suffer miserably and are handicapped

economically and socially. Three patients from our series had to give up their jobs because of this distressing condition. The periods for which the patients suffered ranged from 6 months to about 30 years, the average period being about 10 years. Prolapse is always the presenting complaint but some of the patients also had other symptoms such as bleeding, mucoid discharge, and backache. Five patients had to replace the prolapse manually (See Table I).

Table I

Symptoms.	No. of cases.	History of Dysentery
1. Only Prolapse	... 7	3
2. Bleeding and/or Mucoid discharge	... 9	8
3. Manual Replacement	... 5	—
4. Backache	... 2	—

None of the patients from our series had incontinence, and none suffered from complications such as ulceration, irreducibility, etc.

On Examination

All the patients were made to squat on a bedpan and strain. The prolapse was observed as it came down. The length of prolapse varied from 1½" to 4" and the prolapsing part had circular folds on it. Nine patients had prolapse which was more than 3" in length; the remaining 7 had 1½" to 3" of prolapse. The prolapsed bowel in some cases was oedematous, congested, and thickened. No ulceration or new-growth was seen in any of the cases. Distinct backward opening of the bowel lumen could be seen only in five cases. The scars of previous perineal operation were seen in two cases.

On palpation of the prolapse, the thick musculature of the rectal wall could be felt. The sphincter was lax in 10

patients, the remaining 6 had a fair degree of sphincter tone. Yet all the cases had a fair degree of sphincteric action as could be appreciated by the examining finger. The 2 cases who had been operated on before did not have any damage to the sphincter. No rectal growth was felt and the prostate was found to be normal in all the cases.

After reduction, anterior pressure with the finger in the lower rectum prevented the prolapse from coming down in all the cases. Intestinal coils in the peritoneal sac in front of the prolapse were not felt in any case.

Only two cases had haemorrhoids in addition. Sigmoidoscopy done in 6 cases did not reveal any pathology.

Investigations

Routine urine and stool examinations, R. B. C. counts and Hb%, Blood grouping and cross matching and screening of the chest were done in all the cases.

Treatment

It is unlikely that any of the conservative methods of treatment can be successful in the management of complete rectal prolapse, but some of them can be used with benefit as adjuncts to other treatment.

Once the hernia theory of Moschcowitz of the procidentia is accepted, the logical step would then be to treat it as a case of hernia by removal of the sac, repair of the musculofascial defect (the internal ring) and narrowing the sphincter (the stretched external ring). In the words of Thompson this implies "Removal or obliteration of the pouch of Douglas (or rectovesical pouch), repair of the pelvic diaphragm and a narrowing of the stretched anal sphincter". Any operation which has no correct anatomical basis, and treats the condition only symptomatically, is bound to meet with failure.

Submucous and perirectal injections (D'Espine; Langenbeck, Bensaude, etc.) and chemical or thermocautery are useful only for partial prolapse and have no place in the treatment of procidentia.

Sphincteroplasty operations by the use of fascia (Wreden - Stone) gluteus muscle strip (Chetwood), stainless steel wire (Lockhart Mummery), Silver wire (Thiersch) or plication of the sphincter (Blaisdell) fortify the wrong end of the defect and are comparable to narrowing only the external ring, in the treatment of inguinal hernia. These can be used (e.g. Thiersch's operation) as adjuncts to other operative procedures, to narrow the stretched and atonic sphincter.

Rectorrhaphy procedures, such as excision of mucosal or rectal strips (Duret, Lenorme, and Dieffenbach), transverse or vertical plication of the rectal wall (Rehne-De-Lorme; Lange, Vernenil) or suturing a vertical incision in the rectum transversely (Gant), do not deal with the underlying pathology and are not likely to succeed at all in the treatment of procidentia.

The operation of excision of the prolapse as originally used by Mikulicz (1888) and popularised by Ernest Miles (1933) as "rectosigmoidectomy" has no logical basis as it removes the effect and does not eliminate the musculofascial defect and peritoneal sac. The normal flexures and valves which arrest the peristaltic rush are removed and the rectum is converted into a straight tube (Cromer). It is natural that recurrence after such an operation is very high (65 out of 108 cases followed up from St. Mark's Hospital had recurrence) and many of the patients are rendered incontinent (in the same series from St. Mark's Hospital, 39 out of the 65 patients who had recurrence, had incontinence and out of 43 successful cases 21 had incontinence) as the rectum

forms an important receptor organ in the rectoanal reflex by which sphincter continence is maintained (Gaston). The only possible advantages of the rectosigmoidectomy operation are that it has a low mortality, and can be done in old, debilitated individuals, and that it removes the offending prolapse. To obviate the defects of this operation, various modifications and combinations of abdominal and perineal approaches are recommended as an additional step to resection (Cohn, Hunt, Dunphy, Newell, Altemier, Frykman, Bacon, etc.). Anterior resection with high fixation of the colon and repair of the pelvic floor defect has been suggested by Muir. Castro using anterior resection and removal of the *cul-de-sac* of Douglas in 26 patients had 3 recurrences and 2 deaths. Goligher has used it in 3 cases and is impressed by its possibilities though he is rather partial to Graham's operation.

