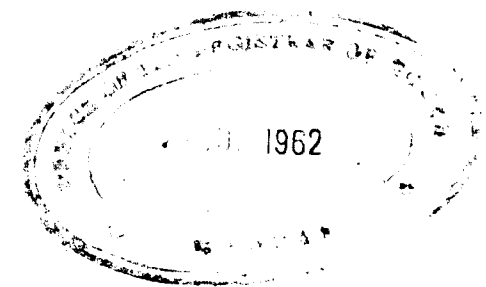


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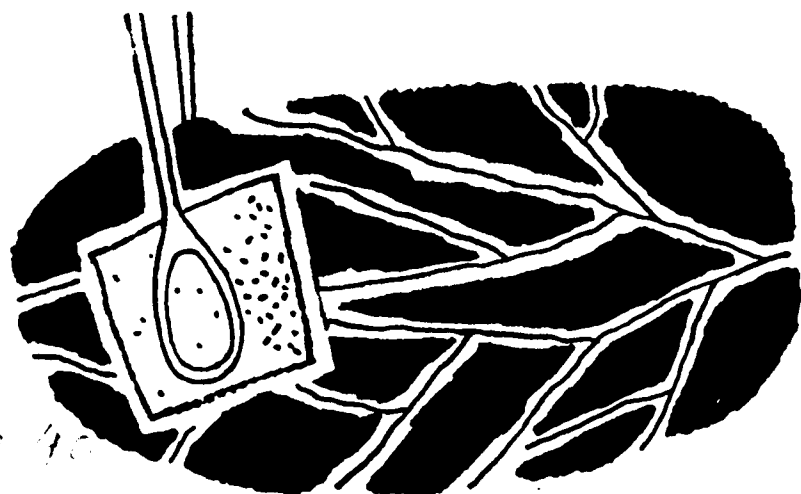
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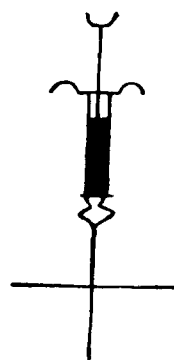
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ACUTE INTUSSUSCEPTION IN INFANCY AND CHILDHOOD

BY

T. E. UDWADIA and A. E. DESA, Bombay.

The acute abdomen is always an enigma - but when the patient is an inarticulate infant, then the acute abdomen presents a problem as intriguing as the proverbial Pandora's Box. Acute intussusception is the most common abdominal emergency in children under 2 years, and accounts for 4% of all intestinal obstructions. Thus, at the Bai Jerbai Wadia Hospital for Children, Bombay, in the year 1957, out of a total of 1,100 admissions to the surgical wards, there were 10 cases of intussusception. The same year, 62 cases of acute abdomen were admitted, hence, about one out of every hundred admissions, and one out of every six acute abdomens was a case of acute intussusception.

Though it was John Hunter who in 1789 gave literature the word Introssusception from the Latin word Intro-within, and Suscipere to take up, intussusception was described as a specific surgical entity by the ancients. Thus Praxagoras of Cos in 380 B. C. advocated the operative reduction of intussusception, whilst Hippocrates equally strongly advocated the reduction of intussusception by forced injection of air and water per rectum. Thus it is obvious that

diversity of opinion regarding the mode of treatment of intussusception has existed from the dawn of surgery.

It is the purpose of this paper to present a brief review of the clinical findings and our experiences in the treatment of 40 cases of intussusception admitted during the last 4 years at the Bai Jerbai Wadia Hospital for Children and the K. E. M. Hospital, Bombay.

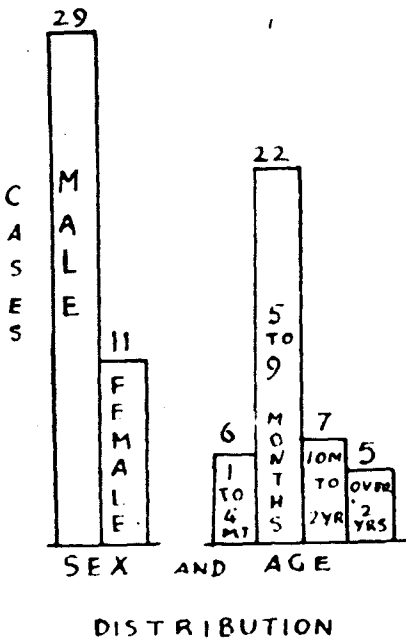
Over 70% of the cases occurred in males and over 70% of cases were seen below the age of 10 months. The youngest age was one month, the oldest thirteen years (*vide* Table 1).

Diagnosis and Duration

The classical clinical features of intussusception are so well known that they do not need repetition. The incidence of the various symptoms and signs observed in this series is documented in Table 2. All books and most workers paint a vivid picture of a healthy infant in pain, who is vomiting, passing red currant jelly stools, and has an intra-abdominal lump. This picture is so firmly rooted in our minds that we often

Table 1

Sex and Age Distribution



fail to realise that it is only in the late case that the entire symptom complex is manifest. In this series in only 30% of cases was the full clinical picture of pain, vomiting, bleeding per rectum and lump present within 24 hours of onset, whilst Morrison observed the full picture in only 39% of his cases within 24 hours. These figures show that if we aim to diagnose intussusception early our mental concept must undergo a radical change and we must endeavour to diagnose intussusception not because, but before the full clinical picture emerges.

There are several finer points in diagnosis which rarely find their way into charts of symptoms and signs. The dramatically sudden onset is a characteristic feature, as is the intermittency of symptoms. The limp, drowsy, knocked-out appearance, though not constant is often characteristic.

Palpation of the lump is THE most vital sign and no pains should be spared in eliciting it. The infant is best comforted, quietened and made co-operative by being put to the bottle or the breast before palpation. In 5 cases we had to administer a light anaesthetic before the lump could be felt. Morrison and Court stress the importance

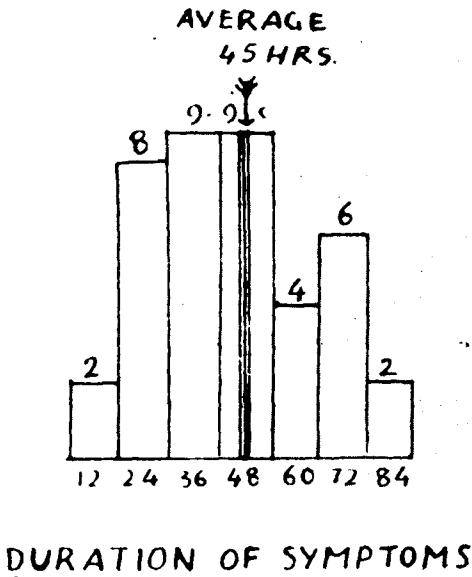
Table 2

Symptoms and Signs

Symptoms	Cases	%	Signs	Cases	%
Vomiting	39	97.5	Lump	29	72.5
Pain	38	95.0	Distension	21	60.00
Bleeding P. R.	32	80.0	Tenderness	21	52.5
Constipation	25	62.5	Dehydration	21	52.5
			Visible peristalsis	16	40.0
			Signe de dance	9	22.5

Table 3

The average duration of symptoms before hospitalisation is 45 hours!



of localised tenderness and guarding as an early diagnostic sign particularly in cases where the lump is ill-defined. Rectal examination is an invaluable aid, and apart from feeling the apex of the intussusception in 3 cases in this series, the presence of blood and mucus on the finger in patients who had not passed it P. R. was of great help in establishing the diagnosis.

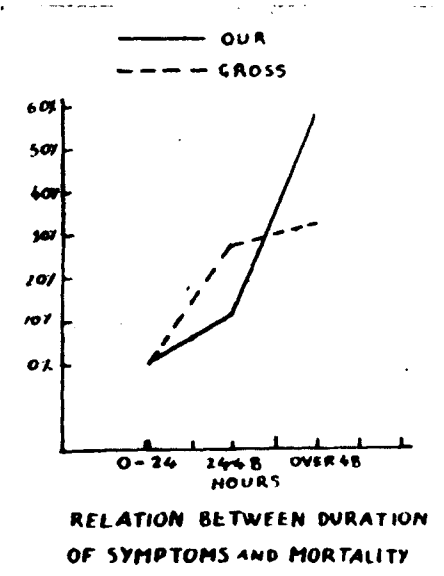
Table 3 shows the duration of symptoms in hours, seen in this series.

It is a sorry reflection that in the city of Bombay a case of acute intussusception, a universally recognised surgical emergency is suffered to waste 45 hours on an average,

before hospitalisation, and the delay more often than not is due to lethargy in diagnosis rather than the neglect of the parents. Forty years ago, the average duration of symptoms in Australia was about 16 hours and today the average duration in the Scandinavian countries is about 10 hours. The words of Clubbe bear repetition—"What the mind does not think, the eye cannot see. A pre-requisite to the early diagnosis of acute intussusception is an awareness of the condition - an awareness which must be brought home to general practitioners and pediatricians on whom the responsibility of early diagnosis most heavily rests."

Table 4

Graphical representation of rise in mortality with delay in diagnosis in this series and that of Gross



Only 2 cases (5%) in this series were diagnosed within 12 hours of onset - one was transferred from the medical ward where he had been admitted for diarrhoea, the other was the son of a pediatrician.

In this series, as in those of Gross, Thurston and others, the vital importance of early diagnosis has been amply borne out, and it is indeed true that in intussusception, delay is often synonymous with death, as is graphically shown in Table 4.

Table 5 shows a striking relationship between the monthly incidence of diarrhoea and of intussusception in Bombay. Apart from being a possible etiological factor, diarrhoea is often the cause of delayed diagnosis as it is difficult to gauge where the colic of diarrhoea ends, and that of intussusception begins.

As shown in Table 6, in 82.5% of cases the intussusception has involved the large bowel. Many would scorn the use of a

diagnostic barium enema as an aid in diagnosis, but if one aims at an early diagnosis one realises that the main purpose of the barium enema is not to confirm but to establish the diagnosis which it can do in 80% of the cases.

Realising the importance of early diagnosis, and bearing in mind the high incidence of intussusception in infancy we make bold to state that any previously healthy infant with colicky abdominal pain of more than 12 hours duration be diagnosed as intussusception until proved otherwise.

Treatment

Out of a total of 40 cases, 30 cases were treated primarily by surgery, and only 10 cases were considered suitable for primary treatment by barium enema reduction. Out of these 10 cases, in only 2 cases was the reduction complete. The remaining 8 cases had to be subsequently subjected to surgery making a total of 38 cases operated on (vide Table 7).

Table 5

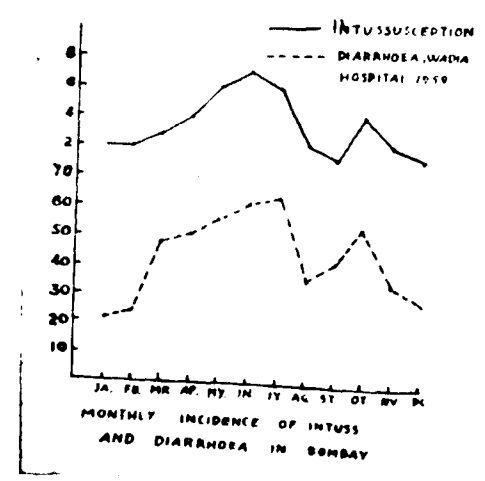


Table 6

In 82.5% of cases the intussusception has involved the large bowel, stressing the value of the barium enema as an early diagnostic aid.

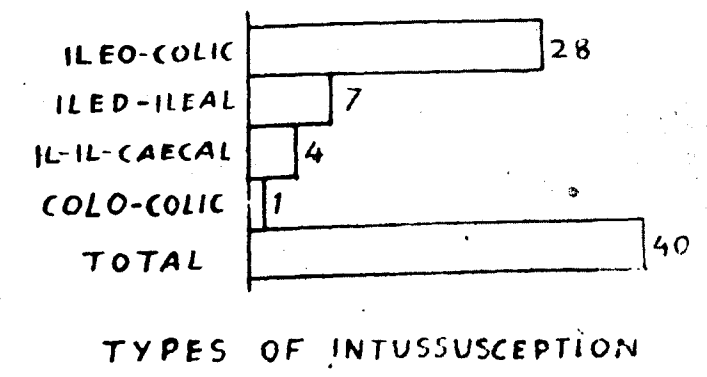
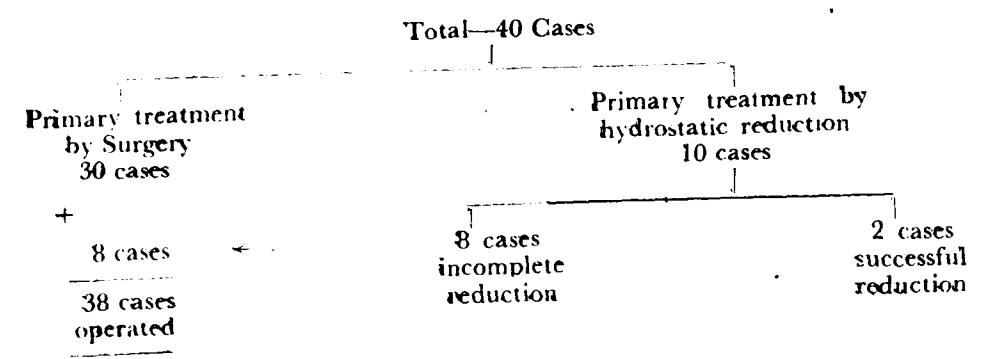


Table 7



The pre-operative preparation which includes gastric aspiration, antibiotics and intravenous fluids is of necessity brief but intensive. We have learnt the truth of Gross' statement - "More children die as a result of over-hydration rather than dehydration." The average interval between admission and operation was 2 hours.

Table 8 shows the various operative procedures carried out in the series.

That taxis and not traction is the key note of safe reduction needs no repetition. Oversuturing of the serosa has a high mortality probably because nonviable bowel is left *in situ*.

The only recurrence occurred in a case in which specific precautions were taken to prevent recurrence, and we feel any such procedure is unnecessary and wasteful of time.

Table 8

Operative procedure	No. of Cases	Recurrence	Deaths
Reduction	20	—	1
Reduction + Oversuturing of serosa	6	—	3
Reduction + Excision Meckel's	2	—	—
Reduction and obliteration of ileo colic angle	2	1	—
Reduction and appendicular fixation	1	—	—
Resection with end to end anastomosis	7	—	3
Ileostomy with exteriorisation	1	—	1
Total	39	1	8

(39 operations were done on 38 patients, there being one recurrence).

The treatment of gangrenous bowel is a subject of considerable controversy. There were 8 cases (20%) of gangrenous bowel in our series. We feel that resection with end to end anastomosis though the more exacting operative procedure offers the highest chances of survival, as the problems associated with an enterostomy following exteriorisation are so formidable.

Our criteria for primary treatment with barium enema were:

1. Duration less than 24 hours.
2. No clinical dehydration or toxicity.
3. Temperature below 99° F. on admission.
4. No gross abdominal distension.
5. No guarding or rigidity in between episodes of colic.

The technique of hydrostatic reduction is well standardised. A few points need emphasis—the fluid level in the enema canister should never exceed 3 feet above the anus to obviate any dangerous pressure head; the enema is most conveniently given through a thick, unlubricated catheter, with

the buttocks firmly strapped together to prevent leakage. The enema is given under vigilant fluoroscopic control. Reduction by barium enema is to be carried out by a surgical team, it is as much a surgical procedure as reduction of a fracture by traction. It is neither a substitute for, nor an escape from surgery.

Before considering reduction complete the following criteria HAD to be satisfied:—

1. Clinical relief.
2. Disappearance of lump.
3. Passage of flatus and faeces.
4. Complete filling of caecum.
5. Barium freely enters ileum.

Only 2 out of 10 cases fulfilled all these criteria.

Figs. 1, 2, 3 show a case where complete reduction by barium enema was achieved.

There was an overall total mortality of 20%, there being 8 deaths in 40 cases.

Discussion

The treatment of intussusception by hydrostatic reduction, which was placed on a firm footing by Hirschsprung of Copenhagen at the turn of the last century, has found strong favour in the Scandinavian countries, Australia, South America, a few clinics in the United States, and is fast becoming popular in China. Thus Ravitch in the United States reduced 79% of cases without any death, while Sheh Ya Hsuing in the Republic of China reduced 77.5% of cases with an overall mortality of 4.4%. These and similar gratifying results reported in Chinese literature are of particular interest to us considering that presumably similar economic conditions of life appertain between China and India.



Fig. 1
Barium enema shows the typical crab-claw defect at the hepatic flexure.



Fig. 2
Partial reduction showing the spring-coil appearance of barium between the two layers of bowel and a thin trickle of barium in the terminal ileum.



Fig. 3
Complete reduction with barium fully entering the terminal ileum.

Thus superficially, hydrostatic reduction appears to be an innocuous procedure which can save the majority of patients from an operation with its associated morbidity and longer period of hospitalisation. However, a critical assessment of this mode of treatment reveals several discrepancies.

The gratifying results of hydrostatic reduction are obtainable only :

1. In very highly specialised centres.
2. In centres where the great majority of cases are diagnosed within 24 hours of onset.

Furthermore, the procedure is not as innocuous as it appears. Reduction of gangrenous bowel, or perforation of devitalised bowel by the barium pressure-head, though rare, has been reported often enough to cause anxiety. However, in our eyes, the main disadvantage of this procedure is doubt regarding complete reduction. Incomplete reduction can easily give a false and even fatal sense of security. The main danger we feel is in the ileo-ileo-colic variety where the ileocolic component is reduced, leaving the ileo-ileal intussusception *in situ*.

The recurrence rate is higher after hydrostatic reduction, being 6% in the series of Sheh Ya Hsuing as contrasted to the 2% recurrence reported by Gross after surgery.

In cases where reduction is incomplete to the subsequent surgery required an appreciable time loss is entailed.

As stressed already, the average duration of symptoms before hospitalisation was

45 hours. Only 25% of cases in this series had a duration of less than 24 hours. After the very modest trial given to treatment by hydrostatic reduction, we cannot help feeling that in our country this method has a very limited applicability, and a meagre minority stands to benefit by this method.

Surgery on the other hand is applicable to all cases whatever the duration, and is within the scope of any surgical team. Though less spectacular than reduction by barium, enema, it is by far the surer, and we feel the safer method, and entails no waste of time. With a better understanding of pediatric anaesthesia, and the fluid and electrolytic requirement of infants, the results in acute intussusception are better when treated by surgery are better than by barium enema reduction, and Gross reports an overall mortality of 2.7% while Jones had one death in 90 consecutive cases.

