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THE
INDIAN JOURNAL OF SURGERY

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HYPOSPADIAS AND OTHER ANOMALIES OF THE URETHRA *

by R. N. SHARMA, Lucknow.

The topic of hypospadias is one in which practically every general surgeon is interested. The Author's interest in the subject was aroused during his internship in the Surgical Wards some eleven years ago. But it was limited until the year 1948, when Duplay's principle secured to offer a procedure whereby a solution to hypospadias could be found. An experiment followed. The patient was a young adult (Fig. 1). Due to slinging and stretching

Fig. 1. Shows the picture of a patient on whom repair was done on Duplay's principle in 1948.

of the glans to the abdominal wall and priapism he developed unbearable pain, and on the 2nd day after the operation he left the hospital unnoticed in his utter anguish. There was no trace of him again. It was a grievous disappointment indeed. But this was only to be a bid of the beginning, for during 1953, after author's return from abroad, Dr. R. N. Sinha a colleague encouraged him to again take up the experiment of repair.

As early as 1924, it appeared to Mr. H. A. Fowler that — "from the numerous procedures which have been suggested that no entirely satisfactory operation for the cure of penoscrotal and perineal hypospadias has been devised. This condition still remains one of the most difficult to treat successfully."[1] And he concluded that it was "difficult to reconcile many of the procedures recommended with the conditions that actually exist, and it is hard to see how anything but a cicatricial mass could result from many of them." This finding has not yet been falsified though it is more than three decades since it was pronounced. Inspite of a series of operations, the imbecile shown in Figure 2 could not be cured of this condition.

Fig. 2. Case 18, Chart 3.

* A paper read at the 18th Annual Conference of the Association of Surgeons of India at Indore, Dec. 31, 1956.

[1] Cabots Modern Urology, 1924.

It has been established that stilboesterol therapy has been a great advance in checking painful priapism during the post operative period. Various procedures adopted by Edmunds, Oinbredanne, Bucknall, Duplay and Young have now come to stay, even if with some modifications. They do ensure success to a large degree. But recently Dennis Browne's technique has captured the imagination of surgeons because of its simplicity, as it has done away with the large number of staging procedures in the repair of this condition. Deviation of urinary flow is a recognised routine in the final reconstruction of the urethra now. As reconstruction of the urethra is required in other congenital or acquired defects, it is necessary to also refer to the conditions of Epispadias, Traumatic hypospadias, particularly after excision of the anterior urethra for long strictures.

56 cases were studied over a period of 3 years, of these 44 were congenital hypospadias, 3 large fistulae following trauma or traumatic hypospadias, two cases required reconstruction of anterior urethra after complete excision following strictures and seven cases of Epispadias.[2]

Associated Anomalies

Associated congenital anomalies were found only in two cases of hypospadias. In one case of penile hypospadias talipes, contracture hand, congenital heart disease and group II cleft palate were also discovered. Another case of congenital hypospadias had associated congenital macrostoma. In four cases hypospadias was associated with undescended testes.

Family History

No family history was detected except in one case where two brothers had hypospadias; one having the coronal variety, while the other had the penoscrotal variety.

I. Congenital Hypospadias

From the point of view of treatment Hypospadias can be divided into two main groups, namely:

1. Coronal,
2. Penile, Penoscrotal and Perineal.

1. *Coronal or glandular variety*

(a) *With no curvature*: In twelve cases in this series there was coronal hypospadias with no curvature. A pin hole meatus existed. Simple meatotomy was sufficient with good results. No need for further reconstruction of the urethra was felt. Ten of them were cases that showed hooded prepuces, while in the remaining two, the prepuce was complete (Fig. 3).

1 2 3

Fig. 3. Coronal Type of Hypospadias Without Curvature.
1. Showing Complete Prepuce (Case 5, Chart II).
2. Showing Hooded Prepuce (Case 15, Chart II).
3. Same case as in 2 on erection.

[2] See Chart No. 1.

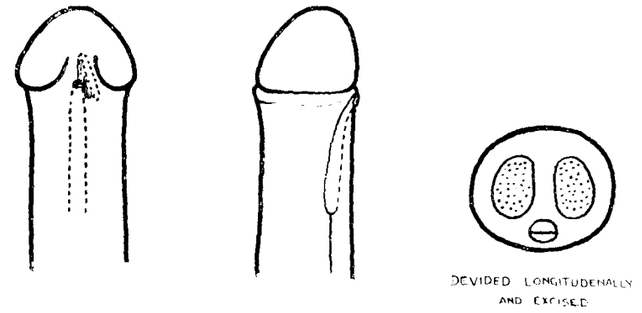


Fig. 4. Shows a simple technique of meatotomy.

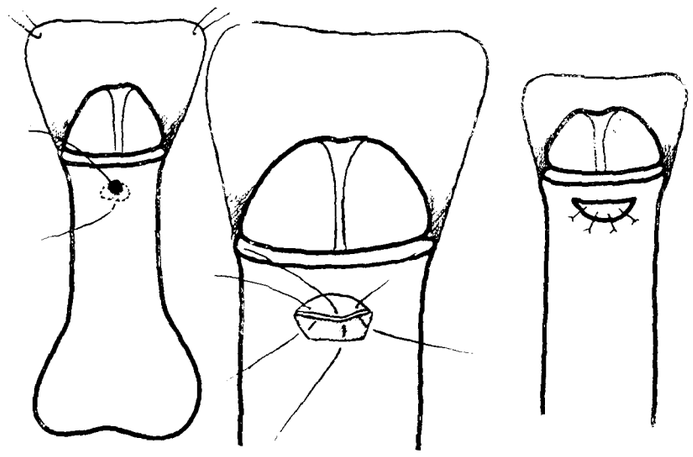


Fig. 5 shows a simple technique of meatotomy. A non-absorbable suture, e.g. nylon, is passed from the pin-hole meatus and taken out *about 4 mm.* proximally. This is 'A' or anchoring suture *that does not* allow mucous membrane to retract. The opening is next *slit just* distal to 'A' stitch and the 'A' stitch is tied. Skin as marked in shaded area is then excised and the free edge of mucosa is stitched to the free edge of skin with two or three interrupted sutures. No special dressings are required. The patient passes urine through this enlarged opening from the very beginning.

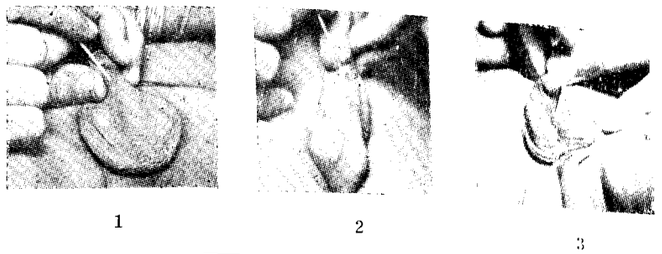
A transverse septum, described by other authors, dividing the urethra into two compartments, (the dorsal one — being more or less blind) has been met with in our experience also. In one case some effort at canalisation was found distal to the pin-hole opening, which was deliberately left as such and simple meatotomy was done. The transverse septum wherever found was divided longitudinally and excised (Fig. 4).

(b) In two cases of this variety that were associated with curvature, in addition to meatotomy, chordee correction was done according to the method to be described later (Fig. 6).

1 2 3

Fig. 6. Coronal Variety with Curvature.

1. Common type with chordee and Hooded prepuce Case 2, Chart II.
2. No chordee and complete prepuce, i.e. Congenital short urethra, therefore, the penis is curved. Case 3, Chart II.
3. Same case as in 2 after division of urethra.



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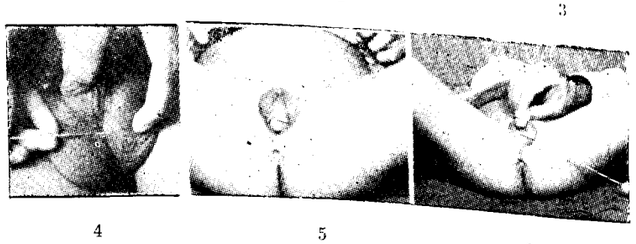


4 5 6

Fig. 7.

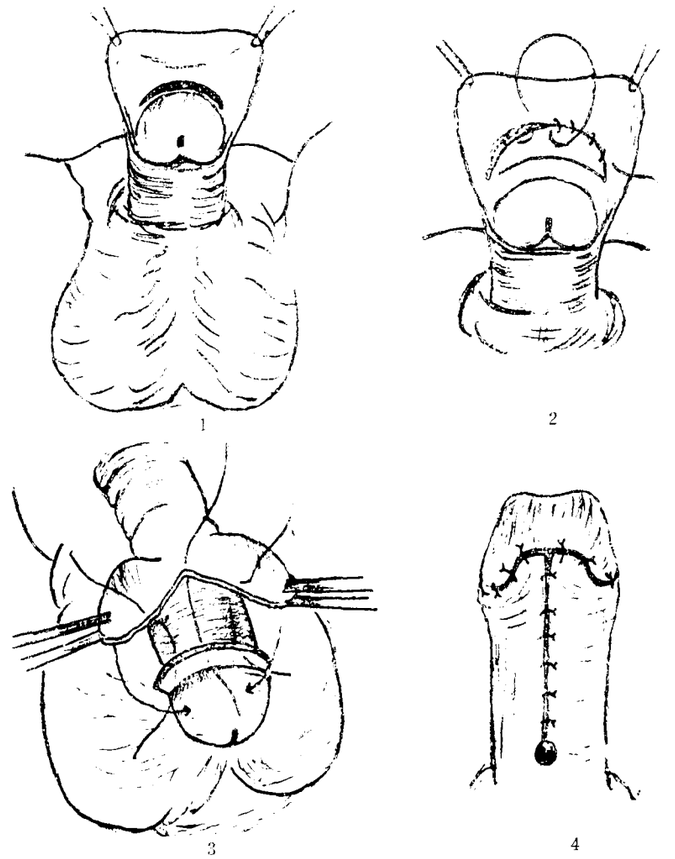
1. Penile (Chart 3/5).
2. Penile (Chart 3/9 & 4/5).
3. Penoscrotal (Chart 3/26).
4. Perineal common type (Chart 3/20 & 4/9).
5 & 6. Perineal uncommon type showing anterior position of scrotum (Chart 3/29).