One thing is certain that the perineal approach is grossly insufficient to eliminate the peritoneal sac completely and to repair the defect in the pelvic diaphragm.

Moschcowitz was the first to suggest the abdominal approach for the cure of procidentia by obliteration of the true pelvis by a suturing method. Mayo advocated the use of fascia lata strips to create a new pelvic floor. Both these procedures do not, however, repair the pelvic floor defect. A significant contribution came from Roscoe Graham as he was the first surgeon to apply the principles of hernia surgery to procidentia, viz. (1) Removal of the peritoneal pouch (sac); (2) repair of the musculo-fascial defect in the pelvic diaphragm (internal ring) and (3) narrowing of the external sphincter (external ring). He did not use any operative procedure for the last step but he encouraged the patients to practise sphincter contractions many times daily to achieve

this end. Goligher using the Graham operation in a modified form in 22 cases reports good results. Satisfactory results are also reported by Desai, Hayes and Burr, Phadke and Snellman.

All the cases in the present group were treated with Graham's operation.

The patients who gave histories of dysentery were treated before operation with injections of emetine (gr. 1 daily) for 8 days and enterovioform tablets (2, t.d.s.) for 8 days. They were kept in the Trendelenberg's position for 2 days before operation to get accustomed to this new position which is maintained for 10 days in the post-operative period. Otherwise, the preparation was as for any other abdominal operation. A catheter was left in the urethra before the operation was started.

Fourteen cases were operated on under spinal anaesthesia; general anaesthesia with intratracheal tube was used in two cases. The patients were kept in Trendelenberg's position.

The abdomen was opened by an adequate midline incision extending from the umbilicus to the symphysis pubis. The peritoneal sac (rectovesical pouch) was incised and dissected free on each side; the dissection of the flap from the anterior surface of the rectum was difficult. In the early part of the dissection of the flaps the ureters were identified and retracted laterally by passing a tape round each of them. When the dissection was carried down deep, the musculofascial defect due to the widely-separated medial borders of the levatores ani covered by the pelvic fascia came into view. The rectum was pulled up tightly, and the pelvic fascia with the levatores ani muscles were approximated by strong chromic catgut; about 3-4 sutures were required in most of the cases. On the lateral sides, the fascia was sutured to the rectal wall. The suturing

TABLE II

Serial No.	Name	Age of Pt. when admitted	Duration of Prolapse	Size of Prolapse	Operation Findings	Results of Operation	Period of Follow-up
1	B. R.	35 years	5 years	About 2"	Deep pouch, lax fascial gap easily defined.	No recurrence	8 years
2	R. B.	30 years	7 years	About 2"	Deep pouch, musculofascial gap easily defined.	No recurrence	7½ years
3	R. J. J.	25 years	9 years	About 3"	Deep pouch, musculofascial gap defined with difficulty.	Recurrence (Correspondence by post)	7½ years
4	B. R.	25 years	6 months	About 3"	Deep sac, musculofascial gap well defined.	No recurrence	7½ years
5	A. G.	24 years	More than 14 years	About 1½"-2"	Deep peritoneal pouch, musculofascial gap wide, easily defined.	No recurrence	7 years
6	P. B.	25 years	More than 15 years	About 3"	Deep pouch, musculofascial gap well defined.	Could not be followed	—
7	A. R.	42 years	More than 32 years	About 4"	Deep pouch, musculofascial gap well defined. Levators very thin.	No recurrence	6 years
8	S. S.	24 years	5½ years	About 2"	Deep pouch, musculofascial gap well defined.	No recurrence	5½ years
9	R. G.	44 years	9 years	About 2"	Deep peritoneal pouch musculofascial gap wide and well defined. Levators thinned out.	No recurrence	5½ years
10	N. T.	53 years	25 years	About 3"	Deep peritoneal pouch, musculofascial gap well defined, levators thinned out.	No recurrence	5½ years
11	G. P.	30 years	15 years	About 3"	Deep pouch, musculofascial gap well defined.	Could not be followed	—
12	S. S.	38 years	8 years	About 2"	Do.	No recurrence	5 years
13	R. N.	25 years	3 years	About 3"	Deep peritoneal pouch, musculofascial gap well defined.	Could not be followed	—
14	S. V.	37 years	12 years	About 3"	Levators attenuated.	No recurrence	3½ years
15	R. R.	40 years	3 years	About 2"	Deep pouch, gap well defined. Levators fairly good.	No recurrence	3½ years
16	D. N.	22 years	4 years	About 3"	Deep pouch, musculofascial gap well defined. Levators thinned out.	No recurrence	3½ years

of the musculofascial defect anteriorly pushed the rectum back into the sacral hollow. The redundant hernial sac was excised and the peritoneum resutured. This eliminated the rectovesical pouch. The abdomen was closed in layers without drainage.

Post-operatively, Trendelenberg's position was maintained for 10 days. Antibiotics-injections of penicillin and streptomycin-were given in adequate doses for 7-8 days. The diet was liquid and the bowels were bound for 8 days. The indwelling catheter was kept for 8 days and was connected to a bottle by the side of the bed. The patients were given oil enema on the 8th day and liquid paraffin started to secure a smooth bowel action. The patients were encouraged to do sphincter exercises from the day after the operation.