In conclusion we would like to state, that the answer to the appalling mortality of 20% we present, lies in early diagnosis. In the wasted 45 hours before diagnosis lies to a great extent the discrepancy between the mortality of 2.7% in Boston, and 20% in Bombay.

Contrasted to the limited applicability, uncertainty and dangers of treatment by hydrostatic reduction, surgery with its universal applicability, surety and increasing safety, is, we feel, the method of choice in the treatment of acute intussusception in this country.

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SADDLE EMBOLISM OF THE AORTA*

BY

N. D. CHHABRIA, T. P. KULKARNI and P. K. SEN, Bombay.

The condition of saddle embolism of the aorta is rare. We have seen only 4 cases in the course of last 8 years at the K. E. M. Hospital, Bombay. Nevertheless it is one of the most catastrophic events observed in medical practice. Its importance is further enhanced by the fact that it often occurs in a patient already suffering from some other major cardiovascular disorder. If left untreated it carries a mortality of over 70%^{1, 2, 3.}

On an average aortic obstruction at the bifurcation may be considered to occur in 5 to 10% of all cases of peripheral arterial emboli. In a series of 330 unselected cases studied by Haimovici, embolism at the aortic bifurcation occurred in 9% of the cases.⁴

Two conditions which account for about 80% of the cases are mitral stenosis with atrial fibrillation and recent myocardial infarction.⁵ Other associated conditions include subacute bacterial endocarditis, aneurysm of the aorta, atheromatous plaques in the aorta and pulmonary vein thrombosis.

The diagnosis is essentially clinical. The symptoms and signs are typical occurring as they do in a case already afflicted commonly with mitral stenosis with atrial fibrillation or myocardial infarction. The patient complains of a sudden severe pain in one or both lower limbs followed by numbness and tingling. The pain may start in the lumbosacral or gluteal regions and spread down both thighs and legs. The acuteness usually

subsides in about half an hour and a continuous dull ache persists. There is soon an inability to move both legs. In addition to these are present the symptoms of the causative condition.

On clinical examination, the affected limbs are cold and clammy with marked pallor proximally and diffuse mottled patches of cyanosis distally. All arterial pulsations are absent. There are varying degrees of sensory loss and muscular paralysis with, in late untreated cases, signs of gangrene. Well over 50% of cases of peripheral arterial emboli develop gangrene. This high incidence of limb loss has now been considerably reduced with the use of anticoagulants, vasodilators and sympathetic blocks. Such limbs whenever salvaged, however, continue to show signs of chronic circulatory impairment.

The successful management of these cases depends on one factor alone, namely a timely embolectomy carried out before the effects of vascular deprivation become irreversible. Even in a case arriving late with established secondary effects it is worthwhile doing an embolectomy provided the patient's condition permits it. Suitable measures should also be taken towards the management of the source of the emboli after the same has been ascertained.

Much difference of opinion has arisen concerning the role of anticoagulants in the management of arterial emboli. The advantages gained in their use are, minimal

formation of secondary or red clot and its extension both proximal as well as distal, prevention of a fresh clot at the site of aortotomy and the prevention of further recurrent emboli. The occurrence of a second embolus at the aortic bifurcation carries a grim prognosis; only two survivals from two successful embolectomies at the aortic bifurcation are cited in the literature upto the present time.⁶ In both these cases the emboli occurred while the patients were on anticoagulant therapy, suggesting that perhaps other and more important factors are involved. The disadvantages in the use of anticoagulants are excessive bleeding during and after the operation as also the necessity of frequent laboratory tests for clotting time.

A successful and complete clearance of the blocked vessels with a meticulous repair of the aortic wound with minimal traumatization of the intima, is much more important and decisive in the ultimate outcome,

irrespective of whether anticoagulants are administered systemically or not. However, heparin solution should freely be used at the site of arterial incision during and after repair. Postoperative use is decided mainly by the subsequent condition of the peripheral vessels and their pulsations.

Since 1952, we have come across four cases of saddle emboli of the abdominal aorta, three of which have been treated surgically. These cases are reported in this communication.

Case Reports

Case 1.—A female patient 18 years of age was being treated in a medical ward of the K.E.M. Hospital for congestive cardiac failure due to mitral stenosis of 2 years' duration. She had no atrial fibrillation. On the 18th day of her stay in the hospital she developed sudden left sided hemiplegia which cleared up in 24 hours. 13 days later she developed sudden severe pain in the lower abdomen and both inferior extremities. Arterial pulsations were absent and both lower limbs were cold and clammy. A diagnosis of saddle embolism of the aorta was made and the patient operated upon about 12 hours of the episode.



Fig. 1
Case 1—Saddle Embolus Aorta.

*Paper read at the Annual Meeting of the Association of Surgeons of India at Poona in Dec. 1960.

An adherent embolus extending 5 cms. proximal to the bifurcation, 7 cms. into the right iliac and 3 cms. into the left iliac artery, was removed (Fig. 1). The aortic incision was repaired with 00000 arterial silk. This had to be reopened to clear a fresh clot which formed even as the closure was being completed. Heparin was injected locally as well as systemically. In the postoperative phase the arterial pulsations were feebly palpable. Treatment with intravenous heparin, papaverine, repeated lumbar sympathetic blocks and broad spectrum antibiotics was continued. In spite of all these measures the patient developed progressive gangrene of both legs. She refused amputation and expired.

Autopsy revealed button-hole type of mitral stenosis with an orifice of 10 mms.; a thrombus in the aorta extending into the right renal artery and beyond the bifurcation; a large infarct in the right kidney; and a small thrombus in the right middle cerebral artery accounting for the sudden transient attack of left sided hemiplegia.

Case 2.—A male 35 years of age was admitted to the K.E.M. Hospital with signs and symptoms of acute coronary thrombosis. The electrocardiogram revealed an extensive recent anterior myocardial infarct. On the 5th day of his stay in the ward he had an attack of acute pain in the abdomen with numbness and heaviness in both legs. Pulsations in the femoral, popliteal and dorsalis pedis arteries of both sides were absent. The patient was treated with analgesics and intramuscular heparin. The next day his right limb improved but the left limb continued to remain cold, pulseless and cyanosed. At this stage he was referred to our surgical unit. As more than 24 hours had elapsed since the acute episode it was decided to continue with the conservative treatment. On the 3rd day the left limb showed signs of gangrene below the knee. The patient's condition continued to deteriorate with elevation of the serum nonprotein nitrogen and he expired on the 9th day. No autopsy was performed.

Case 3.—A female child 8 years of age was admitted to our ward with a history of sudden severe pain in the lower abdomen radiating down both lower limbs, of 6 hours' duration. On enquiry she revealed a history of continuous fever for 12 days prior to her admission.

On examination, the patient had fever 101°F. Arterial pulsations in the upper limbs were normal but absent in the abdominal aorta as also in the arteries of the lower limbs. Both legs were cold and lammy; the sensations and the movements were

normal. Examination of the heart revealed no abnormal finding. Blood pressure in the right arm was 108/70 mms. of Hg.

Skiagram of the chest revealed normal cardiac and aortic silhouette. In view of a few unusual features present in this case such as the age of the patient, absence of a lesion in the heart and aorta and absence of pulsations in the abdominal aorta, an urgent aortogram through the suprasternal route was performed. This revealed a block in the abdominal aorta at the level of the 3rd lumbar vertebra with no filling of the vessels beyond (Fig. 2).

A successful embolectomy was immediately performed. The embolus was seen to extend from about 1 cm. proximal to the bifurcation to the division of the common iliac artery on either side. No anticoagulants were used systemically. The patient made an uneventful recovery. Subsequent blood examination revealed. Widal test positive for Paratyphoid A (H 1:250 and O 1:125) for which she was treated.

Case 4.—A female 38 years of age was admitted to the medical ward of the K.E.M. Hospital with a complaint of sudden severe pain in both inferior extremities of 10 hours' duration. The pain was



Fig. 2

Case 3—Supracardiac Aortogram.

more severe on the left side and was followed by coldness of both lower limbs below the groins. On enquiry, she revealed a history of exertional dyspnoea with episodes of congestive cardiac failure for the last 15 years.

On examination, all arterial pulsations in the left lower limb were absent, the right femoral pulsations were feebly palpable but all pulsations beyond were absent. Both inferior extremities were cold below the groins. Movements were normal in the right limb but absent in the left. Sensations were normal on both sides. Examination of the heart revealed an irregularly irregular rhythm with a diastolic murmur at the apex. Blood pressure in the right arm was 100/60 mms. of Hg. There were no signs of congestive cardiac failure.

A successful embolectomy was performed on the patient within 2 hours of admission. The embolus was seen to extend from the region of the aortic bifurcation to the division of the common iliac artery on either side. The right common femoral artery was seen to be partially blocked by an adherent white thrombus which could not be removed. The retrograde flow from this vessel was poor. No anticoagulants were administered systemically. A tendency to foot drop on the left side in the earlier postoperative period soon corrected itself. The peripheral pulsations were normal from about the 15th day. Since then a successful mitral commissurotomy has

been performed on the patient and she has been discharged with normal sinus rhythm and peripheral pulsations.

Summary

Four cases of acute saddle embolism of the aorta have been described. The pathogenesis, signs and symptoms and the management have been briefly discussed. The role of anticoagulants in the treatment has been defined.

Of the four cases, in one, saddle embolus followed myocardial infarction, in two, mitral stenosis (with atrial fibrillation in one) and the fourth patient was suffering from Paratyphoid fever and the embolus could have come from an undiagnosed endocarditis of typhoidal origin.

One case treated conservatively died; one subjected to a rather late embolectomy developed gangrene and succumbed to it and two cases treated by timely embolectomy have recovered completely with no after effects. No anticoagulants were given to these two cases.

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THE USE OF A CUTTING INSTRUMENT IN TRANSVENTRICULAR COMMISSURAL SECTION

(Preliminary Report)

BY

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With the application of surgery for even advanced cases of mitral stenosis certain technical problems in its surgical correction are being increasingly felt. In our surgical experience of over 300 cases of mitral stenosis, we are of the opinion that digital fracture of the mitral valve could enlarge the valve slit to a satisfactory point only in about 50% of the cases. In rest of the cases the instrumental help became mandatory. In the past we have employed Bailey's commissurotomy¹ Guillotine, Brock's² valvulotome, Tubb's or Gerbode mitral valve dilators for instrumental commissurotomy. Because of the certain limitations and disadvantages of these instruments we have been searching for a simpler, safer and more consistent method of obtaining splits of the stenosed valve. In the last few months we have resorted to the use of a fine cutting knife for performing transventricular mitral commissural section as an aid to finger fracture. In this communication a preliminary report of our experience with this instrument is presented.

The normal mitral valve which has been compared to a truncated cone of flexible membranous tissue undergoes considerable alteration due to rheumatic endocarditis. The rheumatic process culminates into changes either in the valve cusps, commissures, chordae tendinae and more often in the combination of these. The change essentially comprises of fibroblastic proliferation, collagen formation in which later

lipoid deposition and calcification may occur. Morphologically the stenosis can be classified into four types, namely commissural type in which mitral valve commissures are predominantly affected, cuspal type in which valve cusp becomes stiff and rigid, chordal type in which chordae tendinae are grossly thickened and shortened and lastly in which combination of these changes are found. When the commissures and cusps are involved without involvement of chordae the valve forms a diaphragm with button hole opening but when there is involvement of chordae also the valve forms a funnel with fish mouth opening. In actual practice the surgeon encounters following four types of mitral stenosis. In the first group the mitral valve is minimally involved with flexible leaflets and nonadherent papillary system. In the second group the valves are moderately thickened, their fusion extends only upto the critical area and there may be variable degree of subvalvular fusion. In the third group the valves are heavily fibrosed and thickened, the valve slit is markedly narrowed and the chordae are often shortened and thickened. In the third and the fourth groups there may be mild to severe calcification.

In cases of group I and some cases of group II there is a loose fusion of peripheral portion of the valve without much thickening or fibrosis of mitral valve leaflets or subvalvular mechanism and digital splitting

is effective and normal valve function is restored. However, in the cases belonging to group III, markedly calcified valve, and certain cases of group II where the valve cusps are fleshy and elastic or where there is subvalvular stenosis digital pressure alone fails to split the stenosed mitral valve.

We believe that finger fracture of the mitral valve is always to be preferred provided that it is complete and is easily accomplished without excessive force because of the simplicity of the technique and its freedom from dangerous consequences associated with instrumentation of heart. Extreme disruptive force is fraught with the danger of injuring the valve ring and the papillary system producing valvular incompetence or causing severe myocardial injury. Therefore, wherever finger pressure alone fails the instrumental help is advisable to initiate or complete the split.

In our experience of 302 mitral commissurotomies digital fracture of valve alone was performed in 196 cases. Some sort of instrumentation of mitral valve was found necessary in rest of the cases. Transventricular mitral valve dilatation was performed in 42 cases Brock's valvulotome or Bailey commissurotomy Guillotine was used in 28 cases. In the past few months we have

employed a thin bladed valvulotome for cutting the anterior and posterior commissures transventricularly in 36 cases.

Valvulotome

It is about six inches in length. It has a rounded handle, which can be held comfortably in the palm. It has a single short cutting edge which is only half an inch in length and 2 mm. broad. The tip of the knife is blunt. There is a mark on the handle to show the direction of the cutting edge. It has been modified from a tenotome knife used in squint operations on the eyeball (Fig. 1).

Technique

The chest is entered through the left fifth interspace. The pericardium is opened half an inch in front of the phrenic nerve so as to expose the left atrium and left ventricle. A snare is placed round the base of the auricular appendage of left atrium. With the snare tightened, the auricular appendage is opened. Three stay sutures are placed at the margins of the incisions on the appendage. After inspecting the appendage for thrombus right index finger is introduced through the appendage into the left atrium as the snare is gradually released. The size of mitral orifice, its shape, the amount of



Fig. 1

The knife used for transventricular commissural section.

regurgitation, presence or absence of sub-valvular stenosis etc. is determined. The digital fracture of both anterior and posterior commissures is attempted. In those cases where the digital fracture could not be initiated or was not complete due to one reason or the other transventricular mitral valvotomy was resorted to. With the help of palpating finger the exact situation of the anterior and posterior commissure is located. The thin bladed knife with single cutting edge and a blunt tip is introduced through an area on the anterolateral surface of the left ventricle at a suitable distance from the mitral orifice (Fig. 2). In making the choice of the exact situation on the left ventricle for the introduction of this knife we have practised this manoeuvre on many fresh post-mortem specimens. If the knife is introduced too far, away from mitral orifice nearer the apex of the left ventricle, it is difficult to palpate the small blunt tip of the valvulotome in the contracting heart.

Moreover it is difficult to enter the narrowed mitral orifice in spite of the palpating finger in the left atrium. In addition it is not possible to obtain a proper leverage for the instrument in order to obtain a satisfactory split. When introduced so far down of the ventricle there is always a danger of injuring important intraventricular structures like papillary muscles during this manoeuvre. There is a small danger of injuring the aortic ring while manoeuvring this instrument. If the knife is introduced too close to the mitral ring then there is a definite danger of injuring the chordae tendinae during its introduction and causing mitral insufficiency. In order to obviate this difficulty in our practice we have been entering the left ventricle through a point away from any major coronary vessels and about 2½ to 3 cms. below the level of the mitral ring. The exact situation is determined in each individual case after palpating the mitral orifice and locating the exact situation of the

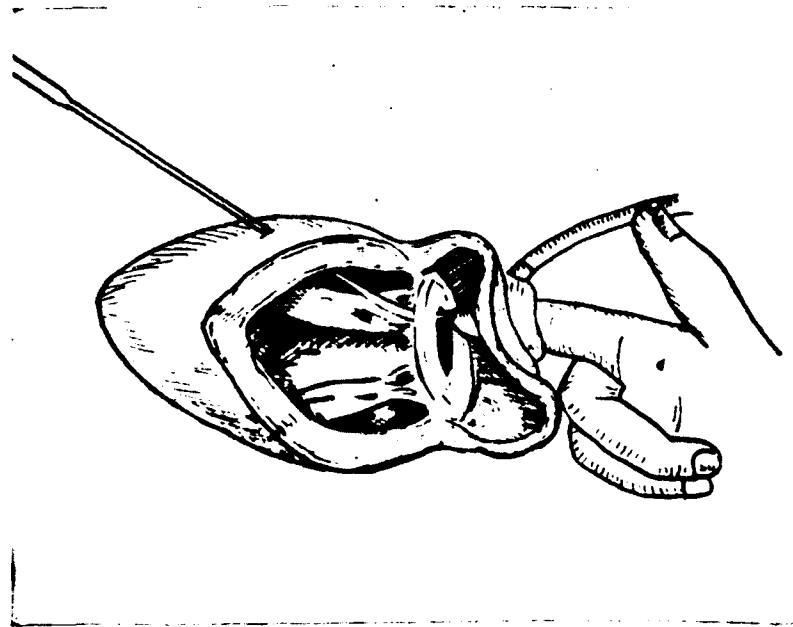


Fig. 2

Diagram showing the technique of introduction of the knife in the left ventricular chamber and then into the stenosed mitral valve.

anterior and posterior commissures. When introduced from this situation the knife can be easily palpated with the palpating finger in the left atrium and can be directed through the mitral orifice. The danger of injuring the chordae tendinae is minimal. Because of the adequate leverage available the knife can be moved forward and backward and bent anteriorly to cut the anterior commissure under the control of the palpating finger (Fig. 4). After cutting the anterior commissure the cutting blade of the knife is turned in the opposite direction pointing towards the post-commissure. With slight forward and backward movement of the knife and the backward and downward pressure of the cutting edge adequate posterior commissurotomy can be achieved under the control of palpating finger in the left atrium (Fig. 3). After completing the anterior and posterior valvotomy the knife is removed from the left ventricle and

the haemorrhage is controlled with finger pressure by an assistant. Finally the commissurotomy is completed by digital pressure. The valvulotome can be reintroduced through the same wound again if found necessary to complete the commissurotomy. The ventricular wound is so small that it often stops bleeding without suture. If necessary a Tubb's dilator can be introduced after enlarging this opening. It may sometimes require suturing with a single four zero silk suture. The auricular appendage is tied at the base and excised. Pericardium is closed after an adequate drainage.