(c) The case of congenital short urethra was operated upon again to straighten his penis by dividing his urethra deliberately. The operation produced a penile type of hypospadias (Fig. 6).[3]

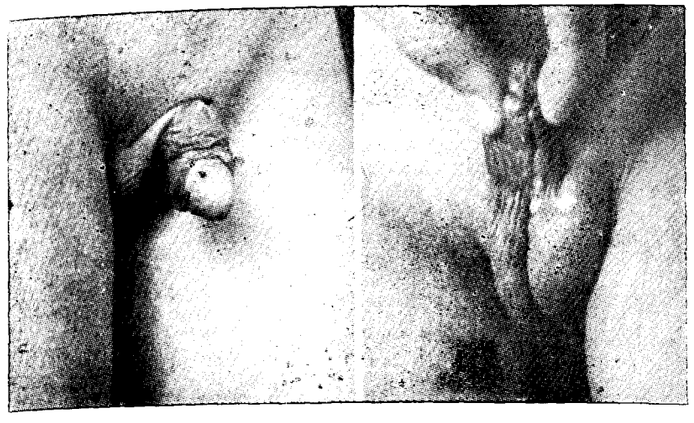
[3] See Chart No. 2.

2. *Penile, Penoscrotal and Perineal varieties of Hypospadias.*

The common types of penile penoscrotal and perineal varieties of Hypospadias have been shown in Fig. 7. Out of the 29 cases, 10 were penile, 13 penoscrotal and 6 of



1 2 3 4



5 6

Fig. 8.

1-4 Showing method of chordee correction by Edmund's technique.
5-6 Showing the results (Chart 3 14).

perineal variety. It shows the highest incidence of the penoscrotal type; next come penile and the perineal. In the perineal variety sometimes one meets with a type where the scrotum is anteriorly placed, resembling more like fused labia majora (Fig. 7 5 & 6, Chart 3/29). Difficulty arises when testes are not descended in such a case in determining the sex. The author came across two cases where the testes had not descended.

The surgical problems involved are correction of chordee or ventral curvature and reconstruction of the urethra. If otherwise not unfeasible the author undertook the correction of ventral curvature before the patient was 5 years old while he preferred to operate for reconstruction of urethra any time after his 8th year. The patients in Western countries are operated upon in comparatively younger ages because of the difference in the mode of micturition. Indians do it in a squatting position. Therefore the reconstruction of the urethra is better performed when the patient has grown up a little.

A. Correction of Chordee

The usual method of repair of chordee adopted is based on Edmunds technique wherein the prepucial skin is utilized to cover the shortage after chordee correction on the ventral surface of the penis, as shown in Fig. 8, Chart 3/14.

The author, however, followed a different technique in the 27 cases under discussion. It will be noticed that there is a triangular piece of skin distal to the urethral opening that is marked usually by a groove in the centre going up to the tip of the glans penis (Fig. 9). This groove represents the short roof of the urethra attached proximally to the urethral opening thus producing a curvature. From the same proximal urethral opening two divergent lines can be seen going up to the corona and becoming continuous with the free edge of the hooded prepuce. This triangular piece of the mucosa represents the frenum and it seems as though the frenum has got attached to the proximal urethral opening instead of finishing at the corona and merging with the inner layer of prepucial skin.

Keeping this in mind while correcting chordee the author detached this triangular piece and brought it to its normal position, thereby restoring the anatomy and completing the prepuce. These steps are illustrated in Fig. 10. After having corrected the chordee by excising the fibrous bands, the incision is extended into the free edge of the hooded prepuce that lies in continuation with the divergent line of the frenum. Undermining of the prepucial skin on both sides of the penile shaft follows, ensuring a broad base for the dorsal flap. The proximal urethra is also mobilized and it is allowed to retract further proximally and insert it at its new site wherever it sits, without any tension by making a proximal midline slit on the ventral aspect of the penis. The whole plan of incision is shown in diagram No. 10/1. Wherever we feel the necessity of a dorsal slit at this stage we make it. It has been necessary in only one of our cases. This simple procedure may now be termed as a 'V' to 'Y' closure of the defect thus inserting the free frenum at its proper place and completing the prepuce (Fig. 11).

Fig. 9. Case 6, Chart 3.

The author's technique thus does away with the need of transferring prepucial skin to the ventral aspects, reducing the multiplicity of stages obtained in Edmund's method. It may be observed that the transfer of the prepucial flap often obstructs the blood supply causing breakdowns. The healing by secondary intention that may follow not infrequently results in the recurrence of the curvature. The suture

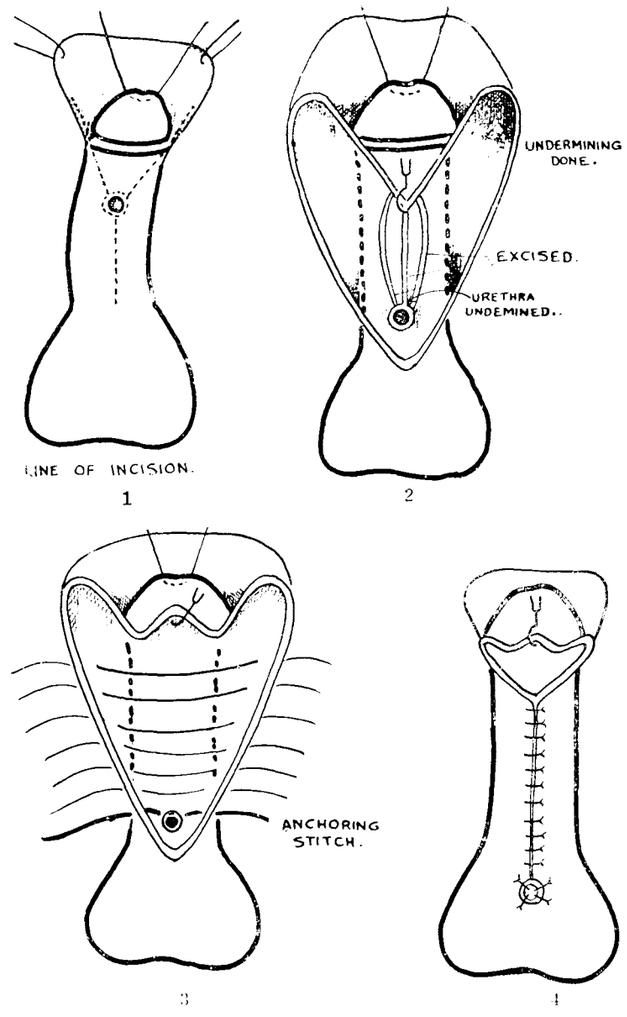
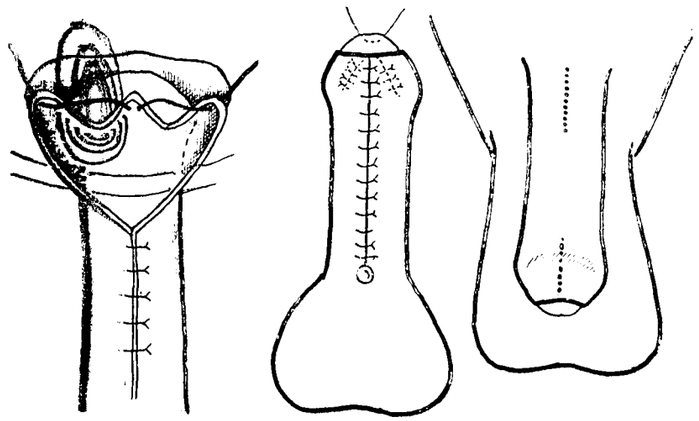


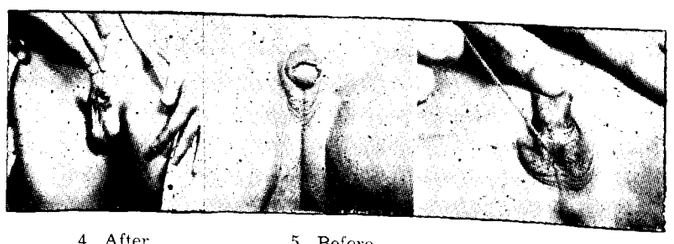
Fig. 10. 1. Showing plan of incision for chordee correction.
2. Showing the position of flap and fibrous bands.
3 & 4. Showing plan of stitching the flaps.



5 6 7

Fig. 10. 5. Showing plan of stitching the flaps.
6. After complete suture.
7. Dorsal slit made wherever necessary.

1 Before 2 After 3 Before

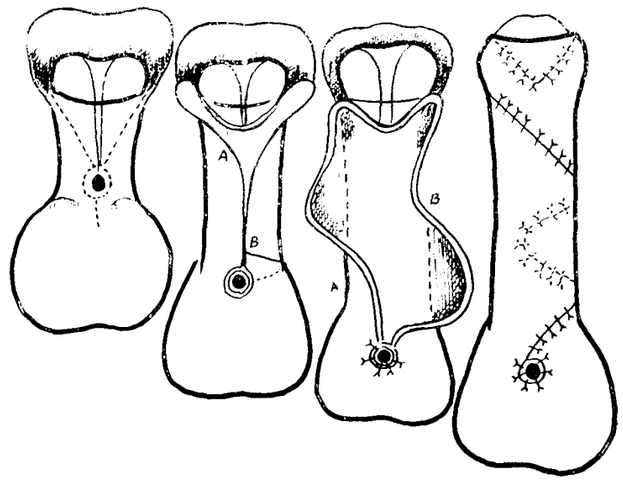


4 After 5 Before 6 After

Fig. 11. 1 & 2. See Chart 3/26.
3 & 4. See Chart 3/9 and 4/5.
5 & 6. See Chart 3/22.

1 2 3

Fig. 12-A. Chart 3/6.
1. Before operation.
2. After Chordee correction contracture due to infection.
3. After 'Z' Plasty.