Complications

No complications of any severity were present in any of the cases. Four patients had moderate pyrexia for 4-5 days. One patient had slight superficial gaping of the wound. The recovery was uneventful and there was no post-operative death.

Follow-up

Out of 16 patients who were operated on, 13 could be followed. 12 patients attended the hospital for follow-up and one patient answered by letter. (This patient complained of recurrence). The period of follow up ranged from 3½ years to 8 years (See Table II).

Three patients complained of a sense of incomplete evacuation and had to pass stools for 4-5 times a day.

One patient complained of diminished sexual desire and incomplete erection. It is difficult to say whether this was due to injury to the nervous erigentes or due to spinal anaesthesia.

No prolapse could be seen in any of them on straining. All patients had good sphincter action.

Sphincter tone was good in 10 cases and fair in the other two. Recovery of tone in atonic sphincters was remarkable. The musculo-fascial shelf was well felt anteriorly in all the cases. Proctoscopy did not reveal any abnormal findings.

Summary and Conclusions

1. Many operations have been described for the treatment of procidentia; most of them do not give serious thought to the anatomy of the rectum.

2. The History of the development of surgery for procidentia is traced and prolapse defined.

3. The normal supports of the rectum are discussed with special reference to the levator ani muscles and the pelvic diaphragm.

4. The Pathogenesis of the condition is described.

5. Predisposing and precipitating factors are outlined and the findings in our cases are discussed.

6. The merits and demerits of various operative procedures are discussed and the importance of Graham's operation in the correction of procidentia is stressed as it follows all the principles of the treatment of hernia.

7. Follow-up study is given.

Acknowledgements

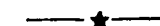
Our thanks are due to Dr. V. S. Shevade, the Acting Superintendent, L. T. M. G. Hospital, Bombay 22, and the Ag. Chief Surgeon, Dr. M. N. Gheewala, for their valuable help and for allowing us to report the cases.

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ORTHOPAEDIC SECTION

THE VALUE OF OSTEOPHONY IN THE DIAGNOSIS OF FRACTURES

BY

A. D. DIAS, Bombay

Anything that could make the physical examination of a patient, particularly one with a fractured bone, more comfortable, would I'm sure touch the heart of any sensitive physician or surgeon. Osteophony I now believe is one such test that can fulfill this condition in full measure.

The ability of osteophony to achieve this is undoubtedly due to the fact that it can help us to diagnose a fracture without manipulation at the fractured site. This is because osteophony is based on the principle of conduction of sound along intact cortical bone and is performed at some distance from the fractured site.

Methods and Materials

Since no costly, cumbersome or unusual equipment is necessary for the performance of this test, osteophony can be quite a practical and useful test in the routine examination of a traumatic case. All that one needs is a stethoscope and a percussing finger. The force of percussion is the same as that applied while percussing the chest.

Two subcutaneous bony points are chosen—one proximal and one distal to the suspected fracture. The stethoscope is placed at one site and percussion is performed at the other. The sound heard is compared to the sound heard over an identical area on the normal side. The intensity of the sound is markedly diminished if there is a fracture which has resulted in a breach of cortical continuity. It is interesting to note that the sound is just as well transmitted even if the

stethoscope and the percussing finger are separated by two or more joints.

For fractures of the clavicle and humerus the stethoscope is placed on the sternum while the olecranon is percussed. To separate a clavicular fracture from a humeral one, the acromion should be percussed. Obviously, if there is only a fracture of the humerus, percussion of the acromion, will produce no difference in conduction as compared to the normal side. For fractures of the radius and ulna, the stethoscope should be placed either on the sternum or on the olecranon or radial head and the corresponding styloid process should be percussed.

For fractures of the pelvis and femur, the stethoscope is placed on the symphysis pubis, and the patella is percussed. To separate a fracture of the pelvis from that of the femur, the anterior superior iliac spine is percussed. If there is only a fracture of the femur, obviously then, there will be no difference in conduction if the anterior superior iliac spine is percussed. For fractures of the tibia and fibula, the stethoscope is placed on the symphysis pubis or patella and the corresponding malleoli are percussed.

Both in the forearm and in the leg, where there are double bones auscultation and percussion should be first performed in one direction and then repeated in the opposite direction, otherwise a false negative sign may be obtained due to conduction along the neighbouring intact bone.

Results

This study was carried out by me at the Lokmanya Tilak Municipal General Hospital, Sion. Fifty fracture cases and fifty normal patients were chosen for this study. These have been presented in Table No. I.

Table No. I

Type of Fracture.	No. of Cases.	Test.
Clavicle	2	+ve
Humerus (Shaft)	5	+ve
Radius and Ulna	9	+ve
Radius Only	3	+ve
Ulna Only	2	+ve
Superior ramus of pubis	1	+ve
Inferior ramus of pubis	1	+ve
Ilium	1	+ve
Intertrochanteric Femur	4	+ve
Shaft femur	11	+ve
Tibia and Fibula	8	+ve
Fibula Only	3	+ve
Total	50	

In none of the normal patients was the test positive. In the fractured cases, all cases showed a positive test though in the cases of fractures of the pubic rami and ilium the intensity of the sound heard on the fractured side was definitely diminished but not as much as was noticed, say, in a case of a fracture of the shaft of the femur. This was probably due to a certain amount of conduction along the neighbouring intact bone.