Indications

Out of the 36 cases where this knife was employed to cut the commissures, in 11 cases the fibrotic process was so advanced that even with extreme digital pressure alone either the anterior or posterior

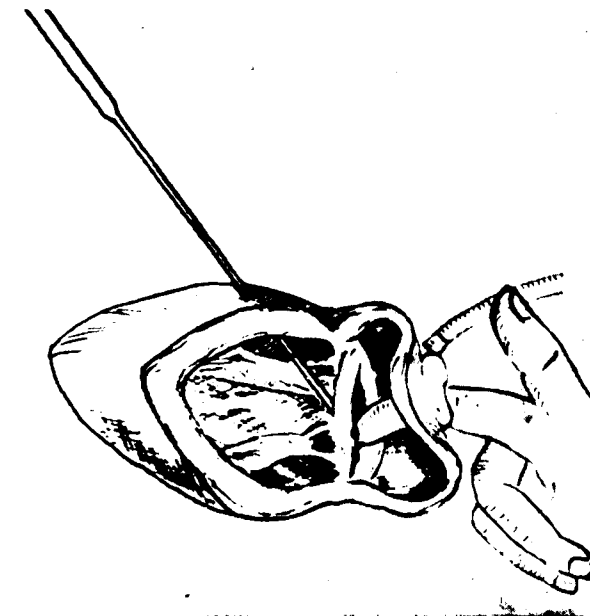


Fig. 3

The technique of posterior commissural section.

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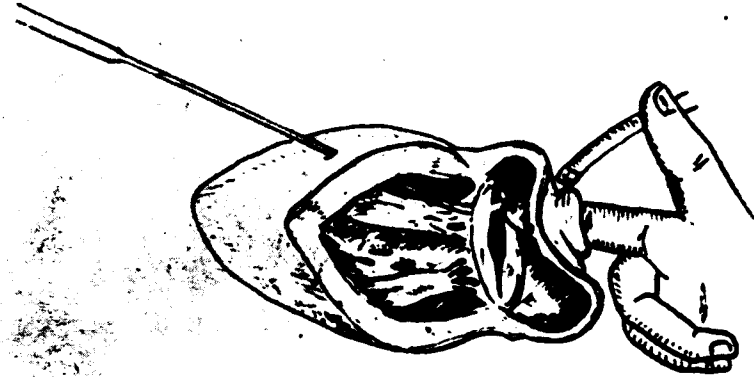


Fig. 4

The technique of anterior commissural section.

commissures remained resistant to finger fracture. After cutting the corresponding commissures with the knife blunt finger pressure was effective in completing the commissurotomy. In 7 more cases only posterior commissural section was found necessary. In 7 cases the mitral valve was fleshy and elastic and therefore could not be satisfactorily split with finger pressure. The knife succeeded in separating the fleshy valves to a satisfactory point. In five cases the mitral orifice was reduced to a narrow rigid slit which would not permit introduction of a finger within it to initiate the commissurotomy. The knife was employed to enlarge the mitral orifice so that an introduction of finger was possible to complete the commissurotomy. In 4 cases marked basal fibrosis interfered with the enlargement of mitral slit to a satisfactory point by finger fracture alone. In these cases the knife could effectively cut the basal

fibrotic area to complete the commissurotomy. In two cases there was a rock like calcification around the mitral orifice and finger pressure was ineffective in obtaining a split. The knife could cut through the calcific tissue and satisfactory split was obtained.

Results

In the present series anterior commissural section was attempted in 25 cases with satisfactory split in 80%. A satisfactory posterior commissural section, however, could be achieved in only 65% of the 28 cases where it was employed.

With the help of the transventricular incision of the anterior and posterior commissure followed by finger fracture a very satisfactory and complete commissurotomy was possible in 20 cases. In 12 cases, however, only partial commissurotomy was

possible. In 4 cases this method failed to effectively cut the mitral orifice and therefore transventricular mitral valve dilatation with Tubb's dilator was resorted to in order to open the stenosed valve. In only 2 cases in this series significant mitral regurgitation resulted after the valvotomy. There were two post-operative deaths. One patient died on the fifth post-operative day of pulmonary embolism. Autopsy revealed that the mitral valve was cleanly and completely cut (Fig. 5) and there was no injury to the papillary muscles or chordae tendinae. In another patient who died of renal shunt down the fleshy commissures were found to be satisfactorily split. The follow up of 2 months to 1½ years in these cases has revealed significant clinical improvement in over 75% of these rather advanced cases of mitral stenoses.

Advantages

The instrument is very light and delicate and therefore could be easily manipulated

within the heart chambers to accurately cut the anterior and posterior commissures. The cutting edge has to be very sharp and with a moderate pressure against the margin of the mitral orifice and slight sawing movements the commissure was efficiently cut under the control of the palpating index finger in the left atrium. The ventricular wound was very small and quite often did not require a suture. A single 4 zero suture was sufficient to close the ventricular wound whenever necessary. The tip of the knife is blunt and there is neither any danger of puncturing any intracardiac structure nor injuring the finger during manipulation of the instrument. The cutting edge is short and therefore much less likely to injure any intracardiac structure like papillary muscle or chordae tendinae during its manipulation. The instrumentation was very well tolerated by the heart and no cardiac irregularities occurred during the valvotomy. The blood loss during instrumentation was insignificant. The bleeding could be easily controlled by light pressure with finger tip. The entire manoeuvre of valvotomy took very little time and could be repeated, if found necessary, without any untoward consequences.

Discussion

Mitral stenosis, the most common of all organic cardiac valvular disorder and the most frequent rheumatic valvular affection, has interested the cardiovascular surgeons for many years and even today a search for a definitive surgical correction of this lesion with the help of an instrument continues in spite of the phenomenal advances made in its surgical relief. Brunton³. (1902) reported his work on experimental animals and autopsy specimens for mitral stenosis by transventricular incision of mitral valve cusps. Cutler^{4,5} (1923-28) inserted a tenotome knife through the left ventricle and divided



Fig. 5

Autopsy specimen of heart. Note the complete anterior commissurotomy.

both mitral valve leaflets. The results of the operation were uniformly fatal, the majority of cases succumbing soon after operation, probably due to resulting mitral regurgitation. Smithy⁶ (1950) reported excision of segment of stenosed mitral valve by blind valvulotomy introduced trans-ventriculally in 7 cases with survival in 5.

The method of transventricular mitral valvotomy described by us essentially differs from that of the previous workers (Cutler) in that in our technique the anterior and posterior commissure were incised and not the valve cusp and thus restoration of normal function can be achieved without any mitral regurgitation. The valvulotome was employed in such a way so as to make a minimal cut in the fibrotic or fleshy part of the cusp and the rest of the split was accomplished by finger pressure. Thus the danger of cleanly cutting the valve instead of commissure was avoided. With the palpating finger in the left atrium accurate cutting of both anterior and posterior commissure was possible and the danger of blind instrumentation of the mitral valve transventriculally (Cutler,

Smithy) was avoided. After correctly locating the commissures with palpating finger and feeling the chordae, the valvulotome is introduced from a suitable situation on the anterolateral surface of the ventricle gently so as to avoid injury to the chordae. The delicate but sharp instrument was gently manipulated within the heart chambers under the control of the palpating finger. Over and above the advantages of the instrument already mentioned, we feel that this valvulotome is particularly useful in children because in such cases introduction of valvulotome along with the finger transatrially or dilator transventriculally is technically difficult.

Since reading this Paper at the Fourth Thoracic Sectional Conference, we have devised a special type of straight, delicate, short-bladed type of Scissors (Fig. 6) for cutting the posterior commissure trans-ventriculally under control of the palpating finger. We have employed this scissors in 6 cases so far and it appears to work reasonably satisfactorily.



Fig. 6

Scissors for transventricular posterior commissural section.

Summary

(1) Pathological changes in the mitral valve requiring instrumental aid during commissurotomy are summarised.

(2) Surgical technique of transventricular mitral commissural section is described.

(3) Results of the operation are presented. Satisfactory anterior commissural section in 80% and posterior commissural section in 65% of the cases was achieved.

(4) Advantages of the instrument and technique are outlined.

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EBSTEIN'S ANOMALY AS A PREOPERATIVE DIAGNOSTIC HAZARD *

BY

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Introduction

Ebstein^{3,4} in 1866, described a congenital anomaly of the heart the basic morphological features of which are displacement of one or more leaflets of tricuspid valve downwards into the right ventricular cavity, incorporating the proximal portion of the right ventricular cavity into the right atrium. The displaced leaflet remains small and under-developed while the normally attached leaflet becomes huge and sail like. Right ventricular cavity therefore is usually reduced only to its infundibular tract and its function is taken over by the right atrium which consequently becomes markedly enlarged (Figs. 1 and 2).

Clinical manifestations of such a well defined morphological entity however are not equally constant and clear, and Yater and Shapiro¹⁴ in 1937 thought that it was difficult to arrive at a clinical diagnosis during life. Medical literature records only about a hundred and fifty cases of this anomaly¹². It may be possible to diagnose clinically such a case which conforms to all the clinical features^{6,7} but a number of these do not have all the classical features and may very closely mimic commoner heart diseases. Being a rare disease, it may catch an unwary surgeon on the wrong foot.^{1,4,8,9,11} It is the purpose of this paper

to discuss some of these preoperative diagnostic pitfalls.

Case Reports

Case No. 1.—Female, aged 35, attended the King Edward VII Memorial Hospital, Bombay, for progressive exertional dyspnoea and cough with moderate expectorations for five years. Five years back she was treated for bilateral pulmonary tuberculosis.

She had peculiar earthy discoloration of the skin, nails and mucous membranes, and had doubtful clubbing of nails. Jugular veins were moderately engorged, and there was mild oedema of feet. Pulse was 68/min., B.P. 100/65 mm. Hg. and temperature 97°F. The liver was palpable and tender. The cardiac impulse was diffuse with prominent pulsations over the precordium, especially in 3rd and 4th left inter-spaces. On auscultation at the 3rd interspace near the left sternal edge there was a wide split of the 1st heart sound, a short sharp ejection click and grade 1 ejection systolic murmur followed by a wide split of the 2nd sound, the pulmonary component being of grade 2 intensity. Air entry all over the lung fields was diminished with prolonged expiration and fine crepitations, most marked over the right apex and infraclavicular zone.

Routine haematological examination showed total R. B. Cs. 5.1 mill/cmm., Haemoglobin 14 Gms.%, W. B. Cs. 11,600/cu. mm. P. C. V. 49% and E. S. R. 4 mms. at the end of 1 hour. Repeated examination of sputum did not reveal acid-fast bacilli.

Plain Skiagram of Chest (Fig. 3) showed a moderately enlarged heart with prominent pulmonary conus. There was diffuse post tubercular fibrosis in

both lungs and marked tenting of right dome of diaphragm. The pulmonary vascular fields appeared ischaemic and were interpreted as secondary to extensive fibrosis of lungs,

The electrocardiogram (Fig. 4) showed right axis deviation, tall and peaked P waves in lead 2 and a right bundle branch block pattern.

Right heart catheterisation was performed using Cournand No. 6 intracardiac electrode catheter. The right ventricular cavity appeared small and

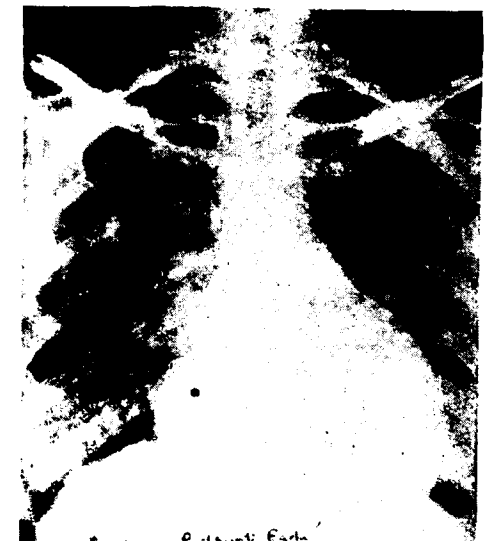


Fig. 3

P.A. skiagram of chest of case 1.

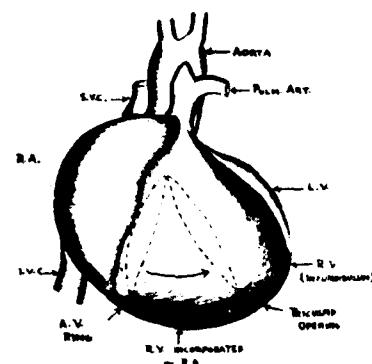


Fig. 1

Externl appearance of Heart with position of displaced tricuspid ring.

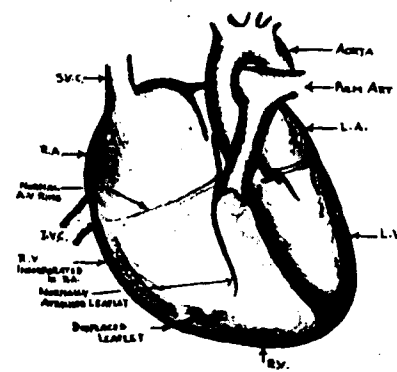
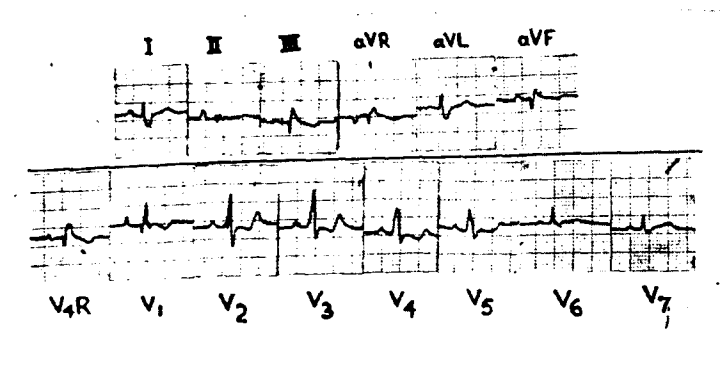


Fig. 2

Diagrammatic representation of the interior of heart showing the heart chambers, the normal position of tricuspid ring and the displaced valve leaflet.

Fig. 4
E.C.G. of case 1.

*Paper read to the 4th Annual Thoracic Sectional Conference of the Association of Surgeons of India, Bombay, on 18-8-1960.

tricuspid valve area appeared to have shifted much more to the left of midline. During withdrawal of the catheter, although the electromanometric pressure tracings changed their pattern from ventricular to atrial type, the simultaneous intracardiac electrocardiogram continued to record ventricular pattern (Fig. 5). The catheter was also negotiated into the left atrium and the left pulmonary vein across a defect situated high up on the interatrial septum. The details of the cardiac catheter findings were as follows :

Cardiac Catheterisation Data		
Site	Pressure (mm. Hg.)	Oxygen Saturation (%)
P. A.	20/5 (10)	79.8
R. A.	20/0 (8)	79.4
LOW R. A.	0	79.1
HIGH R. A.	0	70.0
S. V. C.	0	70.3
F. A.	100/65 (77)	94.3

HB 14 GMS. % O₂ Capacity 18.76 Vols. %
O₂ Consumption (at Rest) 150 CC/MIN.
Systemic Blood Flow — 3.75 L/MIN.
Pulmonary Blood Flow — 5.00 L/MIN.
Shunt L → R 1.25 L/MIN.

The patient was operated upon on 11-7-1959 by P. K. S. under hypothermia of 32° C. Pulse rate at this stage was 58 per minute and regular. B. P. was 85/60 mms. of Hg.

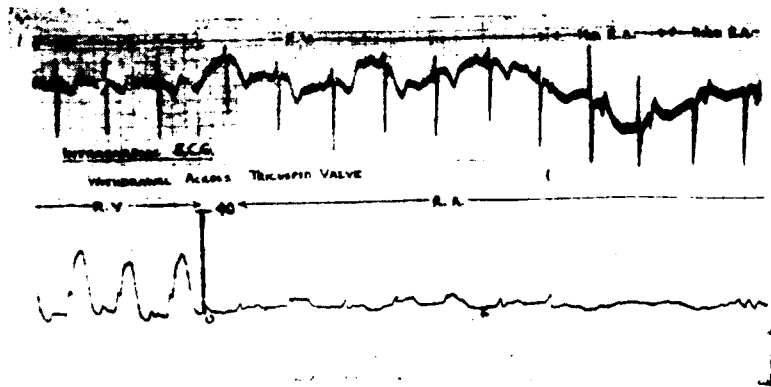


Fig. 5
Right heart catheterisation tracings across the tricuspid valve area.

Standard right anterolateral thoracotomy was performed and a secundum type of interatrial septal defect about 1 cm. in diameter was closed by circumclusion operation following the Sondergaard technique

During the manipulation of the heart, numerous cardiac irregularities developed. These lasted for about 15 minutes and settled after the manipulation of heart was over. At this stage the pulse rate was about 60/min. regular, and B. P. 80/60 mms. Hg.

After the closure of chest, a continuously recording electrocardiographic beam oscilloscope, recorded a sudden fall of heart rate to 30/min. with low voltage of qRS complexes. At this stage peripheral pulse and blood pressure were not recordable. Immediate resuscitative measures were instituted. The heart action however progressively deteriorated into ventricular fibrillation. Cardiac massage was performed, and satisfactory heart beats were restituted for a while. However, after about an hour the heart action gradually faded and further cardiac massage had no beneficial effect.

At autopsy the heart was enlarged and weighed 300 Grams. Enlargement was entirely due to dilatation of the right atrium. Pulmonary artery, aorta, and pulmonary veins were in normal position. The right atrial cavity was 4 times the normal size. Endocardium was smooth. Auricular septum showed a secundum type of defect 1 cm. × 0.5 cms. closed at operation. Right A. V. ring was greatly dilated and measured 14.4 cms. in circumference. The tricuspid valve was anomalous. The septal cusp of the valve was displaced below the A. V. ring, maximum displacement being 6.2 cms. It was small

but was separate and its anterior margin was attached to the moderator band with comparatively well developed chordae tendinae. Anterior cusp was very big and was continuous with posterior cusp forming a membrane. The two were partially separated at the lateral margins where their margins were attached to a small papillary muscle with short and poorly developed chordae tendinae.