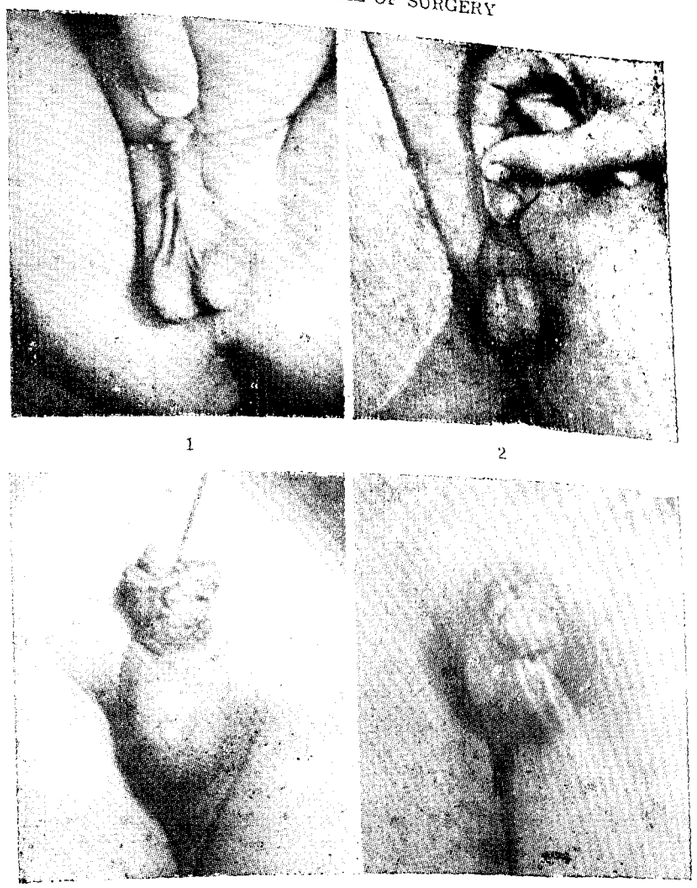


1 2 3 4

Fig. 12-B. Plan showing the technique of 'Z' Plasty.

line becomes so zigzag and the tiny skin flaps take such disheartening shape that it may become difficult to arrange these skin flaps properly on the ventral aspect. Loss of tissue if it occurs, may hamper the final reconstruction from the skin available locally. The method the author has evolved obviates the real danger and ensures the success of the operation.

This double-folding on the ventral aspect has an added advantage (Fig. 11) for in doing the final repair, it provides an extra length of skin strip upto the tip without much tension, while the rest of the double-layered prepuce opens up during the final reconstruction of urethra by Dennis Browne's technique. It results in complete saving of the prepucial skin allowing for



1 2 3 4

Fig. 13. Chart 2/2 and 4/12.

1. Before chordee correction same as fig. 6/1.
2. After correction of chordee.
3. After Ombredanne's repair.
4. While micturating.

its full utilisation. If this type of chordee correction is done in cases below 5 years of age, the newly constructed prepuce will have equal chance to grow with the penis, causing a further gain in local skin.

Twenty seven cases have been treated by the author successfully by this new method (Fig. 11). In one case, in an eighteen year old adult, there resulted, however, a contraction of the scar line, which was due to some infection. It was the same case as shown in Fig. 9. The author amended it by 'Z' plasty (Fig. 12-A).

In another adult case aged 20 years, 'Z' plasty was deliberately resorted to by the

author in the very beginning (Fig. 12-B). In all his cases below the age of 8 years, this procedure has invariably given good results, except in one, where a stricture at the urethral opening resulted, necessitating a secondary meatotomy.[4]

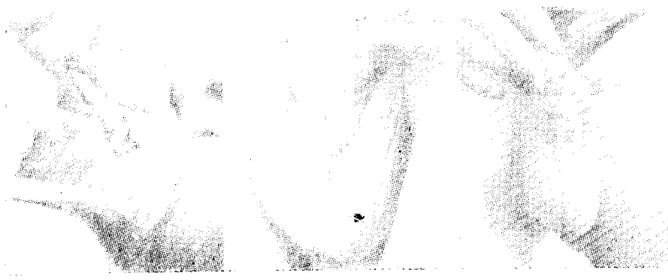
Second Stage Repair: Reconstruction of the Urethra

This type of repair was undertaken in 12 cases. One of these repairs was done on Ombredanne's principle (Fig. 13, Chart

[4] See Chart No. 3.

2 2 and 4 12). This belonged to the coronal variety associated with chordee where, after correction of the ventral curvature, it became penile. Out of the 28 cases, in which chordee correction was done, 14 were below the age of 8 years and they have been advised to come after they had attained that age. Two of these cases were adults one of whom was an imbecile where operation was deferred and the other is still under treatment.

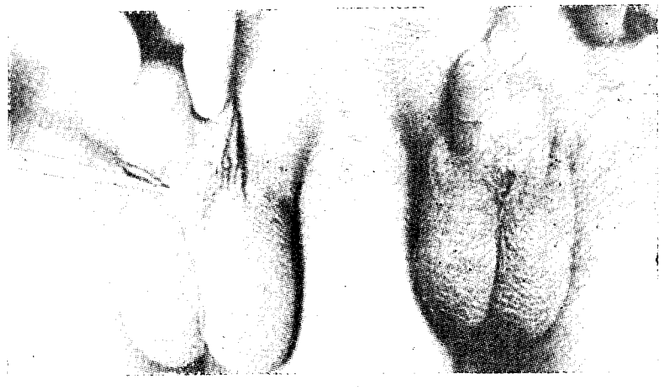
In other cases the final repair was done with Dennis Browne's method. Due to



1 2 3

Fig. 14.

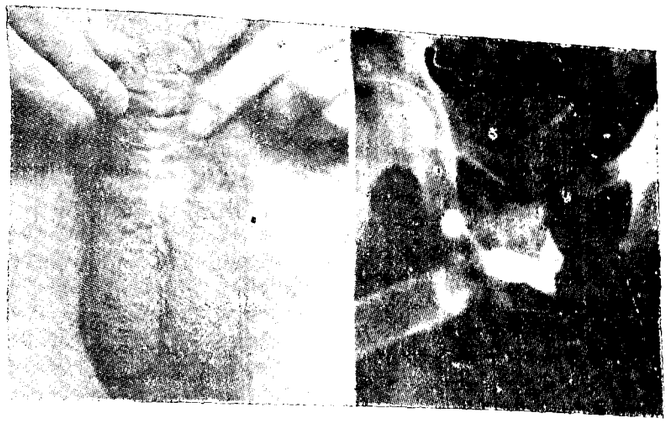
1. Showing use of buttons and rubber tube instead of beads. Chart 3 16 and 4/7.
2. Showing breakdown in same case.
3. Another case showing complete repair with this method. Chart 3 2 and 4 1.



1 2

Fig. 15. Showing Dennis Browne repair with beads and lead shots. Chart 3 12 and 4 6.

1. Preoperative.
2. After chordee correction.



3 4

Fig. 13. Showing Dennis Browne repair with beads and lead shots. Chart 3 12 and 4 1.

3. After second stage repair.
4. Urethrogram of same case.

non-availability of beads and lead shots in the beginning, ordinary buttons and rubber tubing were used in four cases shown in Fig. 14. Only one case had a complete repair, the other three had a small pin hole fistula near the proximal end which was successfully closed at a later sitting (Fig. 16).

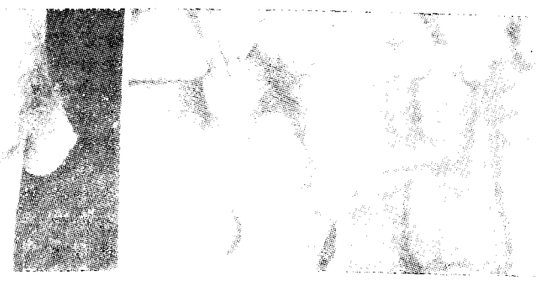
In six cases the usual beads and lead shots were used. Two cases showed complete repair (Fig. 15).

In one case there were two small pinhole fistulae (Fig. 17) which were repaired at a later sitting.

In another case there was a breakdown at the penoscrotal region leaving a gap of about $\frac{1}{2}$" between the two openings (Fig. 21). All these cases were beyond the age of 6 years, except in two where this repair was tried at the age of about 2 years with complete breakdown (Fig. 18).

Most of the Surgeons employ Dennis Browne's technique generally. Though this technique in the hands of Dennis Browne himself gave very good results (only 3 fistulae out of a total of 50 cases), yet it is significant that in the hands of others, it has resulted in a large number of fistulae. In the ten cases undertaken by the author fistulae resulted in as many as five.

The author invariably found that oedema occurred in all the cases, though each varied from the other. Consequently constant watch and careful nursing became essential in checking the pressure of the beads or rubber tubing. From the second day onwards it became imperative to cut the beads producing undue pressure on the skin. Ordinary ribbon gauze collodion dressing was dangerous, because they did not allow inspection of the beads every day. Therefore only cibazol vaseline gauze was wrapped round loosely. Mustardee has also reported the same drawbacks with this simple technique, for no surgeon can really judge the real pressure of the beads required in a given case, because the extent of oedema depended directly on the



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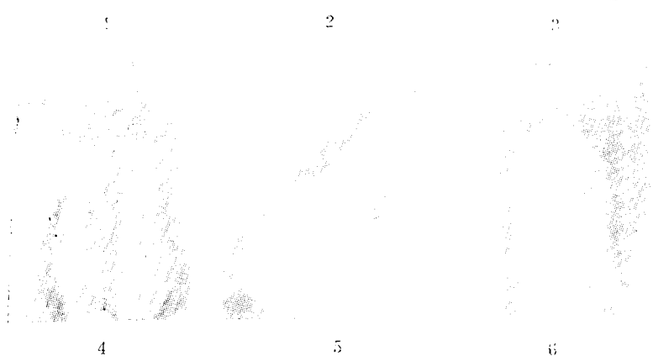


4 5 6

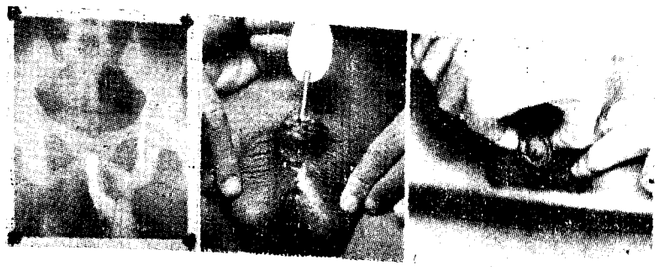
Fig. 15. Stages of Dennis Browne repair with beads and lead shots. Chart 3 3 and 4 1.

1 & 2. Preoperative.
3. After correction of chordee.
4. After Second Stage.
5. ,,
6. Same case while micturating.

1 2 3

Fig. 17. Showing Breakdown after D.B. repair with beads. Chart 3 29 and 4 9.

1. Preoperative.
2 & 3. Showing 2 small Fistulae after D.B. repair.



4 5 6

Fig. 17. Showing Breakdown after D.B. repair with beads. Chart 3 20 and 4 9.

4. Urethrogram of the same case.
5. After repair of Fistulae.
6. Same case while micturating.

amount of mobilisation of the flaps and the size of the penis. Simple dorsal slitting is unable to prevent the pressure of the beads. If we tie them too loose, then too there is danger of a fistula formation (Fig. 21) or else, if one of the beads becomes tight, it may cause pressure necrosis and a fistula may result (Fig. 16 & 17), and then it may be too late to cut the bead.

The transfixing suture in itself has also been blamed for formation of fistulae (Fig. 16).