In order to graphically demonstrate the difference in the conduction of sound between the normal and the fractured side, Colwill and Berg (1958) have used a phonogram. Since it was not possible to obtain a phonogram, I decided to use the audiogram in order to make out more accurately the difference in sound conduction. The sound head, meant for testing bone conduction in audiometry, was placed

where the percussing finger ought to be, and the stethoscope was as usual, used to hear the sound conducted.

In Figure (1) which was a case of a fracture of the shaft of the femur, the conduction of sound with a frequency of 500 double vibrations per second was tested on the fractured and normal side. On the fractured side no sound was heard until the intensity was increased upto 45 decibels, when a faint sound could just be heard. On the normal side even when the intensity was only 15 decibels the sound could be clearly heard.

In Figure (2) which was a case of a one month and one day old untreated and ununited fracture of the femoral shaft, sound with a frequency of 500 double vibrations per second was again used. On the fractured side, only when the intensity was increased to 35 decibels could a faint sound be heard. On the normal side even with an intensity of only 15 decibels the sound could be well heard.



Fig. 1 Shows difference in intensity of sound conduction using constant frequency of 500 d.v./sec. in a case of recent fracture shaft femur.



Fig. 2

Shows difference in intensity of sound conduction using constant frequency of 500 d.v./sec. in a case of old ununited fracture shaft femur.

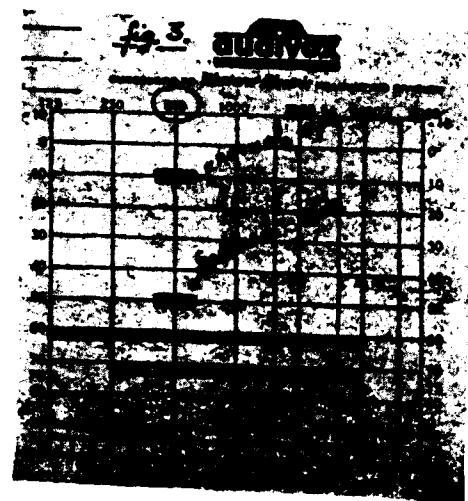


Fig. 3

Shows difference in intensity of sound conduction using constant frequency of 500 d.v./sec. in a recent fracture of the femoral shaft. Also shows difference in range of frequencies conducted.

In Figure (3) another case of a fracture of the femoral shaft, the difference between the normal and the fractured side was 40 decibels using a constant frequency of 500 double vibrations per second. Another interesting feature was noted. Whereas on the normal side frequencies from 4000-125 were heard, on the fractured side the frequencies heard were from 4000-250 using a constant intensity of 60 decibels.

Discussion

Attracted by the gentleness of the test I've tried to assess the value of osteophony in the diagnosis of fractures. The results of the study make one feel that osteophony is a simple, accurate and gentle test which can be adopted as a routine procedure in the examination of a traumatic case particularly when x-ray facilities are not readily available.

It is particularly useful to diagnose a fracture in the presence of a large amount of swelling of the soft tissues of a limb, because apart from crepitus it is the only sign that is directly dependant on a break in the bone. I feel that it is also very useful for the diagnosis of fractures of the pelvis, where clinical examination may not be particularly helpful.

Colwill and Berg have mentioned certain important observations. In cases of impacted fracture of the neck of the femur where x-ray shows cortical contact, the test was negative. But in cases of impacted fracture of the neck of the humerus when the shaft is driven into the cancellous bone, the test is positive. They have also found that it is not easy to obtain a positive result in fractures of the carpus, and tarsus and around the ankle joint because of the difficulty in finding suitable areas proximal and distal to the fracture.

And so even though I do not wish to convey the impression that osteophony is being paraded as a sign that will displace or even relegate to an inferior position other time honoured methods of fracture diagnosis like x-rays etc. I do wish to indicate that osteophony can be safely included among the reliable methods in the diagnosis of fractures.

Summary

The accuracy of a test (based on the principle of conduction of sound through intact cortical bone) in the diagnosis of

fractures has been assessed by studying it in 50 fracture cases. The manner of performing the test and its shortcomings are mentioned. Osteophony is being recommended as a simple, gentle and accurate test.

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MASSIVE OSTEOLYSIS

BY

J. R. DONALDSON and C. E. MARSHALL, Wanless.

Massive osteolysis was first reported by Jackson in 1838. Since then there have been thirty additional cases reported, most of them since 1946 (1, 2, 3, 4, 5, 6). In 1955 Gorham and Stout⁴ made a comprehensive review of the literature and also reviewed the tissue sections when they were available. They felt that there was a basic similarity in the pathological pattern, namely an angiomas of the capillaries of the bone. This does not seem to respond to x-ray therapy. The condition is compatible with long life, one patient living for fifty two years with this condition (4). The onset is in childhood or adolescence. Although trauma is associated with the onset of symptoms, the trauma is usually so mild that the authors have felt that trauma merely documented the onset of symptoms, but had no relation to the basic aetiology. It is our intention to report a case of massive osteolysis in which the bones of the left lower extremity are involved.