The blood flow was mainly through the gap (2 cms. × 1.8 cms.) between the medial margin of anterior cusp and the moderator band, which led directly to outflow tract of right ventricle. Endocardium between the A. V. ring and displaced cusps was thickened. The right ventricular cavity was markedly reduced in size. The myocardium was of normal thickness and the endocardium was smooth. Outflow tract, pulmonary valve and pulmonary trunk were normal. Leftside of the heart showed no anatomical defects or pathological change. Only notable lesions in the other systems were healed calcified tuberculous foci with surrounding fibrosis in both lungs.

Case No. 2.—Male, aged about 18 years attended the King Edward VII Memorial Hospital, Bombay, for progressive exertional dyspnoea and cough with expectorations of 1½ years duration. He had two attacks of pulmonary oedema and several attacks of

congestive cardiac failures in the past. He gave history suggestive of rheumatic fever in childhood. He was orthopnoeic at rest and had no cyanosis or clubbing. Jugular veins were markedly engorged but venous pulsations were not prominent. There was mild oedema at the ankles. Liver was enlarged, about 3 inches below the costal margin, tender and soft, and hepatojugular reflux was positive. Pulse was 74/min., irregularly irregular and B. P. 95/65 mms. Hg. Temperature was 97°F. and venous pressure 270 mms. of water.

The patient was treated for congestive cardiac failure. After 8 days the body weight reduced from 91 to 84 lbs. The liver regressed to ½" below the costal margin and the oedema of ankles subsided.

The cardiac impulse was not visible or palpable although the patient had thin chest and prominent precordium. The heart sounds were very feeble and there was a soft grade 1 mid-diastolic murmur in the mitral area. There were no auscultatory signs of pulmonary hypertension.

Routine haematological examination was unremarkable. E. S. R. was 22 mms. at the end of 1 hour, and arm to tongue circulation time was 20 seconds.

Plain Skiagram of the chest (Figs. 6 and 7) showed a massively enlarged heart shadow filling almost entire lower half of left side of chest and a major part of the right side. On fluoroscopy the

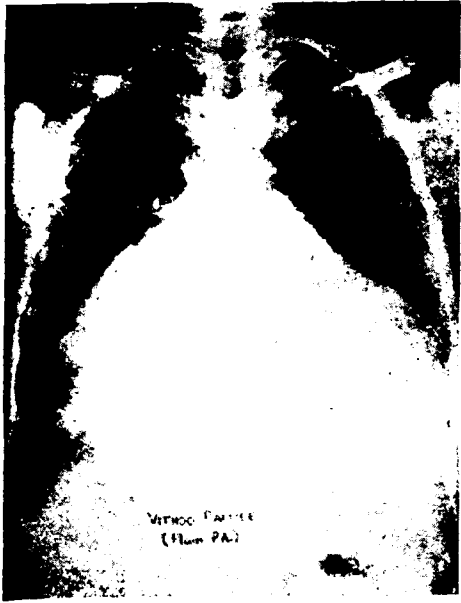


Fig. 6
P.A. skiagram of chest of case 2.



Fig. 7
R.A.O. skiagram of chest of case 2.

pulsation of cardiac chambers though feeble, were distinctly seen. The overlapping double shadow of the atria was well seen in Postero-anterior Skiagrams with higher K. V. penetration, (Fig. 8) so also the tracheal bifurcation was seen widened, suggesting left atrial enlargement. Pulmonary vascular fields on both sides appeared ischaemic.

The electrocardiogram showed atrial fibrillation, right axis deviation, vertical position of heart and a complete right bundle branch block pattern (Fig. 9). I. V. angiocardiology apart from outlining the superior vena cava proved to be non-contributory (Fig. 10). Selective direct angiocardiology under anaesthesia was therefore planned. Soon after the induction of anaesthesia the patient developed marked tachycardia, the QRS complexes changed their pattern, and the patient developed cardiac arrest. Cardiac massage was instituted immediately but proved futile and the patient died of ventricular fibrillation.

At autopsy the heart was enormously enlarged, the enlargement being almost entirely due to dilatation of right atrium. It had pushed the left atrium anteriorly so that part of right atrial cavity was lying posterior to left atrium. Right atrial appendage had also taken part in the dilatation and had formed half of the posterior wall of the atrium. The endocardium was smooth and shining. The myocardium was hypotrophied and measured 4 mm. in



Fig. 8

P.A. skiagram of chest of case 2 showing overlapping double shadow of atria.

thickness. The interatrial septum was normal. The tricuspid ring was greatly dilated and measured 16 cms. in circumference. It had merged with the auricular wall and was indistinct posteriorly. The anterior cusp of the tricuspid valve was large and was attached to the ring normally. The septal and posterior cusps were attached to the wall below the ring, the attachment sloping from septal cusp to

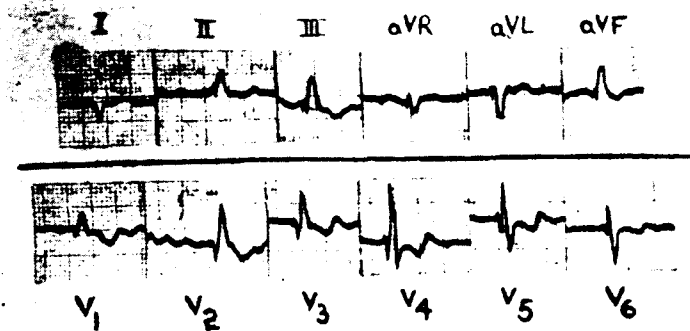


Fig. 9

E. C. G. of case 2.



Fig. 10

I.V. angiogram of case 2.

posterior cusp. The maximum displacement was 7 cms. The septal cusp was moderately developed and attached to papillary muscle with very short chordae tendinae. The posterior cusp was very poorly developed and extremely short chordae tendinae. The right ventricular cavity was very small, its myocardium had the same thickness as that of right atrium. There was no other abnormality in the heart or other systems.

Discussion

Cyanosis and clubbing are described as important diagnostic features of this disease^{5, 10, 16}. There are a few who emphasize that cyanosis is frequently absent¹³. In the present study both the cases were acyanotic. There was no defect for shunting of blood in the first while the other showed a left to right shunt of 1.5 L/min. at the atrial level at rest. It appears that too much reliance on cyanosis as a diagnostic sign may not be justifiable.

Cases of Ebstein's anomaly usually have minimal to moderate disability.¹⁰ However, both the cases in this study had gross disability with effort tolerance reduced to a minimum, and both had congestive cardiac failure.

The classical description of such a heart is a quiet, almost non-pulsatile heart with ischaemic lung fields. One of our cases had prominent pulsations over the precordium and on fluoroscopy had an actively pulsatile cardiac silhouette. She also had auscultatory signs of mild pulmonary hypertension. This suggested a clinical diagnosis of interatrial septal defect, especially as the pulmonary fields were difficult to interpret, due to old bilateral pulmonary tuberculosis.

In Ebstein's anomaly all cardiac chambers do not always remain in their orthodox radiological positions. This may alter the interpretations of the skiagram and may lead to misdiagnosis. In one of our cases on fluoroscopy the enlarged atrial chamber closely mimicked left atrium. This demonstration together with clinical signs, led us to diagnose this case as of a Giant left atrium. Autopsy also revealed that the enlarged right atrium had occupied the anatomical position normally occupied by the left atrium.

Both the cases had a large right atrium. Particularly the case who had no septal defect, had a huge right atrium. It might be rational to postulate that smaller the septal defect, larger will be the right atrial distention, and this distention being very gradual, might lead to gross enlargement of right atrium. Thus size of the cardiac silhouette might be decided by the size of the septal defect and massive cardiac silhouettes might suggest an absence of septal defect.

One of these cases was subjected to right heart catheterisation with intracardiac electrode catheter.¹⁵ This demonstrated that the tricuspid valve was situated much more to the left than normal and that the right ventricular chamber was very small. Correlation of intracardiac electric potentials with simultaneous pressure tracings across the tricuspid valve was very instructive,

suggesting 2 right ventricular chambers with different pressure patterns. Considerable part of right atrium adjacent to the tricuspid valve continued to record intracavitary electrocardiographic patterns of right ventricle, while recording pulse tracing of right atrium. Pathologic lesion thus was identified as an inclusion of a portion of ventricular musculature in a zone of atrial pressure, suggesting atrialisation of a part of the ventricle.

Ebstein's anomaly quite often masquerades as many a commoner cardiac disease with a difference, that although the patient shows many features that fit with these commoner conditions, a few features still remain unexplained. The only way to avoid

a pitfall is to keep this masquerador in mind as a differential diagnosis. The only investigation that would be most reliable in a case clinically suspected to be of Ebstein's anomaly is right heart catheterisation with simultaneous intracardiac electrocardiography which shows the classical pattern. Although a certain small risk^{2,13} is associated with this procedure, it is well worth taking rather than miss the diagnosis.

Summary

1. Two cases of Ebstein's anomaly are described along with their autopsy findings.

2. The significance of clinical and other characteristics which are likely to lead to diagnostic difficulties is discussed in detail.

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PUNCH BIOPSY OF THE PLEURA*

BY

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Pleurisy with effusion is an extremely common condition and yet it is difficult to establish the aetiology in many cases. Although, it is said that tuberculosis accounts for 70-80 percent of pleural effusions in young adults, it is not always possible to demonstrate the presence of tubercle bacilli in the pleural fluid by smear examination of the fluid deposits. Even after cultural methods and guinea-pig inoculations, positive findings have varied from 17 - 88 percent. Routine examination of fluid only helps in differentiating an exudate from a transudate. The study of cellular exudate is also not conclusive because it is now well known that even tuberculous pleuritis can be associated with a polymorphonuclear preponderance. Detection of malignant cells confirms the presence of a neoplasm.

Under these circumstances it was but natural that attempts were made to obtain pleural tissue for examination to establish the diagnosis. Lloyd⁶ (1953) used a thoracoscope to obtain pleural biopsy. Exploratory thoracotomy as undertaken by Sutcliffe¹⁴ et al (1954) is indeed, a major procedure. Small¹⁴ et al (1955) and Landsen⁷ et al (1958) used what is known as small thoracotomy without rib resection to obtain pleural tissue for examination. De Francis⁴ et al (1955) were the first to use Vim-Silverman needle to procure biopsy specimen. Subsequently, Abrams⁹ (1958) described what has come to be known as 'Harefield Pleural Biopsy Punch', which can be used for aspiration

of pleural fluid as well as for taking biopsy specimen. Mestitz^{11,12} et al (1957-58) have done the largest series using the punch. In our country Misra¹⁸ et al (1958), Mathur⁹ et al (1959) and Anjaria² et al (1960) have published their experiences with biopsy of pleura, using Vim-Silverman needle. As far as it could be ascertained from Indian Literature, it appears that there are no reports of "Harefield punch" being used in our country.

The purpose of this paper is to relate our experience in the use of this punch.

Methods and Materials

The description and technique of using the Harefield punch is reproduced here from "A practice of Thoracic Surgery" by De'Abreau⁸ (1958).

"The punch consists of an outer tube and an inner tube, the former having a deep notch near its tip which can be closed by a sharp cutting cylinder on the latter. This action is controlled by twisting the back hexagonal grip. When closed, the punch is airtight and can be introduced into the chest after a tiny incision has been made in the skin. The aspiration apparatus is then attached and notch opened. The pin which controls the travel of the inner tube is held by a spring clip either in open or closed position to prevent the inadvertant movement. When aspiration is complete (the short trocar point does not damage the lung if effusion is aspirated completely),

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the notch is directed along the intercostal space by means of the indicator knob on the front hexagonal grip and sideways pressure is maintained in this direction as the punch is withdrawn, until the notch is felt to engage in the chest wall. The back hexagonal grip is then twisted sharply clockwise so that the cutting cylinder cuts off and holds the tissue in the hollow tip. The punch is then withdrawn and biopsy found either in the hollow tip or in the inner tube from which it is cleared by the stylet" (Fig. 1).

We found that the removal of the biopsy specimen from the punch is better carried out by washing the hollow tip with an attached syringe containing sterile normal saline.

Using the above method, we have carried out 45 biopsies in 42 patients. Material obtained was adequate for histological studies in 37 cases. Tissues were fixed in 10 percent formaline saline and paraffin block

sections were made in the usual manner, cut at about 5-7 microne thickness and stained with haematoxiline and eosine.

Criteria for histopathological diagnosis

1. *Tuberculous inflammation*.—Collection of epithelioid cells, with or without caseation, and giant cells of the Langhans type. Follicular arrangement of cells was confirmatory (Fig. 2).

2. *Suggestive of tuberculous inflammation*.—Collection of epithelioid cells with or without the presence of giant cells of Langhans type (Fig. 3).

3. *Chronic inflammation*.—The presence of chronic inflammatory cells e.g. lymphocytes, plasma cells and eosinophils with evidence of fibrosis.

4. *Malignancy*.—The presence of groups of cells showing hyperchromatism and anaplasia (Fig. 4).

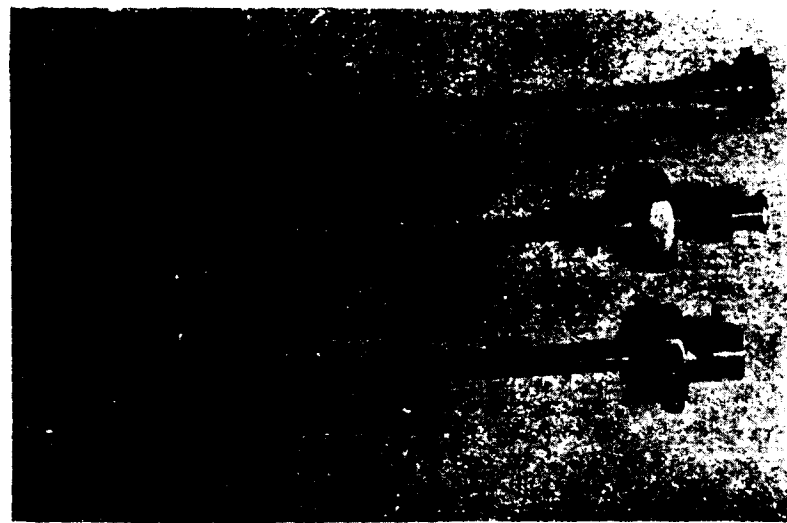


Fig. 1



Fig. 2

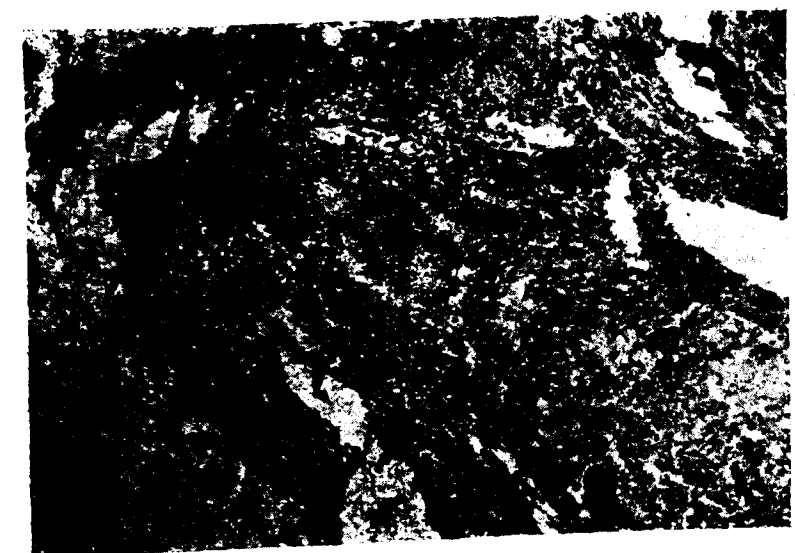


Fig. 3



Fig. 4

On radiological appearances these cases were divided into the following three groups, as shown in table No. 1.

Table No. 1

Groups on radiological appearances

- Group I-Pleural effusion only —17 cases.
- Group II-Pleural effusion associated with lung lesions—13 cases.
- Group III-Hydropneumothorax — 7 cases.

The size of the effusion was graded as follows :—

- (a) Large - when the shadow of the fluid reached anterior end of the second rib.
- (b) Moderate - when the shadow of the fluid reached anterior end of the fourth rib.
- (c) Small - Shadow just covering the diaphragm.

Group I.—This group comprises of the cases of pleural effusions only being thus comparable with the group of “Idiopathic effusion” of the other workers. Apart from the shadow of the fluid the lungs were clear. In this group, there were two cases of large, seven of moderate and eight of small effusions.

Group II.—In these patients, apart from the shadow of effusion, there were shadows suggesting tuberculous lesions. In five cases the parenchymal opacities were on the same side as the effusions ; in six they were bilateral, and in the remaining two cases they were on the opposite side. The effusions were large in one, moderate in five and small in seven.

Group III.—This group consists of seven cases of hydropneumothorax. The lung on the affected side could not be studied because of collapse but there were shadows suggestive of tuberculous infiltration in

contralateral side in four cases; in the other three cases the opposite lung appeared to be clear. Out of these seven cases, sputum was positive for acid fast bacilli by direct smear examination in four. Of the remaining three, acid fast bacilli were demonstrated in pleural fluid by direct smear examination of the deposits in two cases.

Results

Pleural biopsy results are given in table No. 2.

Table No. 2

Group	No. of Patients	Tubercle	Suggestive of tubercle	Malignancy	Chronic inflammation	No. of biopsies
I ...	17	4	2	2	11	19
II ...	13	5	4	—	4	13
III ...	7	2	3	—	2	7
Total ...	37	11	9	2	17	39

Table No. 3

Results of Pleural biopsy in Idiopathic pleural effusion

Name of the author	Year	Method	No. of cases	Positive results	Non-contributory biopsy
Lloyd ...	1953	Thoracoscopy with biopsy	29	12	17
Sutcliffe et al ...	1954	Thoracotomy	21	21	—
Small et al ...	1955	Small thoracotomy	5	5	—
De Francis et al ...	1955	V. S. Needle	6	2	4
Donchoe et al ...	1957	V. S. Needle	78	30	48
	1958	Surgical	52	28	24
Mestitz et al ...	1958	Punch biopsy	152	97	55
Misra et al ...	1958	V. S. Needle	35	4	31
Landsen ...	1959	Small Thoracotomy	17	17	—
Mathur et al ...	1959	V. S. Needle	Result not published		
Anjaria et al ...	1960	V. S. Needle	36	12	24
Present series ...	1960	Punch biopsy	17	8	9

Discussion

Group I.—In two cases where the biopsy was repeated, because of suggestion of malignancy clinically, repeated examination showed cells suggestive of "malignancy". In the six positive cases, (4 with tuberculous changes and 2 suggestive of tuberculosis) the effusion was small in five and moderate in one.