Therefore, in one case the author utilized Mustardee's clip as depicted in (Fig. 19) instead of the conventional beads and lead shots.

Of course a dorsal slit had to be made to relieve tension. But this proved an unqualified success without breakdown (Fig. 20).

But this clip business is not very simple either. Mustardee himself declared that his clip also needs very careful tending. The assistants must watch the colour of the skin flaps. If it becomes dusky, the pressure has to be lessened from time to time. It is indeed oedema again, the unbridled factor, that will control the pressure of the clip. Urinary leakage has been recognized as another cause for breakdown. This is not a major cause when there is a well managed perineal drainage but mishaps cannot be yet ruled out. It is difficult to say as yet if one can do away completely with the need of deviation of urine while using Mustardee's clip. The author's experience with the clip is limited to only one case. In order to do away with oedema and urinary leakage Professor S. C. Misra uses compression of the whole of the penile shaft. This method has a proven advantage of eliminating breakdowns and fistula formation. The author has also used it in one case while closing a wide gap resulting from Dennis Browne's repair (Fig. 21).

A sponge[5] is cut into 3 layers according to the length of the penile shaft and wrapped round it over the vaseline gauze dressings. The circumferential length is left one quarter to half an inch shorter than the circumference of the penis thus stretching it. This gives a uniform compression of the shaft on the penis. The glans penis is then observed for colour changes. If it is pink, no further attention is required.

[5] The rubber sponges sold by the Bata Shoe Company are quite serviceable for this purpose.

1 2 3 4

Fig. 18. Chart 3 19 and 4 8.

1. Before operation.
2. After Chordee correction.
3. Showing D.B. repair with beads.
4. Showing Complete breakdown.

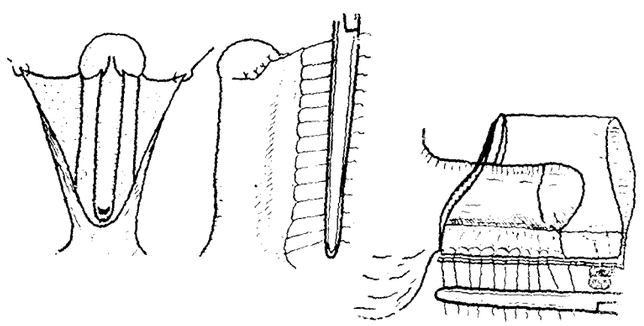
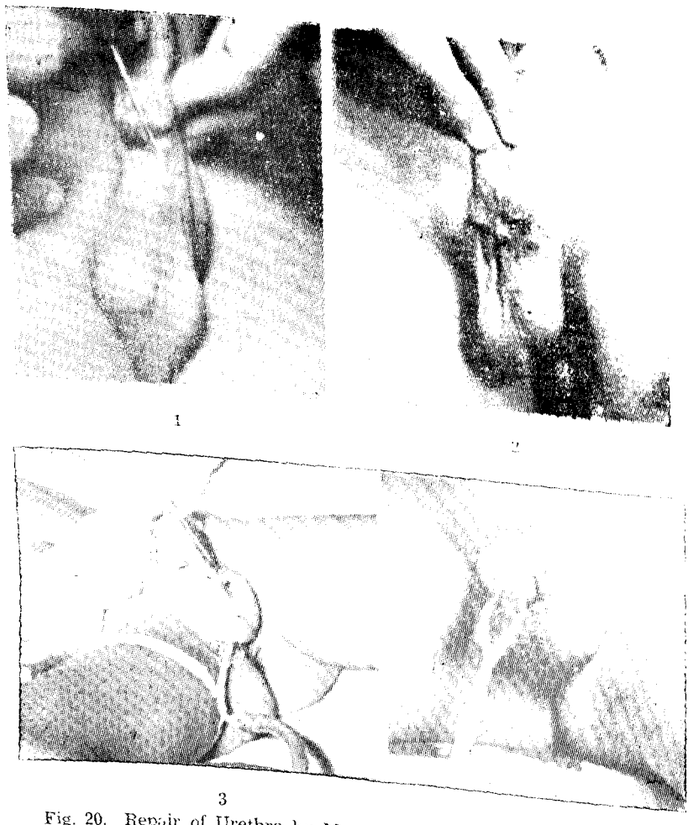


Fig. 19. Showing technique of Mustardee's Clip.



1 2 3 4

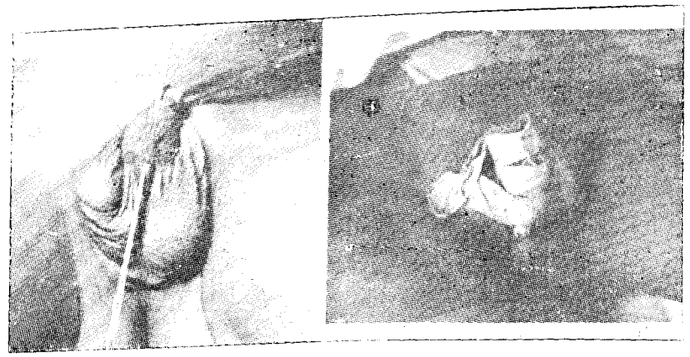
Fig. 20. Repair of Urethra by Mustardee's Clip. Chart 3/9 and 4/5.

1. Preoperative.
2. After Chordee Correction.
3. With Mustardee's Clip on.
4. While micturating.

The compression thus built up is sufficient to prevent oedema, urinary leakage and breakdown. This is kept for six to seven days and then the sponge is removed. The difference in technique is illustrated in Fig. 22.

In four of his cases Professor Misra did not employ perineal drainage. On the other hand he divided his repair into 3 stages, viz. chordee correction formation of urethra distal to Hypospadiac opening (based on Dennis Browne's principle) employing sponge compression and in the third stage he anastomosed the two urethral openings to restore continuity. This is, of course, a sure method, but needs one

factor, that will -



1 2

3 4

Fig. 21. Showing repair by Sponge Compression. Chart 3/4 and 4/3.

1. A big fistula following D.B. repair.
2. Repair and Sponge compression shown.
3. After final repair.
4. Same case while micturating.

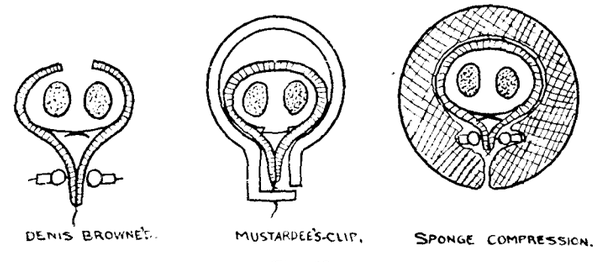


Fig. 22.

stage more. He agrees with this author that normally, if we have a well managed perineal urethrostomy, full reconstruction can be done at the second stage by employing compression technique. Also he slings the penis to the anterior abdominal wall with a stitch at each stage. The author did slinging in all his cases both after chordee correction and urethral reconstruction. But he did not deliberately stitch the thread to the abdominal wall as it is a very painful process. Instead the thread, used for sling, was fixed to the abdominal wall with common adhesive, and the penile shaft was left to rest on a small pillow (inset 2, Fig. 20). In all his cases perineal urethrostomy was done, except in one, where he employed Ombredanne's repair. In no case has there been any urinary leakage. Nor was there any formation of haematoma under the flaps. Dorsal slit was made in all the cases. But in two cases incisions on the sides of the scrotum had to be made.

The author proposes to employ the compression method in all his future cases and compare his results with Mustardee's Clip method at a later date. At this stage, it would not be safe to state with conviction which of the two methods is superior. Dennis Browne's simple method also cannot be yet rejected outright. For the present the sponge compression method seems to be the simplest of all and easy to manage [6].

B. Traumatic Large Fistulae

In one case, out of three, of traumatic large fistulae repair was undertaken with success employing Dennis Browne's technique. The author did not perform perineal urethrostomy on him (Fig. 23 1).

C. Long Strictures

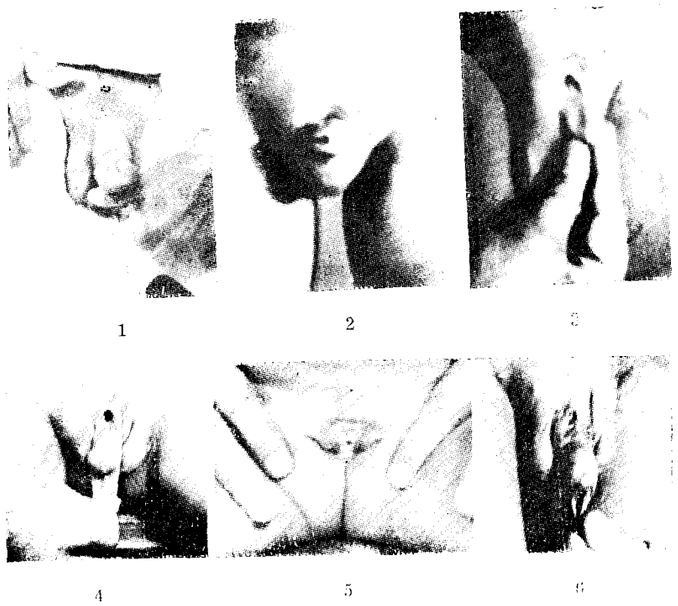
Two cases of long strictures were treated by the author. One of them was Gonococcal. In the other, a young man, the whole of the anterior urethra, starting from the external meatus, was converted into a cord like fibrous stricture. In a stricture following an operation for Phimosis, like effects have been observed by other Surgeons also in Surgical units of the Mahatma Gandhi Memorial Associated Hospitals, Lucknow. But no definite aetiology could be elicited. Both these cases were treated by simple excision of the whole of the urethra upto the proximal normal urethra. Final repair was undertaken in one of them at a later date by McIndoe's technique, using a thick split skin graft for reconstruction of the new urethra (Fig. 23 2-3).

[6] See results in Chart 4.

1 2 3

Fig. 23

1. Traumatic Hypospadias.
2. After excision of stricture of Penile Urethra.
3. Mc INDOE'S repair in a case of complete stricture of anterior Urethra.



1 2 3

4 5 6

Fig. 24. Examples of Epispadias.

1. Penile. Chart 5 1.
2. 2 & 4. Penopubic.
2 & 3. Chart 5 2.
4. Chart 5 4.
5. inf. Vesical Fistula in Continent. Chart 5 6.
6. Double Urethra. Chart 5 7.