Case Report

On 28th December 1960 a seven year old male child was admitted to the Wanless Hospital, Miraj, with a chief complaint of inability to walk. One and a half years ago the child had had a minor fall, and had immediately complained of pain in his left lower extremity and refused to walk. He has not walked since. As he was from one of the wandering tribes, he moved from place to place and his parents made no effort to obtain a definitive diagnosis. Gradually over the next year and a half the parents noted that the left limb was becoming shorter in relation to the right; that

the foot had lost its normal appearance and had become soft; and that the leg, and the thigh just above the knee, were slightly tender. Except for these observations the parents felt that their boy was normal and was developing normally.

On examination the observations of the parents were confirmed. There was loss of the skeletal support for the foot. The leg was soft and "rubbery" and there was instability both above and below the knee joint. Otherwise the child appeared normal.

Laboratory tests of hemaglobin, blood calcium and phosphorus, white count and urinalysis were all normal.

X-ray examination showed a massive destruction of the bones of the left lower extremity with loss, metatarsals, and just shells remaining for the tarsals. The epiphyses of the tibia and fibula and femur could be identified, but the shaft of the fibula, had completely disappeared, and a mere ghost of a tibia remained. There was a pathological fracture at the epiphyseal-diaphyseal junction both above and below the knee joint.

On 30th January 1961 an operation was done and the fibula from the sound side was placed in the thigh to bridge the gap between the shaft and the distal epiphysis. This graft was supplemented with thoracoplasty rib bone chips. The fibula was transfixed with one screw to keep it from telescoping up the marrow cavity of the proximal portion of the femoral shaft.



Fig. 1
Standing on good leg.

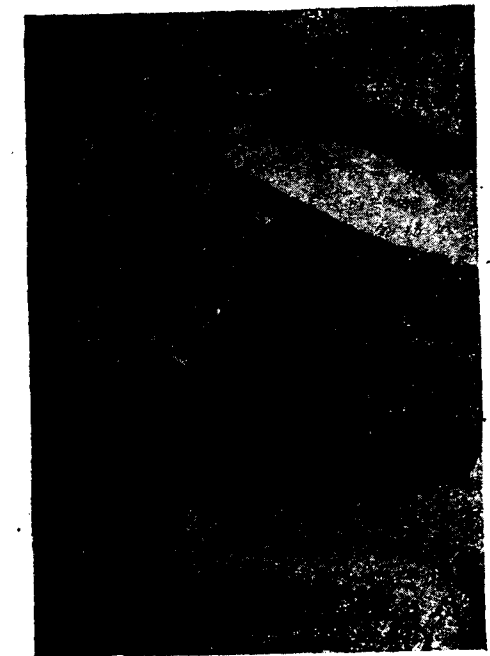


Fig. 2
Abnormal flexibility of the Left lower extremity.



Fig. 3
Low Power-destruction of bone by angiomas.



Fig. 4
High power (same).



Fig. 5
Low power—angiomatous portion.



Fig. 6
High power (same).

Gross operative findings were: There was gritty fibrous tissue between the attenuated end of the diaphysis of the femur and the distal epiphysis. The cortex of the remaining portion of the femur was thin, soft and vascular. But the amount of bleeding was estimated to be within normal limits.

The pathological report was: The tissue removed showed poorly developed callus with chronic inflammation. The fibrous tissue is of a highly vascular nature with many areas of capillary dilatation, all engorged with blood.

Diagnosis

The tissue is similar to that described by Gorham and Stout as characteristic of Massive Osteolysis.

Discussion

We undertook to graft the femur because in one case (3) bone grafting was successful,

and should an amputation be necessary eventually, as much length as possible will be an advantage.

Dr. K. S. Masalawala requested x-rays of skull to rule out the possibility of the case being one of polyostotic dysplasia. These x-rays were done forthwith and were normal. He also suggested treatment by intramedullary nailing and bone graft and quoted one such instance from the literature. He also asked Dr. Donaldson about his approach. Dr. Donaldson said he could only think of an amputation for this particular case.

Dr. A. E. DeSa, suggested the use of angiography for further information on this and such cases.

Dr. M. L. Gupta enquired if there was any angiomatous change seen in the muscles. Dr. Donaldson said the muscles looked normal at operation.

Dr. Kothari asked if there was any chance that the other limb would be similarly involved later. Dr. Donaldson said in reply that the possibility could not be ruled out and that two such instances have been already reported in the literature.

Dr. K. S. Bose enquired about the appearance of the bone at the operation. Dr. Donaldson replied to say that it was what one would expect from the x-rays. The vascularity was increased but not unduly.

The President said that in his opinion the involvement in the case was progressive starting from the tarsus, spreading to tibia, femur and even the pelvis. He asked Dr. Donaldson if he would classify this as progressive or uni-ossous. Dr. Donaldson said he could not say where the affection started and felt that the changes seen in the pelvis were those of disuse atrophy.

Dr. (Miss) Bhārucha quoted the two cases she had seen.

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REHABILITATION OF THE PHYSICALLY DISABLED

BY

L. K. ANANTHANARAYANAN, Poona.

A glimpse into History shows changing attitudes of the public towards the disabled. The care accorded to the maimed and crippled has reflected the political and cultural ideologies of the times, and has thus been, either the most powerful incentive or the greatest barrier to the development of Orthopaedics.