Of the nine results of chronic inflammation, two had thickened pleura; the effusion was small in one, moderate in five and large in one. Satisfactory response to anti-tubercular treatment suggested tuberculous aetiology. A possible explanation for this findings of chronic inflammation in these cases of apparent tuberculous pleuritis, is that in a moderate or a large effusion, one tends to enter the pleura at a higher level than when dealing with a small effusion. The pleura at the base is bound to show more tuberculous changes as it is in contact with the tuberculous debris at the base of the pleural cavity.

Group II.—Evidence of tuberculous pleuritis was obtained in 9 out of 13 *i.e.* 70 per cent of cases.

Of the remaining 4 showing "chronic inflammation" one was proved to be of malignant origin" by scalene node biopsy. Another case had only thickened pleura without any effusion. The remaining two had tuberculous lesions in both the lungs. Lack of definite evidence of tuberculosis in these two biopsies probably shows that pleura is not uniformly affected in the tuberculous process and perhaps biopsy specimen from definite parts of pleura might have shown evidence of tuberculosis.

Group III.—Five out of seven *i.e.* 70 per cent showed evidence of tuberculosis. In all these cases diagnosis of tuberculosis was obvious as acid fast bacilli had been recovered from either sputum or pleural

fluid. Of the two patients with reports of "chronic inflammation", one had considerable systemic and intrapleural anti-tubercular treatment which probably explains the negative evidence of tuberculosis in biopsy. In the other case, the effusion was not yet purulent and the pneumothorax was of recent origin, there was no demonstrable pulmonary lesion. Predominance of lymphocytes in pleural fluid suggested tuberculous aetiology. The small focus which had probably burst and discharged the contents in the pleura did not disseminate sufficient number of tubercle bacilli to cause any wide spread pleuritis. Perhaps repeat biopsy at different sites might have given a positive result.

There is no doubt that pleural biopsy has found a place in the diagnostic methods in relation to disease of the pleura. Its superiority over examination of fluid in tuberculous pleuritis is demonstrated by works of various authors. Mestitz *et al* (1958) in their series of pleural biopsy on idiopathic effusion cases showed that out of 85 cases of presumably tuberculous pleuritis, 70 gave positive evidence of tuberculosis by biopsy, while by culture and guinea pig inoculation of the fluid, tubercle bacilli could be demonstrated in only 45 cases.

Further small advantage of the pleural biopsy over the culture examination of the fluid may be mentioned here, that while results of culture are not available in less than eight weeks, diagnosis by biopsy can be made in one week.

The earlier methods of needle biopsy involved use of Vim-Silverman needle but most workers are now convinced that "Harefield Punch" gives better results.

Table No. 3 shows results of pleural biopsy by different methods used by different workers.

Donohoe⁶ *et al* using V. S. needle got positive results in 30 out of 78 (38.5%) while Mestitz¹² *et al* (1958) using Harefield punch got 97 positive results out of 152 (63%). From our country, Misra¹³ *et al* using V. S. needle procured only 4 positive out of 35 (11.4%) and Anjaria² *et al* got 12 positive results out of 36 (33%). In our series with the use of Harefield punch, we have been able to procure positive results in 8 out of 17 *i.e.* (47%), in idiopathic effusions. Although the majority of effusions in our series appeared to be tuberculous in origin, there were two definite cases of malignancy as proved by pleural biopsy.

Mestitz¹² *et al* (1958) in their series of 152 cases found 20 biopsies suggestive of malignancy. Welsh¹⁶ (1958) in a selected group of pleural effusions in 17 elderly patients, found 10 cases of malignancy.

It is difficult to interpret the sections showing only evidence of chronic inflammation. As pointed out by Misra¹³ *et al* (1958) it is possible that extensive treatment in a case of tuberculous pleurisy may leave the pleura with only chronic inflammatory changes.

In our series of the 7 cases in group III having hydropneumothorax, of obvious tubercular origin, pleural biopsies were negative only in 2 cases. In one of these there was history of extensive systemic and intrapleural antitubercular treatment which probably explains the absence of tuberculous changes in the pleura.

Other probable causes for negative results for tuberculosis may mean that pleura is not uniformly involved in tuberculous process and the site of pleural biopsy may miss the affected area in cases. Probably it would be wiser to do 2 or 3 biopsies at different sites.

Importance of taking biopsy from the lower part of the pleura has already been pointed out earlier.

Lastly the evidence of chronic inflammation may mean presence of a nonspecific inflammation as pointed out by Donahoe⁶ *et al*.

Pleural biopsy appears to be a useful and safe procedure, as in our series there were no complications at all. In one patient with pleural thickening on right side, biopsy showed presence of liver tissue but there were no obvious ill-effects. The liver must have been pierced through the thickened pleura and the adherent diaphragm.

Summary

1. 37 patients had pleural biopsies performed on them with 'Harefield punch' without any ill effects.
2. 47 per cent positive results in 'idiopathic' effusions establishes the fact that pleural biopsy has come to stay as a diagnostic aid in cases of pleural diseases.
3. Results compare favourably with the work of other authors.
4. It is suggested that in doubtful cases biopsy should be repeated.
5. In tuberculous pleuritis specimen should be taken from the lower parts of the pleural cavity.

Acknowledgment

The work has been done in the G. T. B. Hospital, Sewri. We are grateful to the Medical Superintendent, Group of T. B. Hospitals, Sewri, for permission to carry out the work. We are also grateful to the O. P. D. Staff of the same hospital for their help.

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PANCREATIC LITHIASIS*

BY

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Introduction

Pancreatic lithiasis is not a common disease. Haggard and Kirtley (1939) reviewed the literature on the subject and recorded 204 cases all of which were observed only at autopsy. Recent reviews with additional case reports by various authors bring the total number of reported cases to about 300.

Caparelli (1883) is credited with being the first surgeon to operate on a case of pancreatic calculi. His patient developed a fistula, discharged 100 calculi over a period of six years but subsequently died of diabetes. Moynihan (1902) was the first to diagnose and remove successfully a pancreatic calculus by the transduodenal route. Cattell & Warren (1953) have made a comprehensive review of the subject and published the results of various types of operations performed by them in a series of 38 cases of chronic pancreatitis with or without lithiasis. Pancreatico-duodenectomy, in selected cases, gave the best results and is considered by them to be the method of choice in cases where there is obstruction to the pancreatic duct.

We report here two cases of pancreatolithiasis. In the first case, multiple calculi were located in the region of the head of the pancreas and pancreatico-duodenectomy was successfully carried out with complete relief of the symptoms of relapsing pancreatitis. In the second case, calculi were diffusely scattered throughout the pancreas but the symptoms were mild and responded to conservative medical measures.

Case Reports

Case 1.—Female aged 29 years, mother of 5 children, was admitted on 23-3-59 with severe abdominal pain, nausea and vomiting of 6 hours duration. On enquiry, she gave a history of similar attacks of pain and vomiting for which she had been treated in different hospitals on several occasions during the last six years.

On clinical examination, she was of average build, moderately nourished and without any anaemia or jaundice. Temperature was slightly raised. There was a definite area of tenderness in the epigastric region, slight rigidity of the abdomen but no palpable mass.

She was treated on conservative lines with rest, gastric aspiration, fluid and electrolyte replacement, antibiotics and analgesics. The pain and vomiting continued for four days and then slowly subsided, leaving a dull discomfort in the upper abdomen. Radiograph of the abdomen (Figs. 1 & 2) showed a cluster of radio-opaque calculi opposite the 1st and 2nd lumbar vertebrae immediately anterior to the vertebral bodies. I.V. Cholecystogram (Fig. 3) showed a normal biliary tract with the calculi in close relationship to the terminal part of the common bile duct. Barium meal (Fig. 4) showed a small diverticulum of the duodenum and calculi located within the duodenal curvature.

A diagnosis of pancreatic lithiasis localised to the region of the head of the pancreas was made. Laboratory studies included the following:

Haemoglobin 12.5 gm %, RBC—4.5 million/cm., WBC 10,500/cm., Blood sugar—85 mgm %, G.T.T.—normal, Serum bilirubin—0.1 mgm. %, Serum Protein—6.4 gm %, Albumin—4.5 gm, Serum amylase—174 Elman units. Urine—Trace of albumin, no sugar. Stool—No occult blood. In view of the repeated attacks of relapsing pancreatitis and the presence of a cluster of radio-opaque calculi located in the region of the head of the pancreas it was decided to operate on her. On 21-7-59 i.e. about 4 months after her last attack of pancreatitis, pancreatico-duodenectomy was carried out in one stage.

*Paper read at the All India Surgeons' Conference held at Poona in Dec. 1960.



Fig. 1

Skiagram showing a cluster of calculi opposite 1st and 2nd lumbar vertebrae (case 1).



Fig. 2

Skiagram showing calculi anterior to the vertebrae bodies (case 1).

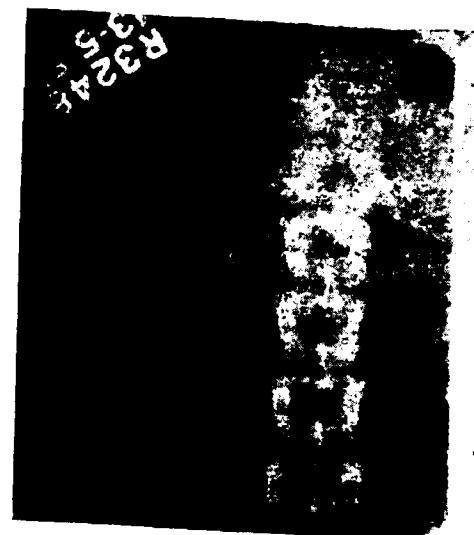


Fig. 3

I.V. Cholecystogram showing calculi near the terminal part of common bile duct (case 1).



Fig. 4

Skiagram after barium meal showing a duodenal diverticulum (case 1).

Operative technique

Laparotomy was done by a right paramedian incision. After preliminary abdominal exploration to confirm the diagnosis, the duodenum and the head of the pancreas were mobilised by incising the peritoneum on the outer border of the duodenum. The hepatic flexure of the colon was freed and pushed down. The peritoneum along the inferior border of the neck of the pancreas was then incised carefully to expose the superior mesenteric vessels. The inferior pancreaticoduodenal artery was ligated. The right half of the gastrohepatic omentum was divided and the right gastric artery ligated. The gastro-duodenal artery was also identified and ligated. The first part of the duodenum was carefully mobilised exposing the common bile duct and portal vein at the superior border of two pancreas. A finger was then inserted behind the neck of the pancreas from above and below but complete separation of the pancreas from the portal vein was not possible because of adhesions. The stomach was divided 2" from the pylorus and turned over to the left. The common bile duct was dissected and divided low down. Haemostatic sutures were placed over the superior and inferior borders of the body of the pancreas close to the neck. The pancreas was carefully transected through its neck exposing the portal vein and the terminal parts of splenic and superior mesenteric veins. The cut surface of the pancreas was closed with few mattress sutures leaving the pancreatic duct free. The jejunum was divided 3" from the duodeno-jejunal flexure and the proximal jejunal stump along with the 4th part of duodenum was freed from under the superior mesenteric vessels and delivered to the right side. The branches of the superior mesenteric vessels going to the

duodenum and pancreatic head were ligated and the uncinate process dissected out carefully from behind the superior mesenteric vessels. The specimen comprising the head and neck of the pancreas with the terminal part of the common bile duct, the whole of the duodenum including the pyloric part of the stomach and proximal 3" of jejunum was removed.

Reconstruction was carried out by mobilising 8" of the jejunum and carrying it in front of the transverse colon to complete an end to side Cholecysto-cho-jejunostomy, pancreatico-jejunostomy and gastro-jejunostomy in that order from above downwards. Pancreatico-jejunostomy was carried out by suturing the pancreatic duct to the jejunal mucosa and then burying the cut surface of the pancreas in the submucous layer of the jejunum (Fig. 5). The abdomen was closed with a drain in the right flank.

The resected specimen was carefully dissected at the end of the operation and the findings were as follows (Fig. 6).

(1) There was a duodenal diverticulum from the 4th part which was adherent to the uncinate process of the pancreas.

(2) The accessory pancreatic duct (Santorini) constituted the main duct draining the body, neck and upper part of the head of the pancreas and opening independently into the duodenum.

(3) The duct of Wirsung was seen draining the uncinate process and caudal half of the head of the pancreas and terminating in the duct of Santorini. It had no communication with the common bile duct.

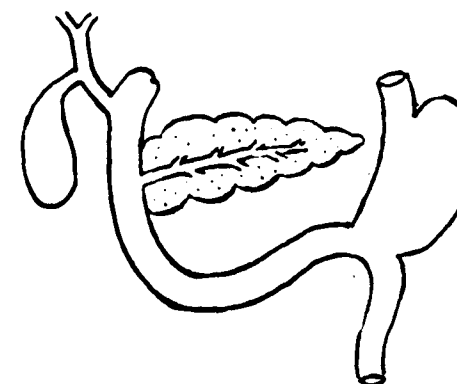


Fig. 5

Diagram showing the method of reconstruction (case 1).

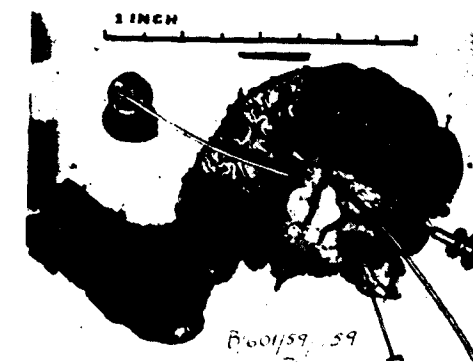


Fig. 6

Photograph of the resected specimen with the pancreatic ducts laid open (case 1).



Fig. 7

Skiagram of the resected specimen
(case 1).

(4) All the calculi were located within the distended duct of Wirsung extending from the tip of the uncinate process to its junction with the duct of Santorini.

(5) There was no evidence of obstruction to the main pancreatic duct (Duct of Santorini) or the common bile duct.

Post-operative treatment was carried out on the usual lines. The patient made an uneventful recovery. She was ambulant after 2 weeks and left the hospital after 3 weeks. She has been followed up for over one year now. She has had no further attacks of abdominal pain. Her appetite is good, bowels regular, and stools normal in consistency. Her body weight had remained constant at about 96 lbs. Blood sugar, haemoglobin, serum, protein and bilirubin have remained normal. Radiograph of the abdomen 1 year after the operation (Fig. 8) did not show any evidence of pancreatic lithiasis.

Case 2.—Male, aged 27 years was admitted on 13-8-59 with complaints of dull epigastric pain, indigestion and loss of weight of 6 months' duration. He gave a history of an attack of infective hepatitis in 1956.

On clinical examination, the patient was thin built. There was no anaemia or jaundice. Tenderness was present on deep palpation in the epigastric region where an indefinite, transversely lying mass was palpable.



Fig. 8

Skiagram of abdomen one year after
operation (case 1).

Radiograph of the abdomen (Fig. 9) showed multiple radio-opaque calculi scattered throughout the head, body and tail of the pancreas. I.V. cholecystogram showed normally functioning gall bladder and absence of any duct obstruction. Laboratory investigations - Haemoglobin - 12 gm.%, RBC. - 4 million per cmm., WBC. - 8,200/cmm., Blood sugar - 80 mgm.%, G.T.T. - normal. Serum amylase - 204 Ekinan units. Serum bilirubin - 0.5 mgm.%. Serum protein - 6 gm.%, Albumin 4 mg.%, Urine - NAD. Stool - well formed. No occult blood; no meat fibres or excess fat. (F.T.M.) was within the normal range.

The patient was kept under conservative medical treatment on a bland diet, antispasmodics and analgesics for about six weeks with some symptomatic relief. No surgical measures were considered as the symptoms were mild and the lithiasis too extensive.

Discussion

Pancreatic lithiasis which usually originates in the head and proceeds distally to involve the body and tail, follows recurrent attacks of inflammation and duct obstruction. There was no associated disease of the biliary tract in our cases. The radiological findings of a duodenal diverticulum in

at the ampulla of Vater to open into the duodenum. Only a small portion of the head of the pancreas is left to be drained by the accessory pancreatic duct (duct of Santorini) Fig. 10.

In about 10% of cases, the accessory pancreatic duct (Santorini) may exist as the main pancreatic duct draining the body, tail, neck and the cephalic part of the head of the pancreas and terminating at the minor papilla of the duodenum. The duct of Wirsung then remains as a minor duct draining the caudal part of the head of the pancreas and uncinate process and terminates by joining the common bile duct at the ampulla of Vater (Fig. 11).

In case 1, the duct of Santorini constituted the main pancreatic duct draining the body, tail, and cephalic half of the head of pancreas. The duct of Wirsung which was found draining the caudal half of the head and uncinate process was grossly dilated and studded with calculi. It was communicating with the duct of Santorini - but even after careful dissection, no communication could be established between the duct of Wirsung and the common bile duct (Fig. 12).

Two possible explanations may be considered. The first is a developmental defect leading to atrophy and disappearance of the terminal part of the duct of Wirsung, a



Fig. 9

Skiagram showing multiple calculi scattered
throughout the pancreas (case 2).

case 1, raised the possibility of duct obstruction by a periampullary diverticulum. At operation, however, the diverticulum was found arising from the 4th part of the duodenum and adherent to the uncinate process.

Normally the main pancreatic duct drains the entire body, tail, neck and the caudal half of the head of the pancreas and uncinate process. It terminates as the duct of Wirsung by joining the common bile duct

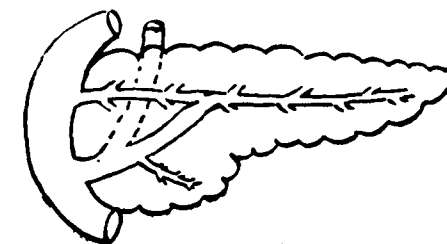


Fig. 10

Diagram showing the usual arrangement
of pancreatic ducts.