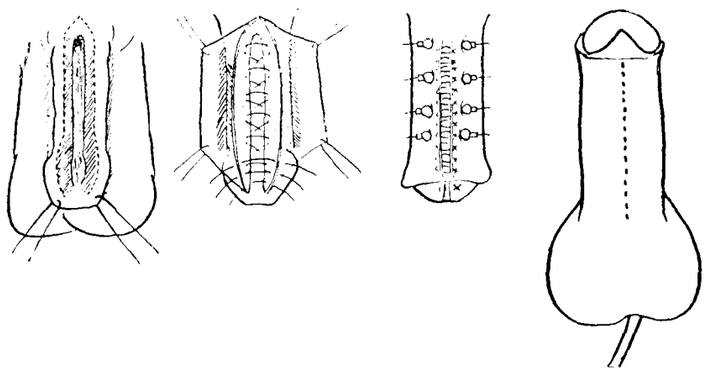
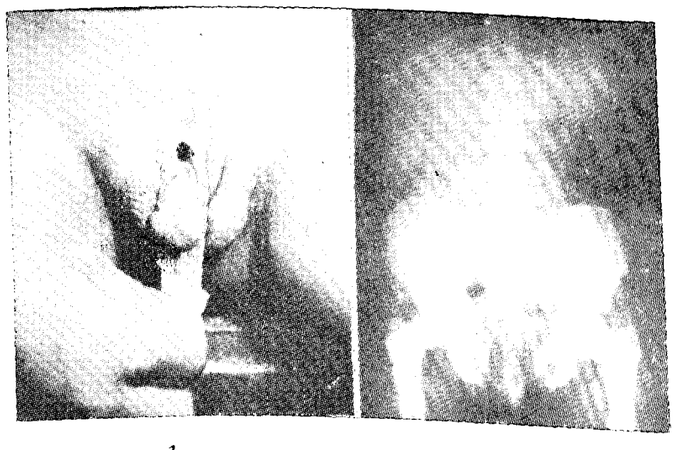


Fig. 25. Showing Dennis Browne's technique of repair of Epispadias.

(ii) In the reconstruction of the urethra in spoiled cases where local skin is not available, and also in cases of long strictures, the use of McIndoe's Split thickness skin tube or a full thickness free skin tube is the established method calling for no comments.

II. Epispadias

Seven cases of epispadias have been treated by this author. Their classification has been detailed in Chart 1, Fig. 24. In 4 cases of true epispadias, he based his repair on Dennis Browne's technique as in Fig. 25.



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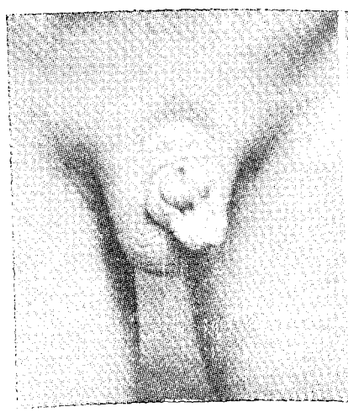
2



3

4

Fig. 26. Chart 5 4

1. Preoperative.
2. Skiagram of the same patient.
3. After repair.
4. While micturating.

Two cases were complete success with no deformity at all (Fig. 26).

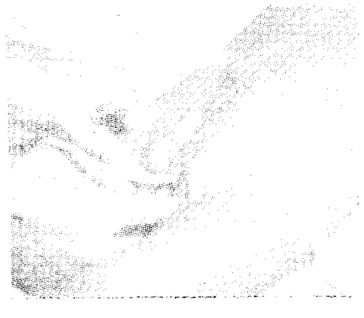
Two had a breakdown with a fistula at the penopubic junction. This confirms the author's faith in mobilising the crura from the ischiopubic rami for he regards the point where the fixed and mobile parts of the penis meet as the most vulnerable. In the fixed part the crura are widely separated. It can be approximated in the mobile part without any tension, but where they start diverging breakdown occurs.

In one of his cases, a young female aged 8 years who had inf. vesical fistula (Fig. 27), the author undertook the repair on the assumption that the sphincter was attached to the widened pubic bone on each side and was not complete as in Fig. 26 2, in addition to the fact that there was defective attachment of the crurae. Therefore, he not only completed the repair of the sphincter, but also mobilised the attachments from the Ischiopubic rami. Finally, he turned down a flap of the rectus muscle according to the Ralph Thompson's technique, though not in the hope that it would act as a sphincter. It was done only to fill in the dead space left between the widened pubic bones. The attachments of the rectus muscle were then crossed. All the steps of this operation have been clearly sketched in Fig. 28. An indwelling catheter was also left inside the bladder (Fig. 27).

The patient was discharged and sent home completely healed up on the fourteenth day of her admission with full control of micturition, as she could withhold her urine for a minimum period of 2 hours.

Some surgeons have come to believe recently that it is the shortage in the length of the urethral floor in an epispadiac that gives rise to dorsal curvature; and, therefore, they deliberately convert it first into a hypospadias condition and thereafter repair it. If this belief is true then what could be the cause of twist to one side, as we observe in some cases? In 2 adults that the author had under his care, one had only a dorsal curvature (Fig. 24 1). But the other also, showed a twist of the whole penile shaft to one side. (Fig. 24 2), therefore, he contends that the deformity is caused by the defective growth of the Crurae attached to the Ischiopubic rami, the urethra remains split on the dorsum, as the junction of the pubic symphysis in such cases is not complete (Fig. 26 2). This is further confirmed by the author's case of a female child in whom sphincteric control was inefficient (Fig. 27). The Author has classified this case under Inferior Vesical Fistula according to Ralph Thompson's classification and in this case, all the attachments along the Ischiopubic rami were ripped off by the Surgeon during the repair operation. The author believes that Epispadiacs

1 Before



2 After repair

Fig. 27. Chart 5 6.

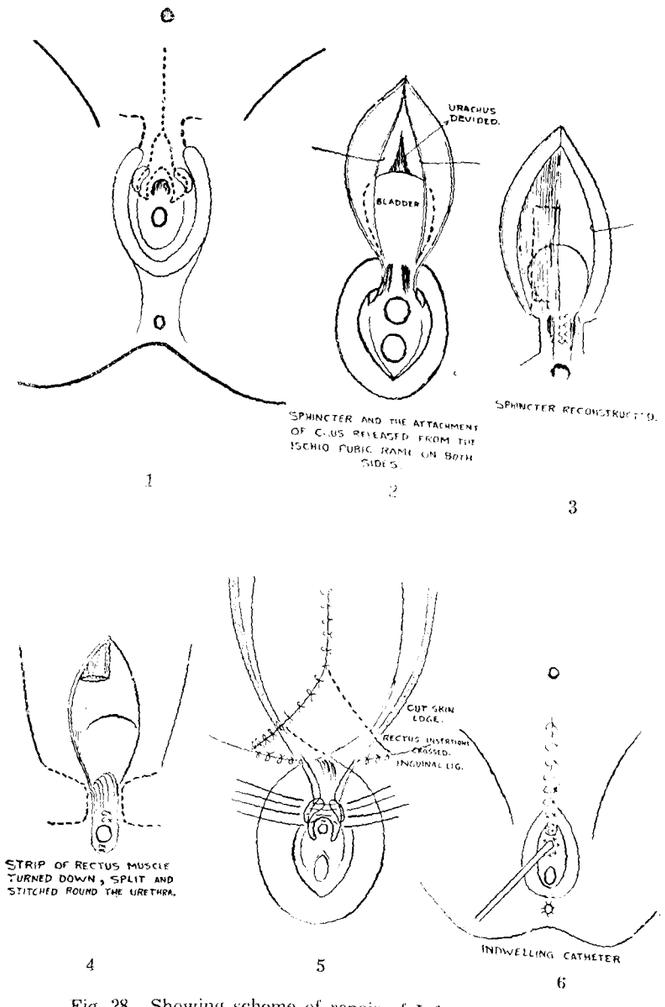


Fig. 28. Showing scheme of repair of Inf. Vesical Fistula.

1. Shows line of incision.
2 & 3. Show repair of sphincter.
4. Rectus slip turned down.
5. Rectus insertions crossed and plan of closure
6. After closure.

with control on micturition have normal length of the urethral floor. In all cases of this type the Dennis Browne technique has been utilized for repair by leaving a simple strip of mucosa buried. In each one of such cases the urinary stream was diverted by perineal urethrostomy that came as easy as in any case of Hypospadias. This is the site where Surgeons make their openings for conversion into Hypospadias. In addition to beads, the split crus is stitched with interrupted chromic cat-gut, arranged in a double layer. In the deformed cases that show rotational deformity also, the author proposes reconstruction by the methods for Inf. vesical fistula case, i.e. detaching the crura from Ischiopubic rami. It will be an important step in reconstructing the urinary channel.

The last case was an epispadiac opening at the peropubic junction (Fig. 24 6) with a full normal urethra in a six year old patient. He had complete control of micturition. The urine used to flow in two streams: from the natural passage and also dribble from the ectopic opening. The author has observed two similar cases in U.K. at Prof. Kilner's Unit. They converted it into a complete channel making the urethra into a double barrelled one. As it is difficult to decide definitely which opening communicated with the channel, or where the vas deferens opened: and since any interference with the Epispadiac opening that may cause its closure might lead to disturbance of the sphincteric mechanism the above procedure was adopted at Prof. Kilner's and was certainly the safest course to follow under the circumstances. However, the author in this case fulgarized the epispadiac opening with diathermy needle in 3 sittings. This caused closure of the opening. But if this closure operation fails the safest course must be to reconstruct another channel, dorsal to the normal urethra, based on Dennis Browne's principle[7]

These, then, are some of the many problems of hypospadias and the other congenital anomalies of the urethra from the operative and post-operative points of view alone: a few of these have been answered; many yet remain for further investigation and solution.

ACKNOWLEDGEMENTS

The author is grateful to Prof. S. C. Misra for allowing him to report results of his cases treated by the compression method; to Professor R. V. Singh for his valuable comments. His thanks are due to all the Resident Staff in Surgery who worked under him during 1953-56 in taking great pains over the post-operative care of these patients and maintaining their records. In particular he is indebted to Messrs. T. P. Srivastava, Khanna, Sharma, Singh and R. P. Baipai who have laboured and helped him in compiling. Mr. G. B. Singh has been a great help in taking the photographs of his cases and his thanks to Messrs. Misra and Kohli Brothers who provided him with enlargements of the photographs and projection slide respectively.