In primitive society, in the struggle for existence, physical fitness was essential for survival. The primitive tribes used to discard their disabled fellow beings. Deformed children were killed soon after birth. The ancient Greeks destroyed their crippled to keep up their ideal of body perfection. The early Romans had even a right by law to destroy deformed children soon after birth.

Hippocrates the Greek physician and the most celebrated practitioner of antiquity, happily brought to this confused period the Sunshine of fundamental humanitarianism to illuminate the shadow which had so long persisted. Much of his work on fractures and other Orthopaedic problems attained a high level and expounded principles which in many instances remain sound even today.

With the advent of Christianity and Buddhism, the lot of the crippled and maimed was greatly ameliorated.

During the Middle ages, the disabled were looked upon with pity and as objects deserving charity. Thus the pathetic condition of the physically handicapped, crippled as a result of congenital maldevelopment, serious illness or injury, aroused the sympathy of kindly disposed people in every land.

It is however, only within recent years that any attempt has been made to study the subject on scientific lines. We are coming to recognize more and more, the handicapped person as an individual with full human rights which he shares with the able bodied. Thus the care and maintenance of the physically handicapped and disabled represent a problem which faces all countries in the civilized World, and is increasingly engaging the attention of leaders, Government Officials, Medical men and Social Workers.

This problem is not only a legacy of the devastating wars which have caused widespread suffering throughout the world, but is also one of the major problems which faces us during times of Peace, for crippling disablement is never absent from us.

Antenatal deficiencies of which we do not yet know the cause; various forms of paralysis occurring both before and after birth (cerebral palsy, poliomyelitis); Tuberculosis and other diseases of the spine, bones and joints; Tumours of the bones; orthopaedic disabilities; and results of serious accidents these are some of the many factors which add their yearly toll to the number of peoples who suffer from general physical handicaps.

The effects of so much disability amongst children and adolescents is far more serious than is sometimes appreciated, for it actually represents a triple loss to the community. To the nation as a whole it means a loss of potential productivity and Service. To the family and friends of the disabled, it means a burden of anxiety, and, often enough, an



Fig. 1

Right arm Above elbow amputee.



Fig. 2



Fig. 3

Figs. 2 & 3

Right arm elbow amputee fitted with prosthesis.

acute problem in providing the necessary support and attention. But more serious than either of these, is the loss to the individual himself, for not only is he or she deprived of the advantages which are open to the healthy normal, but the sense of deprivation and the hopelessness of outlook are only too apt to sow the seeds of serious psychological disorder and social maladjustment, which in turn add to the burdens which the disabled person has to carry through life.

Rehabilitation

One of the most significant advances made in medicine during the War and in the post war period has been the development of a philosophy of "total medical care" in which the resolution of the patients' personal, family, social and vocational problems are considered an integral part of the medical care. This can be achieved only by team work and not by the Surgeon alone.

Medical men have always believed in rehabilitation, but used different terms to convey the philosophy behind these services. The doctor used the word "cure" to express his interest in the programme, meaning thereby his responsibility to relieve the patients' symptoms, restore his function and

return him to his job, his family and his Community as a normal fit person. In conditions like pneumonia, appendicitis and even fractures these objectives were achieved by the doctor working by himself practically with one hand folded behind his back.

However, when a man has lost a leg, or is paralysed due to spinal cord injury or poliomyelitis, the Surgeon then needs not only his own two hands but many other hands as well to deal with the situation. His aim is to restore these people to a useful place in society. This cannot be achieved without the aid of many others like the physiotherapist, the brace or limb maker, the occupational therapist, and many other agencies, if the patient is to be restored as a productive and independent member in society. The patient is now a displaced person in society and the aim of rehabilitation services is to resettle him again in society.



Fig. 4



Fig. 5

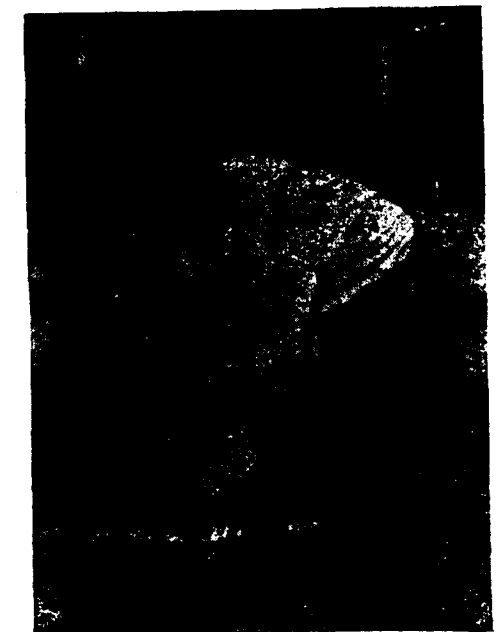


Fig. 6

Figs. 4, 5 & 6

Right above elbow amputee fitted with prosthesis performing routine work, skilful work and manual labour.

Among the large group of the disabled the amputee requires careful consideration as regards rehabilitation. A few of them are able to rehabilitate themselves, because their educational or occupational resources are unimpaired by the handicaps or because they have well adjusted personalities. On the other hand, the majority are unable to help themselves.