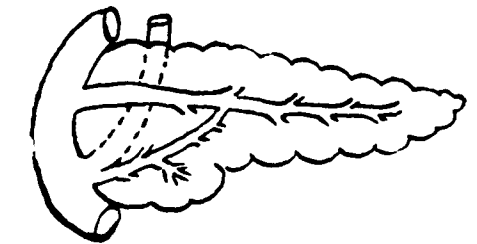


Fig. 11

Diagram showing the less common
arrangement of the pancreatic ducts.

rare anomaly not reported before. The second possibility is an inflammatory fibrosis and obliteration of the terminal part of this duct and its communication with the common bile duct. Whatever be the explanation for the unusual finding, there was obviously stasis in the duct of Wirsung, which was responsible for the location of calculi in the region of the head and uncinate process leaving the body and tail of the pancreas free from disease.

As regards the choice of treatment, it should be dictated by the severity of the symptoms and the extent of the lesion. Medical measures usually succeed where the symptoms are mild as in case 2. Where the disease is extensive involving the whole of the pancreas and the symptoms are very disabling indirect surgical procedures *e.g.*, biliary diversion, vagotomy or thoracolumbar sympathectomy may afford some relief.

When there is a solitary stone obstructing the duct of Wirsung at the ampulla of Vater, sphincterotomy by the transduodenal route, is the treatment of choice. In case 1, the stones were located within the duct of Wirsung but were too many for transduodenal removal. Besides, in view of the duct anomaly discovered later in case 1, sphincterotomy would have led us into the lumen of the common bile duct but nowhere into the duct of Wirsung. Probing

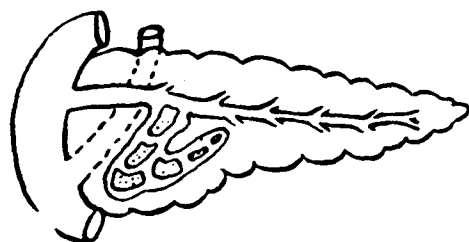


Fig. 12

Diagram showing the abnormality of the pancreatic ducts and the location of the calculi (case 1).

the pancreatic duct by way of the minor papilla would have led us directly to the body and tail of the pancreas by-passing the calculi.

Direct exposure of the duct by incising pancreatic tissue has often been resorted to in the past. This was considered inadvisable because of the danger of formation of a pancreatic fistula.

Distal pancreatectomy, a less formidable operation than pancreatico-duodenectomy may be suitably employed, where the disease is confined to the body and tail of pancreas. It has also been advocated as a form of pancreatic decompression in cases where the duct obstruction is in the head of the pancreas (Aird 1954). In case 1, distal pancreatectomy would have sacrificed the normal body and tail of the pancreas leaving behind the head studded with calculi and the seat of pancreatitis.

Pancreatico-duodenectomy was considered to be the treatment of choice in case 1 because of obvious reasons. The patient had been suffering from repeated attacks of pancreatitis with severe epigastric pain and vomiting for the last six years. All medical measures had failed to give her any relief. Investigations proved that the offending calculi were located in the region of the head of the pancreas. Resection of the head of the pancreas, we considered, would eliminate the point of duct obstruction and the implantation of the transected duct would re-establish the flow of pancreatic secretion. This was successfully achieved. Pancreatico-duodenectomy removed the diseased head of the pancreas studded with calculi but left behind the body and tail of the pancreas, which were free from the effects of duct obstruction because of the congenital anomaly of the duct system.

The patient had an uneventful post-operative recovery. She has been followed up over one year. She has remained symptom-free and in fairly good general health.

Summary

(1) Two cases of pancreatic lithiasis are reported.

(2) In case 1, multiple calculi were located in the head of pancreas and pancreatico-duodenectomy was successfully carried out with complete relief of the symptoms of relapsing pancreatitis.

(3) In case 2, calculi were widely scattered throughout the pancreas, but symptoms

were mild and responded to conservative medical treatment.

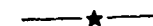
(4) The Resected specimen in case 1, showed that the duct of Santorini constituted the main pancreatic duct. The duct of Wirsung, which contained all the calculi, drained into duct of Santorini but showed no communication with the common bile duct.

(5) The rationale of carrying out pancreatico-duodenectomy in case 1 in preference to other forms of treatment has been discussed.

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ADENOMATOID TUMOUR OF THE EPIDIDYMIS

(Report of a Case)

BY

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Primary tumours of the epididymis are rare. Amongst the known ones are the adenomatoid tumour, lipomas, fibromas, leiomyomas, teratomas, cholesteatomas, sarcomas and primary carcinomas¹.

In a review of the literature in 1951, Longo et al² found 71 recorded cases and they added 19 of their own. In Indian literature only one case has been reported very recently³. During the last twelve years, 40 tumours of the testis were received in this department but none of the epididymis. This case is reported in view of this rarity.

Case Report

Clinical findings.—Case No. 6324/60 G. R., a Hindu male aged 60 years, was admitted to the Civil Hospital, Ahmedabad for hernia of one year's duration, and enlargement of the testis for six months. Palpation of the scrotum revealed a small nodule

attached to the lower pole of the testis. It was ovoid in shape, hard, painless and non-translucent. The hernia was repaired and the right testis removed with a part of the cord.

Description of the Specimen

Macroscopic.—The testis was slightly enlarged. A small, well-circumscribed nodule was seen at the lower pole of the organ. On cutting, the nodule bulged above the surface and was seen to replace the tail of the epididymis (Fig. 1). It measured 1.5 cm. in diameter and was capsulated. Its consistency was firm. It was made up of greyish-white, homogenous tissue. At the periphery there was hyperemia. The testis and cord were normal.



Fig. 2

Photomicrograph of the tumour. A mixed pattern is clearly seen (H. & E. $\times 120$).

Microscopic.—The tumour showed a mixed pattern (Fig. 2). The structure was predominantly canalicular. Here, the tumour cells were flattened or low cuboidal and seen to line irregular disorientated spaces. Some of these spaces showed cellular debris and mucin. In some places was seen a solid cell cord pattern. Here, the cells were rounded or oval. The nuclei were vesicular and showed a prominent nucleolus. Mitotic figures were scanty and there were no abnormal mitoses. Some of the cells showed vacuolisation. Cytoplasmic processes arising from these cells were seen to form an interlacing network. An

occasional giant cell also was seen. There was very little fibrous stroma. At places, was seen muscle tissue (confirmed by Masson's trichrome stain).

Comments

The first case of an adenomatoid tumour of the epididymis was reported by Sakaguchi⁷ in 1916; he labelled it an 'adenomyoma'. The term 'adenomatoid tumour' was first proposed by Golden and Ash¹. Such tumours comprise 50 percent of primary tumours of the epididymis. Masson et al⁶, first reported the occurrence of these tumours in both sexes. A large majority of the tumours of the epididymis arise in the tail. The case reported here is also from the tail. Syed et al⁹ reported one arising in the tunica vaginalis. The tumour can occur at any age and its duration is very variable - from 3 days to 30 years. Very often it is an incidental finding. Although usually solitary, multiple nodules have been reported⁸. The size is usually small; the largest on record was 9×5 cm.² Lee et al³ have described three types of

histological patterns namely, canalicular, tubular and plexiform; a variable mixture of these is obtained in most of the cases, as in the one reported here. The behaviour is always innocent.

The histogenesis is not yet known for certain. There are various views, viz., from (i) the endothelial lining of the lymphatics, (ii) the mesothelium of the peritoneum and the tunica vaginalis and (iii) the epithelium: various epithelia like that of the epididymis, efferent ductules of the testis and Mullerian vestiges are blamed. Sundarasivrao's⁸ case No. 6 convincingly shows its origin from Mullerian vestiges.

Summary

A case of adenomatoid tumour of the epididymis is reported.

Acknowledgement

We are thankful to Dr. V. K. Vani for the clinical notes.

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Fig. 1

Macroscopic appearance of the tumour. A well-circumscribed tumour is seen in the tail of the epididymis.

ORTHOPAEDIC SECTION

PERIARTHRITIS SHOULDER

BY

B. N. SINHA, A. N. SRIVASTAVA and S. P. UPPAL, Lucknow.

The title of 'Painful and Stiff' shoulder does not include all cases with pain and stiffness at shoulder. It refers to a special class of patients grouped under 'Periarthritis' shoulder or 'Frozen' shoulder which has a characteristic natural history, classical clinical pattern, long protracted but usually self limiting course usually spanning over few months to 2-3 years. This condition has been a challenge to our profession for more than a century and it has been the most observed and puzzling condition of all the common shoulder affections. Godman while stressing the Clinical pattern of the affection admitted defeat in understanding the nature of the disease. "This is a class of cases that I find difficult to define, difficult to treat and difficult to explain from the point of view of Pathology.

This study was prompted not only by the frequency with which the syndrome is encountered, but is also an attempt to study the clinical picture of the condition at its most common presenting symptom and to evaluate the various facilities at our disposal.

The systematic study of shoulder lesions was initiated by Sir Benjamin Brodie (1818) and was continued by J. S. Smith (1834) who wrote about rupture of supraspinatus.

Duplay (1872) was the first investigator to recognise the extra articular tissues as the possible factors responsible for 'Painful and Stiff' shoulder and it was he, who applied the term 'Periarthritis' shoulder for such

lesions. He thought it to be caused by involvement of scapulohumeral joint and subacromial bursa. Bar-Painter recognised calcified deposits with the help of X-Rays and this group of cases were separated from the large heterogeneous group. Codman (1956) emphasized the importance of bursae around the shoulder and accused subacromial bursitis for causing this affection. Finding it absent at operations, he later considered the Pathology to be tendinitis of the rotator cuff without calcification. Codman (1934) introduced the term 'Frozen' shoulder in the literature for the class of cases under discussion. 'Frozen' shoulder refers to complete abolition of movements at the glenohumeral and scapulohumeral joint, although upper limb can still move on the trunk with the help of thoracoscapsular mechanism. In such cases arm can be elevated to about 65° from the side, but because of movements of the scapula around the chest wall, it passes forwards from the coronal plane by 20°-30° as the lower angle passes laterally and forwards.

To Meyer (1931) goes the credit of pointing the role of biceps tendon in such derangements of the shoulder.

Pasteur (1932) France and Schragger (1932) in America were the first to suggest bicipital tenosynovitis as the cause of syndrome. Favler (1933) and Simmerds (1949) supported the view of Codman. As a result of further studies on the subject made by McLaughlin, Moseley, Lippmann, Hitchcock and Bechtol, DePalma and many

others, this heterogeneous 'Periarthritic' group was further distinguished and various synonymous terms came into vocabulary such as 'Frozen' shoulder 'Tendinitis' of the supraspinatus, tendinitis of the short Rotators, Fibrositis of the shoulder (Finder 1949) Tenobursitis (Pasteur), adhesive bicipital tenosynovitis, adhesive capsulitis, Checkrein shoulder and many others. This reflects that the title of 'Painful and stiff shoulder' is as vague as Pott's fracture or 'back sprain' but the choice has been done in order to convey that we even today do not know the exact nature of the syndrome which forms a separate entity.

Lippmann (1943) described adhesive Tenosynovitis as the causative factor of Frozen shoulder, a concept with which many differ even today. It is believed that Frozen shoulder is a diffuse inflammatory process implicating all the soft tissue components of the Scapulohumeral joint including the Biceps tendon and not of any one component or an isolated region of the shoulder joint. The Bicipital tenosynovitis is a concomitant finding in all the cases although some regard it to be the only important pathological change which is responsible for the pain factor which is the most distressing feature of this syndrome. Further more it may be pointed out that once the pain element in these shoulders is eliminated, restoration of function can begin and continues until optimum function is regained and all tissues are returned to normal. So this work is prompted not only by the frequency with which the Phenomenon is encountered, but is also an attempt to evaluate the efficiency of various therapies at our disposal.

Clinical Characteristics

This work surveys the statistics of the condition as presented in the orthopaedic

Out Patient Department Gandhi Memorial and Associated Hospital, Lucknow from 1956 to 1960. The disease has been diagnosed in the Out-Patient Department as Periarthritis' shoulder or 'Frozen' shoulder. The incidence of disease appears to be about 1.5%, 1.2% of the total attendance of the Out-patients.

Hundred cases presented here were thoroughly examined, treated and followed up to a period of one year. Their detailed clinical analysis was done and various therapies at our disposal were given to different patients.

This study revealed that the Disease occurred in persons past 40 years maximum incidence occurred in 50-54 years age group (38%, 60% of the patients were between 45-54 years. In this series of cases only 4 patients were under Forty years (38 and 37 years).

Table I
Showing age Incidence

Age in years	No. of Males	No. of Females	Total
Below 40 years ...	2	2	4
40 — 44 years ...	8	4	12
45 — 49 years ...	10	12	22
50 — 54 years ...	18	20	38
55 — 59 years ...	6	8	14
60 — 64 years ...	—	6	6
65 years and above ...	2	2	4
Total ...	46	54	100

Mean Age 49.3 years.

DePalma, Callery and White dissected 95 shoulders of various age to study the degenerative changes in and around the joint. They found that these abnormalities

are noted first in the 2nd decade and increased in gradient in each successive decade. It appears that the 'Painful and Stiff' shoulder with associated degenerative changes in the cuff, and biceps are the price paid by man for adoption of upright posture which throws a constant strain on the shoulder. Perhaps biceps tendon is forced to function as one of its main support of the upper limb and so subjected to greater attritional forces because shoulder joint is designed for arboreal rather than biped existence.

2. *Sex Incidence.*—The males are more predisposed to this affection. In our series ratio of females to males was 54 : 46. The greater incidence in females may be due to less use of the limbs at shoulder than in males.

3. *Side Affected.*—The syndrome affects the left side more commonly. In this series 6 patients (6%) had bilateral lesion. The greater frequency of left side can be explained due to less functional use of the left limb. The affection of the other side may be due to 'overwork' at shoulder on the healthy side. It is here where Neirager's and Coventry's Hypothesis of 'Disuse' fails. It can be said that this overstrain puts the shoulder in rest or relative 'disuse' for sometime during which metabolic changes in the tissues occur. Moseley explains that this little trauma, perhaps of 'overstrain' also can initiate the changes of "reflex dystrophy" in the tissues around the shoulder.

Occupation.—There is overwhelming relative frequency of 'Frozen' shoulder in sedentary workers as opposed to heavy labourers. In 54 women patients—

52 House wives.

2 School teachers.

In the case of house wives also, very little work was done by them as they had their

daughters or daughters-in-law for the work to do.

In 46 men, analysis showed :—

Farmers	...	4
Patients engaged in clerical jobs.		32
Beggars	...	2
Pleaders	...	2
Mechanical Fitters	...	2
Carpenters	...	4
and others	...	4

So it clearly reflects that 'Painful and Stiff' shoulder develops in persons engaged in certain professions where they do very little manual work. So it is the weakened joint with inadequate reserve for which the illness has special predilection as in Neivage's analysis where the incidence was in Sedentary workers - 96% and in Labourers - 4%.

In our series 6 patients got the syndrome after days strenuous work. So it may be said that some minor trauma may be acting as the exciting cause either by the 'disuse' imposed by tiredness due to hard work or directly stimulating the sensory Pathways resulting in 'reflex dystrophy' as illustrated by Mosley and others.

5. *Association with other diseases.*—DePalma and many others recorded the greater incidence of the syndrome with Cardiovascular, Pulmonary and Metabolic disorders which perhaps account the "common denominator" or 'X' factor of degenerative changes in the tissues around the shoulder. The greater frequency may be either due to 'disuse' in forced recumbency imposed by these disorders or the sympathetic pathways may be stimulated through cardiac nerves by pain in the coronary thrombosis.

In our patients there was no such association of the affection with such diseases

except in one patient who developed the syndrome in the convalescent stage of pneumonia.

6. *Infective Foci and Periarthritis.*—The consensus of opinion is that infection plays no part in the causation of the syndrome. Dickson and Crosby suggested that metabolic glandular disturbances and infections are associated with the disease.

7. *Trauma and Periarthritis.*—Our analysis showed :—

History of fall	...	22 Patients
Colles fracture	...	2 "
Sprain of shoulder	...	4 "
No history of trauma	...	72 "

DePalma's analysis of 72 patients was :—

Direct trauma (minor)	...	11 Patients
Indirect trauma (injuries to wrist etc.)	...	14 "
No history of injury	...	47 "

In our series very few cases occurred after injuries to the distal part of the limb e.g. elbow, wrist and hand. This reflects the importance of Physiotherapy where the parts not immobilized are regularly given exercises and these check the factor of 'Disuse' to operate.

It is not the severe trauma like fractures, dislocations and rupture of the cuff which cause 'Frozen' shoulder. It is the minor trauma which initiates the disease perhaps by imposing relative 'Disuse' or causing sympathetic reflex dystrophy (Coventry, Mosley etc.) or causing rupture of the few fibres of the rotator cuff, resulting in tendinitis (Codman, Simmonds etc.) We are inclined to believe that reflex dystrophy may be responsible for the affection and it can be brought by trauma to any part of upper limb or functional disease or some unknown factors.

8. *Relation to Immobilizing Lesions.*—Ghormley has emphasized that painful shoulder

may result from "any condition requiring prolonged fixation of the joint". There occurs 'relative immobilization' or "Functional Disuse" of the shoulder in Colles's fracture or other such injuries of the distal part of the limb requiring immobilization. The exercises are not given at the shoulder and this may operate by causing stiffness at the shoulder due to prolonged immobilization (stiffness - pain on movements - increases stiffness (because of lack of movements)).

9. *Shoulder Pain and Periarthritis*—It has been emphasized by some workers that initial cause of Periarthritis is pain which may be mild or severe. This may be brought about by minor trauma or sprain or twist of the shoulder joint.

Pain	...	Recovery.
Disuse	...	Use.
	...	Periarthritis.

Whether this pain causes direct 'sympathetic' disturbance by working through the sensory pathways at the peripheral level (De Takats) or in the internuncial pool of Spinal Cord (De No) or in the Cortex (Stein Brocker), resulting in reflex dystrophy or by operating through the factor of functional disuse resulting in metabolic changes in the tissues (De Palma and Neviasce) or sympathetic disturbance (Coventry) is yet to be determined.

10. *Periarthritic Personality.*—We have failed to recognise the peculiar constitutional and emotional state in our patients while some workers suggested its essential presence for the vicious aids of Periarthritis to complete.

It appears that the poor patient has been blamed for his own plight as is usually done in other partly understood diseases, we believe that these psychic disturbances can be more often a result of the 'Painful and Stiff' shoulder than its cause because these

manifestations at once disappeared as soon as the painless normal movements were restored. The anxious, depressed, restless patient again became as cheerful as before.