[7] See Chart 5 for Summary of the results

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CHART No. 1

TYPE	SUB GROUP	TOTAL NUMBER	VARIETIES	No. OF CASES	REMARKS
I. Hypospadias.	A. Congenital	44	1. CORONAL		
			(a) With curvature and hooded prepuce. See Fig. 6/1	2	All had
			(b) With curvature and No hood i.e. congenital short urethra. See Fig 6/2	1	pin hole meatus.
			(c) Without curvature and no hood	2	
			(d) Without curvature and hooded prepuce See Fig. 3	10	
			TOTAL	15	
			2. PENILE—All with hooded prepuce and ventral curvature. See Fig. 7/1,2	10	
			3. PENOSCROTAL—All with hooded prepuce and ventral curvature See Fig. 7/3	13	
			4. PERINEAL See Fig. 7 4,5,6,	6	
			Normal. Fig. 23/1		
			Normal. Fig. 23 2-3		
	B. Traumatic large fistula.	3			
	C. After complete excision of urethra for long strictures.	2			
II. EPISPADIAS.	All congenital.	7	1. True epispadias penile	1	See Fig. 24 1
			2. True epispadias peno-pubic	4	,, 24/2,3,4
			3. Inf Vesical fistula with incontinence (female)	1	See Fig. 24,5
			4. Inf. vesical fistula with normal urethra i.e., double urethra.	1	See Fig. 24,6

CHART No. 2

	Name	Age yrs.	Procedure	Result	Remarks
1.	S. N. T.	8	Chordee correction	Good	With hooded prepuce & Ventral curvature. See figs. 6/1 & 13/1 to 4.
2.	M. H.	9	Chordee correction	Good	
3.	M.	2	Chordee correction	Good	Congenital short urethra with curvature and no hood chordee corrected elsewhere resulting in fistula; Transferred to us. Deliberate straightening of penis. (Fig. Nos. 6/2 & 3) establishing defect.
			Dennis Browne	Breakdown	
4.	M. L.	19	Meatotomy	Good	Without curvature. Hood present.
5.	J. A.	5	Meatotomy	Good	Without curvature. No hood. See fig. 3/1.
6.	A. K.	9	Meatotomy	Good	Without curvature. No hood. One brother had penoscrotal type.
7.	M. K.	13	Meatotomy	Good	
8.	B. N. S.	10	Meatotomy	Good	
9.	Baby	1 day	L. A. M. A.	...	
10.	Baby A.	9 mths.	Meatotomy	Good	
11.	R. N. S.	24 yrs.	Advised had urinary infection	...	All had hooded prepuce and no curvature.
12.	S. K.	5 ,,	Meatotomy & Repair for Macrostoma	Good	
13.	M. S.	2 ,,	Meatotomy	Good	
14.	A. K.	2½ ,,	Meatotomy	Good	
15.	K. N.	10 ,,	Meatotomy	Good	See fig. 3/2 & 3.

CHART No. 3

	Name	Age yrs.	Variety	Procedure	Result	Remarks
1.	S	5	Penile	V-Y Repair	Good	...
2.	K.	18	,,	do	Good	Fig. 14/3
3.	K. N.	15	,,	do	Good	...
4.	B. S.	9	,,	do	Good	...
5.	D. K.	2½	,,	do	Good	Fig. 7/1
6.	D. D. N.	20	,,	do	Infection Ventriflexion 'Z' Plasty Rotational deformity.	Still under treatment Fig. 9 & 12/1, 2 & 3
7.	J. P.	8	,,	do	Good	...
8.	D. K.	2	,,	Operation deferred due to congenital heart lesion.	...	Associated contracture hand Talipes Group II cleft and congenital heart disease.

Chart No. 3 Cont.

	Name	Age yrs.	Variety	Procedure	Result	Remarks
9.	Md. I	6	Penile	V-Y Repair	Good	Fig. 7/2
10.	A. K.	1½	,,	do	Good	...
11.	M. L.	3	,,	do	Stricture at opening another opening made proximally.	...
12.	G P.	25	,,	do	Good	Fig. 15/1-4
13.	B. K.	6	,,	do	Good	...
14.	P. K.	6	,,	Edmund's Procedure.	Good	Fig. 8/5, 6
15.	B. D.	8	,,	V-Y Repair	Breakdown healing by secondary intention result good	
16.	B.	24	,,	do	Good	Fig. 14/1, 2
17.	R.	7	,,	do	Good	...
18.	H. L.	28	,,	do	Many breakdowns done elsewhere Imbecile Operation deferred	Fig. 2
19.	B. R.	1	,,	do	Good	Fig. 18/1-4
20.	R. C.	16	,,	do	Good	
21.	K. N.	17	,,	V-Y & Z plasty combined at same sitting.	Good	Fig. 7/4 & 17/1-6
22.	R. K.	3	,,	do	Good	Testes not descended Fig. 11/5-6
23.	B. K.	4	,,	do	Good	
24.	Baby S.	5	Penoscrotal	do	Good	
25.	Baby	1	,,	do	Good	
26.	B.	16	,,	do	Good	Not turned up for final repair Figs. 7/3 & 11/1-2
27.	S. N. T.	8	,,	V-Y Repair	Good	Converted glandular variety into penile.
28.	M.	2	,,	Congenital short urethra	Good	
29.	R. K.	6	Perineal	Under treatment	...	Scrotum anterior to penis Fig 7/6
30.	L. N.	7	,,	do	...	...
31.	M. H.	9	Coronal	V-Y Repair	Good	Followed by Ombredanne's Repair

CHART No. 4

PENILE PENOSCROTAL. PERINEAL—SECOND STAGE

	Name	Age yrs.	Variety	Procedure	Results	Remarks
1.	K.	18	Penile	Dennis Browne's Buttons	1 linear fistula	Closed Later Fig. 19/3
2.	K. N.	15	,,	D. B. Buttons	One fistula	Closed Later
3.	B. S.	9	,,	D. B. Beads, 2nd stage repair	One big fistula at the end of 2nd stage	Sponge compression at 3rd stage Fig. 21/1-4
4.	J. P.	8	,,	2nd Stage repair Beads	Good	
5.	M. I.	6	,,	2nd Stage D. B.	Good	Mustardee's clip used. Dorsal slit Figs. 7/2 & 20/3
6.	G. P.	25	Penoscrotal	do buttons	Good	Dorsal slit incision at the side of scrotum Figs. 15/1-4
7.	B.	25	,,	do	One fistula	Closed Later Fig. 14/1-4
8.	Baby R.	1½	,,	2nd Stage repair beads	Breakdown	Unsuitable age Fig. 18/1-4
9.	R. C.	16	,,	2nd Stage-Beads	2 fistulae	Repaired at 3rd sittting Figs. 7/3 & 17/1-6
10.	K. N.	17	,,	2nd Stage-Beads	Good	
11.	M.	2	,,	2nd Stage-Beads	Breakdown complete	Unsuitable age
12.	M. H.	8	,,	2nd Stage Ombredanne	Good	Fig. 6/1 & 13/1-4

CHART No. 5

	Name	Age yrs.	Variety	Procedure	Results	Remarks
1.	M. U.	25	Penile	D. B. repair as discussed	One breakdown at Penopubic junction with some rotation deformity.	Still Under treatment Fig. 24/1
2.	S. M.	5	Penopubic	do	Good	Fig. 24/2-3
3.	G.		do	Advised	...	Under treatment
4.	K. S.	7	do	do	Good	Fig. 24/4 & 26/1-4
5.	N. A.	22	do	do	Good	...
6.	Baby S.	8	Inferior vesical fistula with Incontenence	Repair of sphincter based on Ralph Thompson's Technique as modified	Good	15th day could withhold Urine for 2 hrs. Figs. 24/5 & 27
7.	M. I.	6 yrs.	Double Urethra one ectopic opening	Fulgarisation of Ectopic opening	Good	Fig. 24/6

HYPOSPADIAS *

by R. N. SINHA, Patna.

This paper is based on my limited experience of 78 cases of Hypospadias during a period of about 6½ years.

Hypospadias is a congenital anomaly of the penis and urethra, in which the external orifice of the urethra is situated on the ventral surface of the penis, scrotum or perineum. The site of this orifice may be anywhere from just behind the external urethral meatus to the central point of the perineum. The severity or degree is assessed and described according to the site of the abnormal meatus. Hypospadius may be glandular, coronal, penile, penoscrotal, scrotal or perineal.

In the present series the following incidence of the different varieties have been noticed :—

(a) Glandular		..	18
(b) Coronal		..	12
(c) Penile	(16+11)	..	27
(d) Penoscrotal		..	11
(e) Scrotal		..	6
(f) Perineal or vulviform		..	4
Total		..	78
Congenital short urethra		..	2
			80

The glandular varieties have little other than an aesthetic significance, but sometimes present for treatment, for a pinhole meatus. Dilatation of the pinhole meatus and assuring the parents, that it does not differ significantly from a normal penis are all that are necessary; on the other hand, there are those perineal types with bilateral herniae and undescended testes, and these present a formidable surgical problem.

In severe cases, the resemblance of the external genitalia to those of the female may cause considerable doubt about the sex of the patient; this is all the more so, when the penis is rudimentary and resembles a long clitoris. Determination is rendered all the more difficult when, as is frequently the case, the testes are absent from the cleft scrotum; and cannot even be palpated in the inguinal region (Fig. 1).

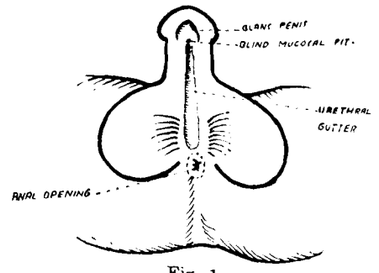

Fig. 1.
Complete Hypospadias — Perineal type.

Fig. 1-A.
Hypospadias. The arrow indicates the position of the urethral opening. There is a groove in the glans. The penis is bent forward.

(Fig. 1-A) Clinical features: Hypospadias has the following clinical characteristics :—

(1) The penis is generally smaller than normal.

(2) Ventral curvature may be mild or so severe as to resemble a serpent's hood.

(3) The prepuce is deficient ventrally so that when it is held stretched out, it actually resembles a hood.

(4) The skin on the ventral surface of the penis is shortened longitudinally and together with the shortened fibrous corpus spongiosum produces a thick web, which is readily demonstrated by stretching the penis.

(5) Erection is possible but ventral curvature may be so marked, as to make it extremely painful and coitus virtually impossible.

(6) Difficulties in micturition are directly related to the degree of hypospadias.

(7) The psychological reaction to this deformity is profound and hence for this reason alone, if for nothing else, repair should be completed by an early age, before the child becomes conscious of his deformity, i.e. about the age of 3-4 years.

Pathological Anatomy (Fig. 2)

(a) *The glans penis* has the shape of a normal heart. In every case of hypospadias, there is a blind pit at the normal site of the external urethral meatus. This pit is lined by pink mucous membrane.