Rehabilitation is a multiphase system, in which the total needs of the individual are respected as well as his specific needs. In approaching it from this point of view, we realize that we cannot start with the artificial limb, often times not even with the amputation, but a stage well before that. We must begin with what might be called, psychological preparation or orientation. For this we must have an idea of what goes through the mind of a person who is about to lose his leg or has lost his leg. We may use the word 'shock' to describe the emotional reaction, to such an experience. Yes, the patient does have surgical shock, but he has also another kind of shock, one that may at best be characterized by the word 'grief'. It evokes similar feelings as experienced when an individual loses a member of his family. The amputee has lost a part of his body. He has now a new look, a defective look, a handicapped look.



Fig. 7
Arm amputees under training.

In addition to this shock and grief, he has many apprehensions such as what is going to happen to him, whether he will ever be able to walk again or work again, what his family will think of him and so on. The doctor, nurse and all the paramedical personnel, concerned with his rehabilitation, must respond to these questions. It is our duty and responsibility to reassure the patient not only by patting him on the shoulder, but more so by helping him to understand his future possibilities, the process of rehabilitation, so that he can be an active member of the rehabilitation team which will help to restore him to lead a near normal life. Concrete measures must be employed to reassure him. This can be done only by having him see other individuals who have lost limbs and how they have made their respective adjustments. He must be shown the various steps in his future rehabilitation. Our programme therefore includes, psychological preparation of the patient, adequate surgery, proper after care of the stump, accurate prescription of the prosthesis, and satisfactory training in the use of the artificial limb.

Before proceeding with the patients' rehabilitation, an appraisal or inventory should be made of the patients' total needs. It must be remembered that we fit the



Fig. 8
Double arm amputee rehabilitated after Neo-arthritis and fitting of prosthesis.

lower extremity prosthesis to the patients' stump, but we fit the upper extremity prosthesis to the patients' personality. Since personalities differ, each case should be studied carefully before recommending the procedure to be adopted. The farmer, the doctor, the salesman, the truck driver all will have different requirements. It is essential to analyse the specific requirements of the individual before selecting the special procedure to be adopted in each case.

Of great importance, as part of the psychological preparation is the indication to the patient of the limitations of all prosthesis. Unless this is done, the patient will expect too much from his prosthesis and be inclined to give too little of himself. The choice of the prosthesis is made after the factors of utility and appearance are weighed in the light of the patients' own personality and the social and industrial problems he must face.

It should be remembered that the arm amputee has lost not only part of his arm but also part of his skills. The arm and the hand constitute a sense organ. It is an extension of the patients' brain and for that reason the re-education and retraining of many of the integrative and proprioceptive reflexes becomes an important part of the rehabilitation.

Today the amputee has the benefit of many surgical procedures which help in working the prosthesis, like cineplasty (biceps, pectoral) neoarthrosis, Krukenberg's operation etc.

Advances in Orthopaedic Designing the Fusing of Skills

The age old urge of man to preserve himself in the best physical form possible has served as a constant stimulus to improve and perfect orthopaedic designing by consolidating the interests of the prescribing

limb fitting or Orthopaedic Surgeon and the producing limb or brace maker. The higher the Orthopaedic Surgeons level in Scientific limb fitting or Bracing, the more exacting in turn is the brace makers' problem of precise mechanical production

Thus it is logical that the ORTHOPAEDIC Surgeon has assumed leadership in this mechanical field of medicine because of his training and experience which represent the blending and fusion of surgical and mechanical knowledge and skills. His duty therefore demands that he possesses a good understanding of many fields apparently unrelated to that nearest his heart - his patient.

People believe that the amputee fitted with limbs is suitable only for special sedentary jobs like watchmen at the gates. Today an arm or leg amputee properly



Fig. 9
Double arm amputee rehabilitated by Krukenberg's operation on right side and prosthesis on left.

fitted and trained can be employed in a wide range of activities and can work competitively with his normal next door neighbours.

Henry Viscardi, son of an Italian barber was born with rudimentary legs. Dr. Yanover rehabilitated him back to near normal life. Abilities inc. which Henry Viscardi established in 1952 differs from other business in one astonishing respect; everybody there is 'unemployable' by almost any standards but its own. It has flourished mightily, and its lack of absenteeism and enviably low accident rate



Fig. 10

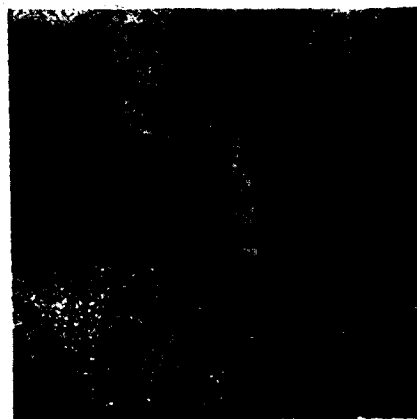


Fig. 11

have led other employers to re-examine their own employment policies.