What actually initiates the syndrome in majority of the patients who give no history of pain or trauma is yet to be discovered.

Clinical Picture

The mode of onset in majority of the cases is insidious (86% patients). The exciting factor may be some mild trauma to the shoulder as in fall, or sprain or twist. The patients usually attribute pain to these. In majority of cases, mostly with insidious onset, there was no exciting factor found in the history.

11. *Duration of Symptoms at the Time of Consultation.*—No doubt the acute onset of the disease is infrequent and it throws the patient in agony of pain but the patients usually came late to our Hospital when all remedies at their disposal had failed to give relief. In our series, the disposal record showed the following :—

Duration of the symptoms.	No. of shoulders affected.	No. of the patients.
Before 2 months	None	—
2 - 3 months	24	24
3 - 4 months	22 2 Bilateral (as in nine cases)	20
4 - 5 months	25 1 Bilateral	24
5 - 6 months	5	10
6 - 9 months	7	14
9 months to 1 year	2	4
Over 1 year	2	4
Total	103	100
Average duration	4.62 months.	

Neirager analysis showed the average duration of 4.82 months with minimum as one month and maximum as 9 months.

Symptomatology

The outstanding presenting symptoms are:—

- Pain in the shoulder region with distal radiation.
- Limitation of motion at shoulder and inability to elevate the arm.
- Occasionally weakness of the arm.
- Psychic symptoms.

1. *Pain.*—Duplay (1872) recognised pain as the outstanding symptom of the syndrome. (Hilton) gave as the purpose of pain, the need for rest for the injured portion as nature's method of splintage of a joint. Pain is the commonest and the 1st symptom. In this series 84% patients complained of pain as their 1st presenting symptom and the 14% as their 2nd complaint. Only two patients did not complain of any pain at the time of consultation although they had it in the beginning of the disease. All patients have pain of varying severity mild or severe - at the onset of the disease.

Pain may be felt during any movement, elevation, internal rotation and abduction in order of frequency. The Patient usually ascribes the pain to this movement which in their words cause 'sprain' or twist of the shoulder. The history records of the patients showed that following activities have been responsible for the initiation of the pain.

- Putting on a coat or shirt.
- Reaching up the shelf.
- Placing hand in the Wallet pocket.
- Fastening a Brassiere or rubbing lower interscapular region during bath.
- Combing hair.

Two patients got pain after getting up from the bed in the morning and thought the pain due to some twist in bed at night.

Pain is felt deep in the area of humeral head and down at the insertion of the deltoid tendon or somewhere along the deltoid muscle. It is a tooth ache like pain or dull aching pain which gradually increases and may become of piercing character. Pain, though constantly aching, is specially increased by any movement causing abduction or adduction with internal rotation. At night sleep may be disturbed, the patients being unable to sleep on the affected side. In our observation it has been felt that the pain is directly related to the limitation of motion as evidenced by the cessation of pain when the range of motion improves or *vice versa*.

The pain usually referred to mid humeral region (deltoid insertion) may be fanned into the forearm, wrist and fingers. The typical scalenus anterior syndrome may be produced by the spasm of the said muscle. The pain may be referred to the back over the scapula or up the Neck due to inter segmental diffusion of pain which is not uncommon. The fingers may tingle, may become swollen, Hyperaemic and Hyperaesthetic. The patient's grip may be weakened.

In certain cases in our series the pain has been so severe that the patients walked at night with the limb supported by the side. This attitude of the limb, has resulted in adduction and internal Rotation contracture. The lack of movements allows adhesions to form in the synovial cavity bursae and facial planes and may end in 'Frozen' shoulder.

In other cases the pain has been mild throughout the course of the disease. Some patients have been more fortunate where

early pain which later spread down the arm, retraced its steps leaving the peripheral areas and gradually working back to the shoulder region. The Disease is known for spontaneous termination at any stage. It may be said that in these patients the factor of Disuse could not operate well.

The pain initiated in any way can continue to keep up the 'Vicious circle' of Periarthritis complete. This pain may be operating by causing sympathetic Disturbances resulting in reflex dystrophy of which again the pain is one of the symptoms. This circle can be broken by abolition of pain by any medical or surgical measures.

2. *Limitation of Movements.*—All patients have limitation of movements but some may fail to complain unless specifically asked for. This stiffness of the joint is expressed in the various disabilities felt by the patient; the most common being inability to elevate the arm at the shoulder. 14% patients gave the above disability as the 1st symptom and the pains as the next symptom. 2% patients had only the inability to elevate the arm at shoulder although they had pain at the time of onset of the disease.

In the initial part of the syndrome, especially if the pain has been severe the limitation of movements is due to spasm of the muscles around the shoulder, brought about by pain 'Nature's splintage of joint' (Hilton). This limitation is in all planes. As the arm is held by the chest (Position of rest), Contracture and adhesions develop in the shoulder joint, bursae and in fascial planes. The humeral head held high up in the glenoid appears to be prevented from descending, thus limiting abduction due to diminution in the capacity of the shoulder joint and contracture of the adductor muscles. The range of motion increased by

10° - 20° when these patients were put under general anaesthesia.

In the chronic stage the limitation of motion is due to adhesions and contractures, and so the range is not affected by the anaesthesia.

In the 3rd group of patients, the pain has been never severe and the movements have been lost quietly. Many patients noticed limitation for the 1st time when they tried to pick up a thing, from the shelf or wear a coat. Similarly other patients noticed that their range is gradually decreasing till they could not dress their hair or put on shirt.

The patients with nerve palsies or ankylosis of elbow get "stiff shoulder" so quietly that they had no pain at any time.

3. *Weakness of Arm.*—Some patients complained of weakness of the arm and hand-grip. There has also been history of tingling in the fingers, hands and forearms in some cases. A few patients gave history of swelling of the fingers at the time of onset of disease although it had disappeared by the time patient had come to the Hospital.

4. *General Symptoms* in the form of loss of weight, loss of appetite and weakness were present in many of them perhaps all due to pain which disturbs their sleep and general health.

5. *Psychic Symptoms.*—Almost all patients were anxious, worried and depressed because of loss of function at the shoulder. They felt that their future was doomed because of failure of ordinary treatments and analgesics in relief of pain and limitation of motion. They were dejected and despondent because their professional work was suffering and financial difficulties had arisen. Some of them described their

symptoms in a wealth of metaphors and by lavish use of superlatives to impress their symptoms.

With the improvement in functions with treatment, these symptoms disappeared rapidly.

Clinical Signs

After thorough examination of the patient, a triad of signs was practically seen in all patients.

(i) Limitation of Movements.

(ii) Pain at the limits of motion.

(iii) Tenderness at the bicipital groove.

(i) *Limitation of Movements.*—In all patients, motion was limited at the shoulder joint. It is usually said that in the early stage of the disease, there is usually no loss of motion, but in this series it was not so. The cause of limitation of motion has been spasm in cases with severe pain; and adhesions, contraction of capsule and contractures of muscles specially adductors, in chronic cases, or cases where pain is not a marked feature.

(ii) The second point revealed on examination was the range of active movements and Passive movements was almost the same in almost all cases.

(iii) An other important information revealed by this study was about the movements affected by this limitation. It is usually stated by many workers, that this affection causes limitation of abduction and Ext. Rotation and is free for other movements. This may be true in early stage but in the later stage at which the patients usually come, movements are limited in all planes. Abduction and Ext. Rotation are affected earlier and more severely than other movements. This progressive limitation of motion ends, in 'Frozen' shoulder

in which all movements at the gleno-humeral are abolished. The upper limb still moves on the trunk, but it does so through the scapulo-thoracic movement, because of lateral and forward movements of the scapula around the chest wall, the arm passes forward from the coronal plane by 20° to 30°.

The Abduction Movement was limited in all cases. In this series, 44% patients had range of abduction below 70° or 8% had abduction more than 100°. 48% had abduction between 70° - 100°.

The Ext. Rotation was again limited in all cases

In 44%	...	5° - 20°
48%	...	between 20° - 60°
8%	...	more than 60°

The limitation of external rotation and Abduction go hand in hand.

The Flexion movement was comparatively free but limited.

6% had complete flexion.

22% had less than 120°.

72% had flexion between 120° - 180°.

The other movements specially internal rotation and adduction, were limited. Some patients gave their complaint as inability to take hand on to the back. Limitation was roughly judged by asking the patients to take hand to the inferior angle of the opposite scapula across the back. Majority of them failed to touch the opposite scapula.

Limitation of Adduction movement is the most important sign of this syndrome. Its limitation is almost Pathognomonic of 'Frozen' shoulder. It is seldom noticed by the patient or tested by the doctor. The patient is asked to touch the opposite spine of the scapula with arm and forearm across the front of the chest. It was found limited in majority of the cases.

Extension was not limited more than 10° - 30° in majority of cases.

The character of limitation varies with the stage of illness. In the painful phase or stage of increment, it is primarily pain that causes limitation. In the later or healing phase, mechanical block is perceptible to the examiner and pain develops or increases only upon attempt to strain the shoulder beyond point of mechanical block. In extreme cases, fixation may be so complete that only a few degrees of remaining motion is elicited only by grasping the angle of the scapula with one hand while conveying slight motion to the patients arm by the other hand.

Aldar Farkas has laid great emphasis on two signs namely Scapular sign and Elbow sign. In the former the patient tries to grasp the shoulder of the contralateral side with the arm across the chest with the hand and fingers sliding over the shoulder until the region of the spine of the scapula is reached. In this affection, the patient fails in this attempt. The comparison between both sides and measurement of the distance of the finger tips crossing the chest from the scapular sign gives a fair measure of limitation of muscular arrest, and is helpful in judgment of the improvement. This test has been positive in almost all cases.

Elbow sign in which there is inability to extend the elbow due to flexion contracture caused by arrest of long head of the Biceps. This sign has been found to be of no diagnostic value in our series.

2. *Pain at the limits of motion* was present in 100% cases. There is usually present certain painless range except in those cases where there is severe pain. As soon as he reaches the limits of motion, the pain increases and the movement comes to a stop. This sign is not of diagnostic value as it will

be present in any fibrous ankylosis (true or false) due to any cause. Some range of painless motion is always left in the sagittal plane even when it is completely lost in the coronal plane.

In cases in acute phase, the thoracoscapular mechanism may also be put out of action because of muscle spasm, and hence no painless range may be left. The patient gets pain even on slight movement at the shoulder.

3. *Tenderness at the Bicipital Groove* is present in most of the cases and indicates involvement of the biceps tendon in the chronic inflammation, which affects all the component parts of the shoulder joint. In this series it was present in 92% cases. The tenderness could actually be elicited extending upto the anterior joint capsule. The patient often points out painful area on the anterior part of the joint, lateral to the coracoid process and one could easily elicit tenderness.

In cases with severe pain or in acute phase, pressure on the lateral side of the joint over the deltoid also elicited tenderness.

Tenderness should always be elicited by applying pressure in the inter-tubercular sulcus, and rolling the biceps tendon under the thumb in the sulcus a little above and medial to the deltoid tuberosity where deltoid muscle is inserted. As the patient improves this tenderness decreases and finally disappears. This observation pointed to the implication of the biceps tendon in the pathological process present, and further suggests that its involvement is the chief cause of pain. This is further substantiated by the fact that those movements of the scapulohumeral joint which permit greater excursion of the humeral head on the biceps tendon, were associated with

accentuation of pain. Contrary to what is usually thought, it is not the tendon which glides in the groove, but the humerus which moves on the fixed tendon during motion at the shoulder. From complete adduction to complete elevation of the arm, a given point in the groove moves along the tendon for a distance of at least $1\frac{1}{2}$ inches. This motion is facilitated by extension of the synovial pouch from the shoulder joint to line the intertubercular groove for the greater part of its extent. Below the bursa, the tendon glides through its peritendinum. It is this tendon sheath gliding mechanism which is involved in this syndrome. Motion of the humerus on the tendon, in all movements of elevation at the shoulder, whether the elevation is accomplished through the pathway of forward flexor or abduction causes pain. All these movements are nearly always associated with strong flexion and supination of the elbow, the long head of the biceps is rendered exceedingly taut as these latter movements increase its tension but require no gliding motion.

De Palma could elicit involvement of the tendon in 72% cases at operation and tenderness was clinically present in all cases.

Other Signs

Wasting of the Spinatus - Muscles and Deltoid Muscle.—In 'Frozen' shoulder the wasting of the spinatus muscles is quite apparent, so that scapula stands prominently. In cases with acute pain, this wasting occurs rapidly. Next to the spinatus muscles, deltoid is wasted and this results in flattening of the shoulder with soft, flabby deltoid on palpation.

2. Muscular power of the muscles of the arm, forearm and hand is usually normal although the patients with severe pain may feel weakness of the grip. The muscle power in other muscles is usually normal.

3. In some patients the tenderness was present at the lateral part of the joint (lateral to the normal process).

4. Psychic disturbances have been referred to above.

Treatment

As the true nature of the disease is ill understood, there is no specific treatment. Since the recognition of disease by Duplay (1872) the treatment has been based on empirical grounds and aims at alleviating the symptoms of pain and limitation of motion.

As the basic pathology of pain, though ill understood, is thought to lie in some sort of non-bacterial chronic inflammation of unknown origin with adhesions of the capsule of the shoulder joint and adjacent tissues, and involvement of the biceps tendon, tendon sheath gliding mechanism. The principle of abolishing inflammation by such non-specific anti-inflammatory and fibrinolytic agent like cortisone oral or intra-articular, or by age old counter-irritants, like Scott's ointment or by directly attacking the biceps tendon and obliterating the tendon - tendon sheath mechanism by surgical means which also do not offer more than Palliative therapy, form the basis of treatment.

The restoration of motion can be either attempted by active exercises which can only be best applied after the relief of pain by any above therapy which allow gradual increase in range of motion or by manipulation by which all adhesions are broken and complete range of motion restored but this restoration of motion can only be maintained if the severe pain following manipulation can be relieved by cortisone therapy and reformation of adhesion is checked by active exercises and fibrinolytic action of cortisone or its related drugs.

Treatment was divided into two parts

1. General treatment.
2. Local treatment.

General Treatment

(a) The recognition of psychological and social factors in the patient emphasize that the patient should be treated as a whole and not as a problem of disturbed shoulder mechanism. Proper psychotherapy should be instituted to counteract anxiety, depression and Hypochondriasis, which always increase the pain. Poor muscular development and posture, inadequate nutrition and anaemia were treated by active postural exercises, supplementation of diet with vitamins and iron tablets. The patient must be induced the "will to recover". He is impressed that stronger the will to use the painful shoulder, the greater the ability to stand pain, sooner will be the recovery.

(b) Analgesics are given for temporary relief of pain and spasm so that patient can sleep well at night. We used only mixture soda salicylas Ounce One T.D.S. or Codo-pyrine Tablets. No narcotics were used. Cortisone was used in majority of cases. It acts more than simple analgesic.

Local Treatment

- (i) Preventive.
- (ii) Conservative.
- (iii) Surgical.

(i) *Preventive.*—This treatment is instituted in every patient with the aim to maintain motion in the shoulder joint after slight trauma or sprain of the shoulder or when fractured bones of distal parts are immobilized. The ideal, therefore, is "Early use of injured part without movement of the injured structure" (Watson Jones). Codman's "Pendulum" Type exercises can be given.

(ii) *Conservative Treatment*.—100 patients were divided in six groups for the purposes of treatment and evaluation of different therapies were done, only on clinical assessment of the cases. It has been well realized that clinical evaluations alone are not truly quantitative but it is necessary to rely on them at present because of lack of any bio-assay methods or other satisfactory laboratory tests to assess the activity or progress of the disease.

(i) Scott's Dressing, 5 patients.

(ii) Physiotherapy alone in the form of

- (a) Heat application.
Hydrotherapy.
Thermotherapy.
Electrotherapy.

(b) Exercises - active and passive.

(c) Massage.

(iii) Local infiltration with Xylocaine and Physiotherapy.

(iv) *Cortico - Steroids*

(a) Oral.

(b) Intraarticular.

(c) Oral and Intra-articular.

(v) Manipulation with Physiotherapy.

The treatment with Scott's strapping gave only temporary relief. The partial relief may be due to splintage action of shoulder spica. The results were poor when compared with other methods.

The Physiotherapy has been the sheet anchor of treatment till the advent of cortisone and still forms an essential and integral part of every form of treatment described above. It plays a very important part to break the vicious circle of Periarthritis shoulder where 'Disuse' factor plays a major role. It appears that principle of

movement and function is the key to therapy and we believe that principle of rest so emphasized by Hilton and others has been carried too far in our treatment of this lesion. It has been applied in the form of application of heat, in the forms of hydrotherapy, thermotherapy and electrotherapy the latter as infrared exposure and short wave diathermy (ii) Massage and (iii) exercises - The exercises help to

(a) mobilize the shoulder joint and to maintain increasing range of motion.

(b) to restore muscle power (muscle re-education).

(c) to restore co-ordination of movements (movement re-education).

They alone with heat and massage have been able to effect cure in a few cases but the time taken to do so was much longer than if supplemented with cortico-steroids or manipulations. This single form of therapy is more suited to patients who have come early, have not got severe pain and would thus attempt active exercises.

Results in our series were

10 patients Excellent in 4-6 months.

6 " Good 4 "

4 " Poor 4 "

The cortisone therapy is a great advance in the treatment of 'Periarthritis' shoulder.

Corticosteroids by Intra-articular injection were given in 30 cases. In 20 cases 1 cc. (25 mgm.) of hydrocortisone, was given biweekly and in other group of 10 cases Hostacortin 'H' (prednisolone) crystalline suspension of 1 cc. (1st injection of 10 mgm., and later of 25 mgm.) was given at the same interval.

On an average we had to give 10 - 12 injections of hydrocortisone or 5 - 6 injection of Hostacortin 'H' (prednisolone) crystalline suspension for the cure of the disease.

The cases being treated with Hostacortin 'H' (Prednisolone) Crystalline suspension in our series needed lesser number of injections and had a quicker relief of pain than with plain hydrocortisone and the recurrence were almost nil.

This treatment of intra-articular injection of Corticosteroids definitely shortens the duration of treatment and patient can go to work much earlier.

The physiotherapy was continued in the form of active exercises even after the restoration of full movements to check refreezing of the joint again. Cortisone therapy was adjunct to Physiotherapy and not *vice versa*. There were no local complications of Intra-articular therapy in our series given.