(b) *The hooded prepuce* is a feature of every case of hypospadias, irrespective of the grade of the defect. The hood is attached to the penis behind the retro-glandular sulcus, and the hood narrows and ends on the sides of the penis. There is no inferior segment of this prepuce and no fraenum.

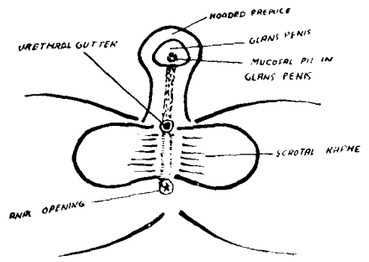

Fig. 2.
Partial Hypospadias — Peno-Scrotal type.

(c) *The Peno-Scrotal raphe.* In hypospadias, the peno-scrotal raphe begins at the central point of the perineum and passes forwards up to the urethral orifice. There is no raphe in front of the urethral orifice. If the urethral orifice is behind the scrotum, the scrotum is bifid, and there is a gutter of mucous membrane passing from the urethral orifice to the glans penis. This gutter runs between the two halves of the bifid scrotum, and consequently there is no midline raphe.

(d) *The under surface of the penis between the urethral orifice and the glans penis*; if the urethral orifice is behind the scrotum, there is a moist pink gutter of mucous membrane with a well defined muco-cutaneous line. The gutter flattens out, as it passes towards the base of the glans penis and at this plane there is no sharp line of demarcation in the muco-cutaneous line. Histological sections of this mucous gutter immediately posterior to the base of the glans penis show stratified squamous epithelium with no underlying layer of erectile tissue.

(e) *The Corpus Spongiosum* in hypospadias is of almost normal diameter and it terminates at the hypospadiac opening in the ventral surface of the penis. The presence of the corpus spongiosum up to this opening can be readily palpated through the skin and by inspection during operation for repair of the defect. There is absence of corpus spongiosum in front of the urethral orifice and is represented by a fibrous cord.

(f) *The band connecting the urethral orifice to the glans penis* : In partial hypospadias, defects restricted to the penis, there is a band, deep to the surface, passing between urethral orifice and the blind mucosal pit on the glans penis. The band is inelastic and is shorter than the overlying corpora cavernosa, causing a downward curve of the penis resulting in the

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

"chordee deformity." The anchorage of this band is greatly increased when the penis becomes turgid. Histological examination of this band showed that it was composed of fibrous tissue and there was no erectile tissue or epithelium.

Aetiology :

Hain reported disturbances of urogenital growth in female rats, in which the urethra normally opens at the tip of the clitoris. Injections of oestrin or androgen given to the mother or to the new born rat, whilst still in the plastic slate in the first four days of life, resulted in the production of hypospadias.

Lacassagne (1936) produced hypospadias in male rabbits by oestrin injections. Burrows (1939) produced the same effect on female rats with progesterone and in male rats non-descent of testes resulted. Thus three sex hormones have been found to produce abnormalities of growth in the genitalia. As these three sex hormones are chemically allied to each other, it is quite possible, that a common factor may be responsible. Therefore, it is likely that the cause of hypospadias in human beings is probably an endocrine imbalance in the mother during the most critical phase of development of the child's urethra, i.e. before the fourteenth week.

It has also been reported in association with other developmental defects following rubella in the mother during pregnancy.

Of late "stress" has been incriminated as an etiological factor of considerable importance in the causation of congenital deformities. How far this is operative in the causation of hypospadias is not possible to say, without much work in this direction.

In my series, I have not found even one case with a hereditary or familial history, though cases have been recorded in father and child.

Embryology : (Fig. 3)

In a human embryo of 4 mm., the cloaca is continuous with three endodermal tubes, the hindgut, the allantois and the tailgut. About the thirtyfifth day (about 5 mm. stage), the cloaca is divided by a urorectal septum, arising from the angle between the allantois and the hindgut. This septum grows caudally and divides the cloaca, into a dorsal primitive rectum, and a ventral primitive urogenital sinus. This division beginning at 5 mm. stage is completed at about the 15 mm. (less than seven weeks). With this division the cloacal membrane, which is yet intact, becomes divided into anal and urogenital membranes. The urogenital membrane ruptures shortly after the completion of the division. Even before the division of the cloaca is completed, the ventral or urogenital division begins to show three transverse subdivisions (Fig. 4).

(1) The cephalic end, from the entrance of the Mullerian ducts to the base of the

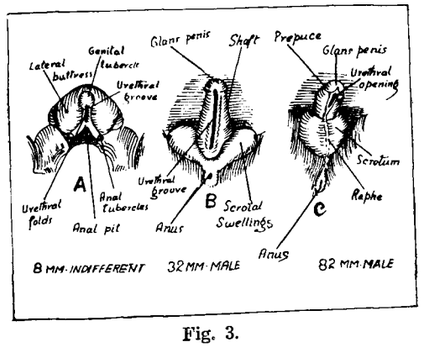

Fig. 3.

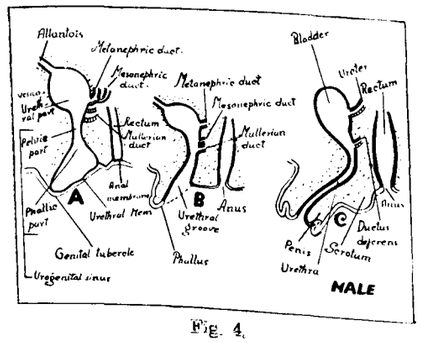

Fig. 4.

allantois is the **Vesico-urethral part** which early becomes enlarged.

(2) The middle part, beginning at the Mullerian ducts, is the more slender, **Pelvic part.**

(3) The terminal division is the **Phallic part** which also is somewhat expanded.

The "Pelvic" and "Phallic" parts are together called "Urogenital sinus."

The male urethra develops from the "vesico-urethral primordium" which contributes to the development of a part of the Prostatic urethra, and the rest of the male urethra is formed from the "urogenital sinus."

While the uro-rectal septum is developing, the cloacal membrane rotates so that its outer ectodermal surface faces caudally and posteriorly. This is brought about partly as the result of passage of a well defined band of mesoderm round the cloacal membrane. From this band is developed the infra-umbilical part of the abdominal wall, the symphysis pubis and the muscular coat of the bladder and a local proliferation, gives rise to the 'genital tubercle'. The 'Phallic part' of the urogenital sinus elongates and is drawn into the undersurface of the 'genital tubercle.' Proliferation of the wall of the sinus results in the formation of a solid urethral plate on the ventral aspect of the tubercles. The genital tubercle now starts to elongate and becomes the 'phallus.' The urogenital sinus breaks through the urogenital plate, forming a groove on its surface. Two urethral folds form on each side of the opening and at about 45 mm. stage, they fuse together in the midline to form the tubular penile urethra.

The defect of hypospadias is clearly referable to a failure of union of the urethral folds. The urethral orifice marks the anterior point to which the fusion of the urethral folds progressed from the central part of the perineum. The penoscrotal raphe marks the line of fusion of the urethral folds. The raphe terminates at the urethral orifice, giving additional support to the view that hypospadias is the result of an arrest during the progressive fusion of the urethral folds, from behind forwards. Absence of corpus spongiosum beyond the urethral orifice, lends further support to the view that the 'urethral folds' not only constitute the urethral channel but also the walls of the channel with the erectile tissue, constituting the corpus spongiosum (38 mm.—95 mm. stage).

The absence of the fraenum in minor grades of hypospadias is due to the fraenum being formed from the extreme anterior ends of the urethral folds. The progressive fusion of the urethral folds, from behind forwards, would mean that every grade of hypospadias will have a failure of fusion of the extreme anterior ends of the urethral folds. This failure gives the hooded prepuce with its absent fraenal segment. The hooded prepuce is thus the hallmark of every case of hypospadias.

Associated lesions :

In some of the penoscrotal and the perineal or vulviform varieties of hypospadias, bilateral hernia and undescended testes are often encountered.

In the present series of 78 cases, bilateral hernia was encountered in 3, and undescended testes in 5 cases.

Only in one case of hypospadias, a boy of 15, was a congenital cardiac condition—with a patent interventricular septum, encountered. (A harsh murmur, starting early in systole extending up to diastole, audible best along the left external border near the third costal cartilage, and not conducted either to the neck or to the axilla. The pulmonary second sound was audible). As the cardiac lesion was compensated, it was decided to operate on him.

As to the hernia and undescended testes, these must be treated prior to the treatment of hypospadias.

Injections of testicular hormone are tried first for undescended testes for about 6 months, and herniae are operated on. If both conditions coexist, as they often do, it has been our practice to do a herniotomy and at the same time to anchor the testes to the fascia-lata of the thigh by the Keetley-Torek procedure. They are released after about six months, when traction has firmly anchored them in the scrotum.

In addition to these, minor co-existing deformities in the urethra, i.e. congenital valves and bands are infrequently encountered especially in cases of glandular hypospadias, where the patient not infrequently has a pin hole hypospadiac meatus, and presents himself with varying degrees of urinary obstruction. These are usually treated with urethral dilatations prior to any operative procedures.

Not infrequently, however, a new born child with a complete perineal hypospadias with bilateral undescended testes and split scrotum raises temporary difficulties regarding the sex of the patient (psuedohermaphrodism) but a detailed examination, rarely leaves the diagnosis in doubt.

Differential diagnosis :

(1) Congenital short urethra (Fig. 4 A).

At first sight it resembles hypospadias, for the penis is short, ventrally curved and bound down. but the condition is uncommon and I have encountered it only thrice. Normal erection is not possible. The distinguishing feature is that the urethra emerges from the meatal dimple in the normal way and not on the ventral surface of the penis, as in hypospadias. Actually the corpus spongiosum and urethra are complete, but are too short when compared with the corpora cavernosa. The second distinguishing feature is that the prepuce is intact and not deficient inferiorly as in hypospadias.

Fig. 4-A.
Congenital short (anterior) urethra. Note complete prepuce ventral surface.

This condition should be treated by dividing boldly the urethra and corpus spongiosum ventrally at the level of the corona to straighten the penis fully, and to establish the urethral defect however great it may be, as a partial urethral loss in continuity. The gap when established may be reconstructed by Ombredonne's method, using the prepuce, if the gap is small, or if it is large by Denis Browne's method, which will be discussed in detail, later.