In his book "GIVE US THE TOOLS" Henry Viscardi describes how it is the ability in an otherwise disabled individual that should be considered in selecting him for a job. An able bodied individual may not be able to sing which makes him unsuitable and totally disabled for an opera career. But he is able to work at his trade and so is a disabled man who is found otherwise fit for his trade. An accountant in a wheel chair can be just as efficient as one in a swivel chair and a blind girl is not a bit disqualified from answering a telephone. He describes a young Ex sailor veteran who had lost a hand. He was doing fine in the kitchen of a big hotel; he could slip his steel hook into scalding water and fish out dishes, the other able bodied workmen couldn't touch. He goes on to say that there is no such thing as disabled persons - only people with abilities at varying tasks. The disabled man is a careful man; he knows the consequence of a slip - a burnt child dreads the fire - the amputee has already learnt his lesson. The inevitable hazards are more than balanced by the good medicine of useful activity.



Fig. 12

Figs. 10, 11 & 12

Through-Hip disarticulation fitted with prosthesis.

Work has been found to be a wonder drug for ills of both body and mind.

Gp. Capt. Douglas Bader provides an inspiring example of a person with will-power and search for adventure in spite of his severe disability.

In her book "And how to live again" which is a masterpiece in rehabilitation literature, the author Betsy Barton, a paraplegic tells how she succeeded in learning to stand up and fight for her rightful place in life.

In the Artificial Limb Centre, POONA a good number of amputees are employed on the staff (arm and leg as well as double amputees) who perform their duties with a sense of pride zeal and ability.

Today, as medical science moves forward in the prevention and care of infectious diseases, chronic diseases and accidents with their resultant physical disability has become the nation's primary medical problem. One of our great medical needs to-day is for the provision of total treatment of such disabled people in terms of every day problems of living which they face. Many such persons cannot be rehabilitated to the extent of employability, but a good percentage can be rehabilitated to the point of sufficient self care so that they can live independent, dignified and happy lives at home, requiring the minimum of aid from the members of the family.

In doing so, we should think of the handicapped, not as an object of pity or

charity or anything of that kind; not as a case to be studied from the point of view of aetiology or pathology or psychology; not as a claimant, asking for financial support and board or shelter; but essentially as a person, with all the individuality and personality, the longings and desires, the hopes and capabilities, which a normal man possesses; but a person suffering from grievous privations, subject to serious disabilities and frustrations, and needing all the sympathetic and wise handling which we can possibly offer by rehabilitating him into a useful, productive and respectful life.

Summary

1. A glimpse into the History shows that the care accorded to the disabled has reflected the political and cultural ideologies of the times which has been a powerful incentive or the greatest barrier to the development of Orthopaedics.

2. The scope and methods of rehabilitation are discussed.

3. Some examples of rehabilitation centres working successfully and of rehabilitation literature are described. Illustrations of how amputees properly trained and fitted can be employed in a wide range of activities and can work competitively with their next door neighbours are given. It is emphasised that there should be no such category as disabled persons - only people with abilities at varying tasks.

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CONTRIBUTORS—FEBRUARY, 1962

1. Dr. P. A. Bhatt, M.S.,
Dr. K. L. Sharma, M.B.B.S., T.D.D. (Wales),
Dr. M. M. Mirani, M.B.B.S.,
& Dr. H. L. Harsha, M.B.B.S., } Madar Union Sanatorium, Madar,
Ajmer (Rajasthan).
2. Dr. A. G. Fletcher, Jr., F.R.C.S.(C.), F.A.C.S.,
Dr. K. Banerjee,
& Dr. S. B. Trivedi, } Thoracic Surgery Section, Wanless
Tuberculosis Sanatorium, Wanless-
wadi.
3. Dr. Jayant M. Jalundhwala, F.R.C.S., F.R.F.P.S.C., Associated Professor of Surgery,
Dr. (Miss) S. C. Pandya, M.D., Professor of Obstetrics & Gynaecology,
& Dr. R. C. Shah, M.S., Assistant Professor of Surgery, School of Post-Graduate
Medicine and Research, Sheth Vadilal Sarabhai General Hospital, and Sheth
Chinai Maternity Hospital, Ahmedabad-6.
4. Dr. (Miss) P. Virmani, F.R.C.S. (Eng.), F.R.C.S.E., Reader in Surgery, Lady Hardinge
Medical College Hospital, New-Delhi.
5. Dr. Amalendu Roy, D.M.R.D. (Eng.),
& Dr. Binoy Chakraborty, M.S. (Cal.), S. S. K. M. Hospital, Calcutta-20.
6. Dr. B. R. Kalke, M.B.B.S., M.S., F.C.P.S., Dept. of Surgery, T. N. Medical College,
and B. Y. L. Nair Cr. Hospital, Bombay-8.
& Dr. A. V. Gondhalekar, M.B.B.S., Asst. Medical Officer, Birla Hospital, Pilani
(Rajasthan).
7. Dr. A. D. Dias, M.S., Lokamanya Tilak General Hospital, Sion, Bombay-22.
8. Dr. J. R. Donaldson, M.D., Orthopaedic Surgeon,
& Dr. E. C. Marshall, M.B., M.S., Dept. of Orthopaedics, Wanlesswadi, Miraj
(Bombay State).
9. Lt-Col. L. K. Ananthanarayanan, M.S., F.R.F.P.S., & Commandant and Senior
Specialist in Surgery, Artificial Limb Centre, P.O. Box No. 86, Poona-1.

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