15 patients were given local xylocaine infiltration in the shoulder joint supplemented with physiotherapy and Cortisone therapy. The pain is relieved immediately but patients complained of "some heaviness" persisting, and the pain reappeared at night. After the injection the patient was persuaded to do exercises. The injection was repeated on 4th day. After two months' treatment the results were

Good in ... 20%

Poor in ... 80%

It emphasizes the fact that Hydrocortisone acts more than simple analgesia and is much superior to xylocaine in the therapy of 'Frozen' shoulder. It can be used to relieve pain in the absence of Intra-articular Hydrocortisone which is a costly medicine.

Only five patients were kept on oral prednisolone therapy. Although the relief of

pain was dramatic and result were good relapses were frequent. There are definite advantages of Intra-articular therapy over oral therapy. There are no systemic effects of Intra-articular Hydrocortisone. It has only local action, and so can be used in all patients where oral cortisone therapy is contraindicated. The patient has not to be examined daily and so offers good ambulatory treatment. There are no withdrawal symptoms.

Manipulation with Intra-Articular Cortisone Therapy

The acceptance of manipulative surgery for stiff joints has been very discouraging in the past and it has been condemned as dangerous and futile. As a rule, pain after manipulation has been so severe that active motion is difficult or impossible for the patient. By the time the pain subsides, the adhesions reform often with more limitation than before. The introduction of intra-articular Hydrocortisone therapy has solved all these difficulties provided physiotherapy forms an essential part of the treatment. The intra-articular Hydrocortisone relieves the pain and checks formation of adhesions. The shoulders of 25 patients were given the trials of the treatment. General anaesthesia has been used in all cases to secure adequate relaxation, to render the procedure painless and to allay the fear and anxiety of the patient. The force applied during manipulation should be regulated with ease. The movements are elicited by leverage. The patient lies supine on the operation table with shoulder projecting over the edge of the table. The surgeon standing on the side grasps the arm just distal to the axilla to avoid fracture of the neck of humerus with his forearm pressing equally at all points against its length. The operator's other hand depresses the shoulder and restricts motion of scapula and clavicle. The

axillary border of the scapula may be fixed by the assistant. The first movement consisted of powerful traction to cause distraction followed by External rotation and abduction. The external rotation must precede abduction. A soft tearing noise is heard and then a sudden release of resistance occurs. Later the other movements are done to their full range. In this way all "Cheekreins" to movements are ruptured. The aqueous suspension of Intra-articular Hydrocortisone with 10 c.c. xylocaine solution was injected in the shoulder joint. The addition of the latter brings immediate relief. The patient's limb was kept fixed in Hyperabduction for 24 hours when he is again given intra-articular Hydrocortisone 1 c.c. and active exercises are started with massage and heat application. The injections were repeated twice a week till total number of five injections was given. The Physiotherapy was continued. The results at the end of one month were

Excellent	...	80 %
Good	...	16 %
Poor	...	4 %

The one patient who did not improve well was very irregular in attending orthopaedic Rehabilitation unit for Physiotherapy.

It appears that manipulation is definitely a method worth trial. It definitely cuts short the course of the disease and saves numerous hours of loss of work. No complication was met with in our series, although dangers of manipulation are there, specially of osteoporotic humerus. We feel that it is better to restore full movements at single manipulation, than to increase the range at many sessions. This method may prove to be the method of choice in future in the treatment of 'Frozen' shoulder. In all these cases a premanipulation skiagram of the shoulder joint is advised to exclude severe Osteoporosis of the bones where this procedure is contraindicated.

Other methods of surgical treatment including operations on biceps tendon to obliterate tendon-tendon sheath gliding mechanism were not done.

Results

The evaluation of different treatments were done on clinical assessment of the cases. It is well realized that clinical evaluations alone are not truly quantitative, but it is necessary to rely on them at present as there are no bioassay methods or other satisfactory laboratory tests to assess the activity or progress of this illunderstood disease.

The efficacy of treatments was inferred as follows :-

(i) Excellent, No pain, No limitation, No disability.

(ii) Good, No pain, Some limitation of movements, No disability or only slight disability.

(iii) Fair, Some pain, Some limitation of movements, Disability present.

(iv) Poor, Pain and limitation of movements not or slightly improved, Marked limitation of movements, Disability present and inability to attend to himself.

An open mind was kept throughout the treatment to revise the diagnosis in cases of doubt. All precautions were taken to see any complications of treatments.

Conclusions

(1) The title of 'Painful and stiff' shoulder does not include all cases. It refers to a special group of cases with their characteristic natural history, classical clinical pattern with long protracted course spanning over months to 2-3 years.

(2) It occurs in patients past forty, more in females and sedentary workers.

(3) Pain is usually the presenting symptom. Limitation of abduction is the next common complaint.

(4) Clinically a triad of signs in the form of (i) limitation of motion specially abduction and ext. rotation in initial stage and its involvement in all planes in later stages (ii) Pain at the limits of motion (iii) tenderness in the bicipital groove is present in all cases.

(5) Treatment is based on empirical grounds and aims at relief of pain and limitation of motion. The cortisone therapy is a definite advance in the treatment of 'Frozen' shoulder. It has reduced the duration of treatment. The manipulation with Intra-articular Hydrocortisone has further shortened the period of disability by months. The usual conception that manipulation is dangerous and futile is baseless in this disease, provided cortisone therapy in addition to Physiotherapy follows.

(6) Physiotherapy forms an essential and integral part of the therapy. Cortisone therapy is adjunct and not *vice versa*. The latter not only alleviates pain but also diminishes the course of malady.

Our thanks are due to Dr. R. C. Srivastava, Superintendent, Gandhi Memorial and Associated Hospital, Lucknow, for permitting us the use of the Clinical data of the Patients attending Orthopaedic Department of this group of Hospital. Our thanks are also due to Mr. G. Winter nitz, Scientific Director and Mr. V. K. Sinha the Local Representative of the Hoechst Pharmaceutival for supplying us Hostacortin 'H' crystalline suspension and also giving us valuable suggestions in the use of this drug.

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THE XXIV ANNUAL CONFERENCE

The XXIV Annual Conference of the Association of Surgeons of India will be held at Calcutta during the last week of December, 1962. Dr. K. K. Ghosh, M.B., F.R.C.S., 33-B, Landsdowne Road, Calcutta-20, is the Local Secretary, who is making arrangements for the Conference. At the Conference the following subjects will be discussed :

- 1. Tumours of Urinary Bladder.**
by Drs. K. K. Ghosh and H. K. Sarkar, Calcutta.
- 2. Management of Burns.**
by Dr. Anjali Mukherji, Calcutta.
- 3. Symposium on Extracorporeal circulation for Cardiac Surgery.**
(Initiated by Prof. A. K. Basu and Prof. P. K. Sen) with Guest speakers.
- 4. Septic and Suppurative Arthritis of the hip.**
by Dr. B. Mukopadhaya, Patna and Dr. N. D. Aggarwal, Patiala
and
- 5. A Paper on Anaesthesia.**

Besides this a few short papers will be presented. Members desirous of reading short papers are requested to let the Office know about the titles of their short papers well in advance (before the 30th of June, 1962).

Titles of Sectional Short papers should be intimated to the Secretaries of the various Sections before the above date. The names and addresses of the Secretaries of the Sections are as follows :—

1. Thoracic Section.

Dr. N. Gopinath, M.S., F.A.C.S., Department of Thoracic Surgery, Christian Medical College, Vellore (S. India).

2. Orthopaedic Section.

Dr. B. Mukopadhaya, M.Ch.Orth., F.R.C.S.E., Khuda Bux Library Road, Patna-4.

3. Plastic Surgery Section.

Dr. N. H. Antia, M.B., F.R.C.S., Ben Nevis, B. Desai Road, Bombay-26.

4. Urology Section.

Dr. B. N. Colabawalla, F.R.C.S., Ben Nevis, B. Desai Road, Bombay-26.

Railway concession certificates for attending the above Conference at Calcutta in December, 1962 will be available at the Head Office at Madras, from the 1st October to the 30th of November 1962.

* * *

SUBJECTS FOR DISCUSSION AT FUTURE MEETINGS

25th Meeting (1963)

- 1. Hypothermia.**
- 2. Experiences in Surgery for Chronic Pancreatitis.**
by Dr. R. S. Gupta.

26th Meeting (1964)

- 1. Non-tuberculous Intestinal granulomas.**
by Drs. A. Prakash and S. K. Nair, New Delhi.
- 2. Surgery of Leprosy.**
by Drs. N. H. Antia, Bombay and Paul Brand, Vellore.

* * *

NOTICES

FOR SPECIAL ATTENTION TO THE MEMBERS OF
OUR ASSOCIATION

Members are requested to let the Office know about their changes of addresses, as otherwise there is a chance of getting their copies of the Journal lost in the post, and sometimes it may not be possible to send duplicate copies.

They are also requested, to intimate the Local Secretary at Calcutta, Dr. K. K. Ghosh, M.B., F.R.C.S., 33-B, Landsdowne Road, Calcutta-20, the changes of their addresses, so that notices etc. in connection with our ensuing Conference at Calcutta in December this year will reach them promptly.

* * *

UROLOGY SECTION

The Sectional Conference of the Urology Section of the Association of Surgeons of India will be held on the 16th and 17th of August 1962 at Vellore (S. India). Members of the Urology Section and all members of the Association of Surgeons of India are requested to attend this Conference.

Dr. H. S. Bhat, M.S., Professor of Surgery, Christian Medical College and Hospital, Vellore, is making the necessary arrangements for this Conference and members desirous of attending the Conference are requested to contact him early (before 15th June 1962) for accommodation, etc. at Vellore during the Conference.

* * *

ORTHOPAEDIC SECTION

INVITATION

**from the Embassy of the Federal Republic of Germany, through the
Director-General of Health Services, New Delhi**

50th Meeting of the German Orthopaedic Society

SEPTEMBER 19, 20, 21, 22, 1962

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Cervical Syndrome

Traumatology

- i. Traumatic Dislocation of the Hip-joint.
Necrosis of the Femoral Head, following traumatic Dislocation.
- ii. Treatment of Pseudarthrosis of long bones.

Diseases and Pathology of the veins**Rehabilitation**

To facilitate your enrollment for the meeting in Munich or the Instructional Courses which will be held from September 17-18, 1962 at the Orthopaedic Hospital in Munich it is necessary to register until April 1, 1962.

Office of the
President of the German Orthopaedic Society
Professor Dr. Max Lange
Munich—Germany, Harlachinger Strabe 12.

Every member of the German Orthopaedic Society or guests intending to read a paper at the Meeting must register until April 1. It is necessary to send an abstract of the paper.

The Meeting of the German Orthopaedic Society will be finished on Saturday morning, the opening day of the "Munchner Oktoberfest". Reservation for a later meeting in one of the famous "Bierzelte" are already made.

* * *

AUSTRALIAN ORTHOPAEDIC ASSOCIATION

147, Macquarie Street,
Sydney, N. S. W.

9th May, 1962.

Dear/Sir,

The Annual General Meeting of the Australian Orthopaedic Association will be held in CANBERRA A. C. T., from Monday 24th to Thursday 27th September, 1962.

I would like to extend a cordial invitation to all members of the Association of Surgeons of India, to be present at the meeting.

Should you require further information regarding accommodation etc., please contact me at the above address.

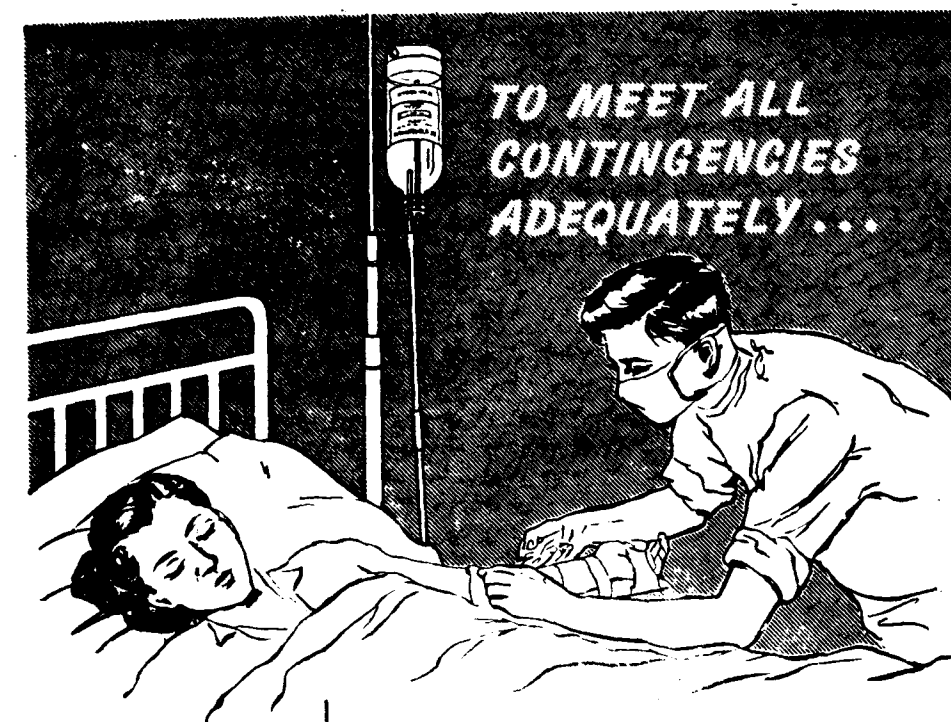
With my kind regards,

(Sd.) **Richard Hodgkinson,**
Honorary Secretary.

—★—

CONTRIBUTORS—MAY 1962

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& Dr. S. P. Uppal, M.S. (orth.),
Dept. of Orthopaedic Surgery, K. G. Medical College, Lucknow, (U.P.).



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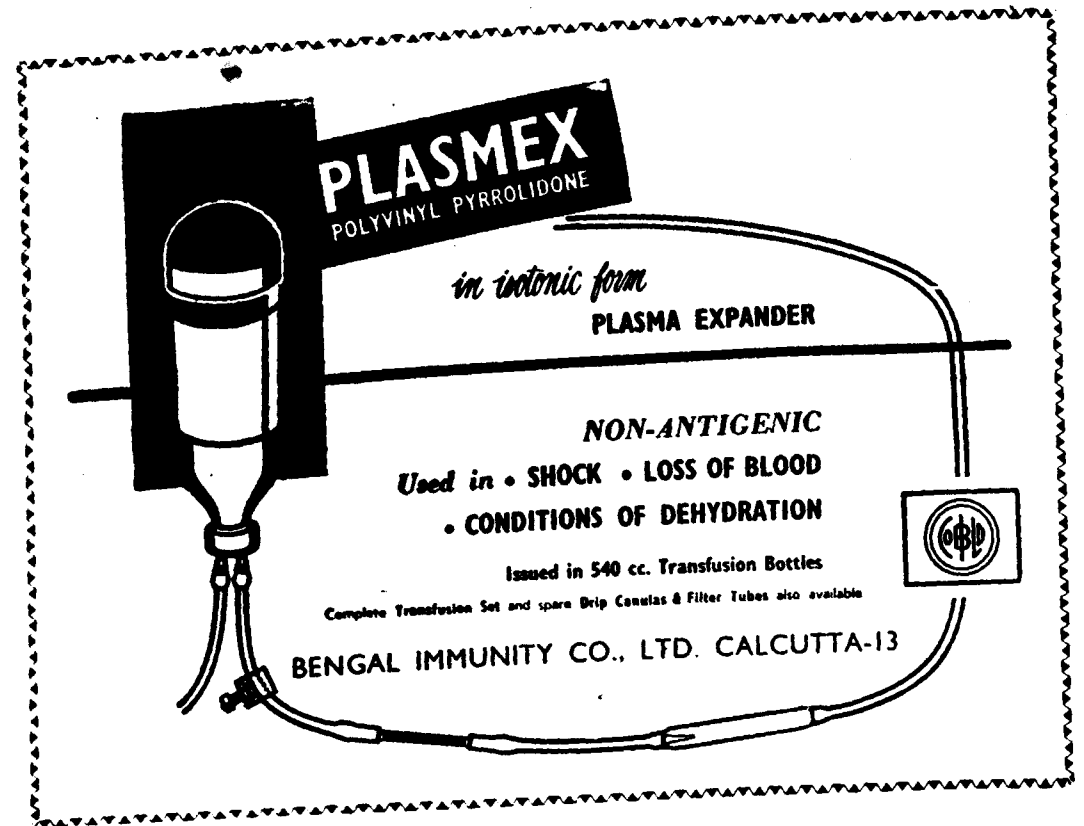
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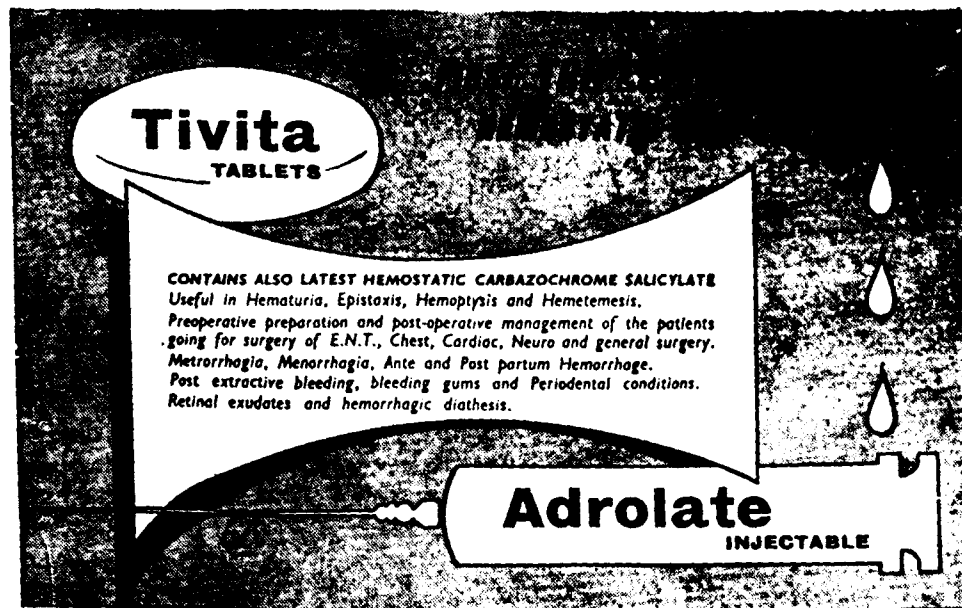
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