Epispadias—Like congenital short urethra, it is a rare condition, and is said to be ten times less common than hypospadias. Epispadias is a failure of the urethra to unite dorsally, and is a midline anastomotic defect allied to cleft lip and palate. The urethra lies open as a groove along the dorsum of the short spade-like penis. The distribution of the prepuce is normal in contrast to hypospadias, where it is deficient inferiorly. The only resemblance between these two conditions is that while the urethra runs the whole length of the penis it is relatively short and produces acute dorsiflexion during erection, just as the short urethra produces ventral flexion in the hypospadiac. Clinically, there are three varieties :—(a) the urethra is laid open dorsally from the tip of the glans, for a varying degree, as far as the urethral sphincter ; the patient is continent, (b) the urethra is laid open dorsally beyond the urethral sphincter in which case the patient is incontinent, (c) the urethra, sphincters, bladder, symphysis are all open and the condition is known as ectopia vesicae.

For the treatment of the latter two conditions, I can do no better than quote

Keyes, who wisely says, " Every urologist must prove at least once, that he is unable to close the anterior bladder wall, make a new sphincter, penis and urethra, and close the symphysis, before he is satisfied to accept uretero-intestinal anastomosis as the cure of extrophy — Plastic operations may close the bladder wall, but they do not very often repair the sphincters effectively, and the stinking patient remains aware of the wit of those elder anatomists who dubbed the sphincters along with the heart and diaphragm " the royal muscles."

In the incontinent epispadiac, Young's operation on the bladder neck may be tried, but generally speaking the incontinent epispadiac is still best treated by ureteral transplantation.

The continent epispadiacs are best treated by Cantwells' operation, resembling the Marion-Duplay procedure which consists of " in-turning " the local flaps to form the urethral tube and closure over it by the lateral flaps. Here the urethral shortness and hence the acute penile dorsiflexion persists. To obviate this, the condition is best treated by dissecting out the ectopic urethra from the tip of the penis to the posterior meatus, from it into a tube, and bring it down ventrally between the corpora cavernosa as far back as possible, thus converting the epispadias into hypospadias. This lengthens the penis and overcomes the dorsal shortness. The treatment from thereon follows that of hypospadias.

Hermaphrodism — As indicated earlier, sometimes a severe degree of perineal hypospadias with bilateral undescended testes, which cannot be palpated in the inguinal region, and a bifid scrotum appear to be confusing to the parents, specially so when the penis is so small as to resemble a long clitoris.

The infant should be kept under observation until further investigations become feasible, i.e. utero-salpingograms, 17keto steroid estimations, etc. Where there is doubt, laparotomy and biopsy of the genital glands must be carried out.

Treatment

In the last decade, a well known text book of surgery in English described hypospadias as an inoperable condition. One can well imagine that this pessimism was brought about by the disintegrating effect of urine, and particularly infected urine, on wound healing in the penis. Once urine leaks through a penile suture line, a fistula is bound to develop. Haematoma formation and infection also are disastrous.

Glandular Hypospadias — Minor abnormalities of the glandular urethra do not give rise to any major deformity of the penis, and at its worst may lead to a slightly abnormal projection of the urinary stream, they are of little importance, and do not call for any treatment. If, however, there is a co-existing pinhole meatus, the opening should be enlarged and dilated. There is sometimes a small blind sinus distal to the hypospadiac opening. When present, this should always be identified and one blade of a fine blunt pointed scissors thrust into it, as far as possible. The other blade is inserted into the urethra and the scissors closed to throw the two tubes into one. This simple expedient will enlarge the urethral opening to the necessary size without shortening the already short urethra, and will leave the penis so close to normal in both appearance and function, that nothing more is necessary. But where consciousness of defect is responsible for psychological defect then they should also have the benefit of operation. For all other varieties of hypospadias, the treatment is entirely surgical and has two principal aims :—(1) to provide a normally placed urethral orifice and a normally directed stream of urine—the reconstructed urethra should be of even and adequate calibre sufficient to allow the passage and projection of a normal stream of urine, and as McIndoe points out " A new urethra which produces a spray, instead of a stream, is a piece of bad plumbing," (2) to correct the ventral curvature of the penis, so that the penis will be straight during erection and allow the patient to fulfil, later, his marital obligations properly.

While these chief aims of treatment are not in dispute, up till now complete agreement has not been reached on the best method of treatment. There are many different methods employing as many different principles, a fact which itself testifies to the complexity and difficulties of the problem. Each method has its ardent advocates, but the truth is, that there is no one type of operation excepting Denis-Browne's which can be elective procedure for all degrees of hypospadias, but some operations present certain advantages according to the degree of the lesion.

Denis Browne states the requirements for a satisfactory operation which are :—

1. It must be applicable to all degrees of deformity.

2. It must construct a urethra free from hairs on the inside.

3. The new urethra must be of a size and elasticity approximately normal (sufficient to permit passage of a cystoscope).

4. It must be capable of completion fairly early, before the child becomes psychologically conscious of the defect, roughly by the age of 4-5 years before the child goes to school.

5. It should be capable of consistent performance by any reasonably skilful surgeon and not depend upon either great technical accomplishment or great good fortune.

Hence any acceptable repair should overcome penile curvature, so that satisfactory sexual intercourse can take place, enable a stream to be projected forwards with the patient standing, be devoid of new disabilities such as stricture formation and growth of intra-urethral hair, and finally be cosmetically satisfactory.

The literature for the surgical repair of hypospadias is voluminous and it is not the purpose, and not within the scope of this paper to present an extensive and historically accurate review of the many different types of procedures which have been used for repair of this condition. However when one considers these procedures carefully, one is impressed with the fact that basically there have been only three principles of urethral reconstruction proposed :—

1. The use of adjacent local skin which is turned over or left buried to gradually turn over in such a manner as to form a new urethra. The advocates of this method are Bucknall (1907), Ombredonne (1911), Blair, V. P. & Byars (1938) and Denis-Browne (1947).

2. The use of some type of more distant pedicled flap which is formed into a tube or brought into position to ultimately from the new urethra—advocated mainly by C. H. May (1901) and Schaffer (1950) and D. M. Davis (1953).

3. The third method consists of the use of a free graft usually of skin, to reconstruct the urethra, first advocated by Nove-Josserand in 1897 and later popularised by McIndoe in 1937, and later by Young and Benjamin in 1948, by using whole thickness free skin graft.

The method to be used in constructing the new urethra should be determined beforehand, with a clear assessment of the requirements of the case. Before coming to a decision, it is worthwhile considering these factors in the operation :—

(a) Unfavourable factors in the operation.

(i) Passage of urine through the area of operation—has a deletirious effect on the process of healing; urine has an uncanny way of finding a way out other than that intended by the surgeon which soon tends to be skin-lined and the fistula becomes permanent. This contingency can only be prevented by diverting the urinary stream temporarily by an urethrostomy.

(ii) Presence of erctile tissue—contributes to unwanted erections of the penis during the post-operative period leading to sudden increase in tension on suture lines, not infrequently resulting in breakdown of sutures. This can be prevented by putting the patient on sedatives and oestrogen compounds.

(iii) Post-operative oedema in the subcutaneous tissues is a real difficulty, as oedema puts tension on sutures and impede circulation contributing to delayed healing.

(iv) Extreme thinness and fragility of penile skin.

A degree of tension which will be perfectly safe on the face, abdomen or elsewhere, will cut through penile skin with alarming rapidity and completeness.

(v) The difficulty of getting sufficient skin at certain points.

At the distal end of the penis in the prepuce there is superfluity of skin, at the base of a hypospadiac penis it is woefully deficient for surgical manoeuvres. The problem is one of distributing the epidermal resources equally, by tailoring skin from superfluous sources to where it is required most.

(b) On the other hand, **favourable factors** in the operation, again, are largely dependant on the special characteristics of penile skin.

This is quite different from that of any other skin in the body, and in many ways remembles the mucous membrane, the normal lining of the urethra. Penile skin including that of the prepuce is hairless, extremely mobile, extensible and most important of all, hardly forms hypertrophic scars or keloids. Besides, there is complete absence of thickening or contraction in the subcutaneous tissues after operative procedures. This fact is utilised in the forming of a new urethra out of penile skin, which has all the qualities of an ideal artificial urethra—it has a hairless elastic lining and no tendency to contract.

Of all the methods used for reconstructing the urethra, associated with the names of Marion-Dupley, Bucknall, Beck, Ombredonne, Blair, Nove-Josserand, Rochet, Young, Edmunds, McIndoe and Dennis-Browne, I have used mostly the Ombredonne and Dennis-Browne methods with gratifying results.

There is general agreement however, that the penile ventral curvature or "Chrodee" if present, should be corrected at an early age preferably at about 18 months of age when the child and the parts are large enough to make the operation fairly safe and easy, but on the other hand, should leave 2-3 years for the penis to grow normally before the new urethra is constructed. The presence of marked penoscrotal web of the skin in spite of minimal bowing is an indication for preliminary "lengthening operation."

In the present series of 78 cases, only 45 cases presented for treatment before the age of 1½ years, and 34 cases had marked bowing even then (12 being of the glandular variety without much bowing for which no operative treatment was advised). Out of 32 cases, which presented for treatment after the age of 18 months of varying ages from 2 to 30, 2 were of the glandular variety and no operative treatment was advised. The preliminary operation of correcting the chordee was done in 30 cases of the late age groups, and, excepting in two cases (one aged 30, and another 32) where, in spite of a fairly radical chordee resection a certain amount of bowing still persisted, presumably due to long standing fibrotic changes even in the corpora, the ultimate result so far as bowing is concerned, was satisfactory.

Lengthening operation :

There are two methods in common usage today, one is a simple manoeuvre advocated by Denis Browne and a more complicated one described by Edmunds. The choice of procedure is governed by the extent of ventral curvature. Minor degrees of bowing can be satisfactorily dealt with by **Denis-Browne's procedure.**

(Fig. 5 A.B.C.D.) A transverse incision is made just proximal to the glans, across the ventral surface of the penis and it is continued laterally into the prepuce on either side. All contracted tissues down to the corpora cavernosa are divided and allowed to slide towards the base of the

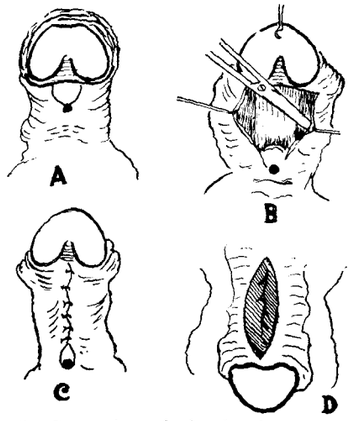

Fig. 5. Correction of chordee by the method of Denis Browne.
A. Transverse incision.
B. Dissection and excision of remains of corpus spongiosum.
C. Suture.
D. Dorsal relaxation incision.

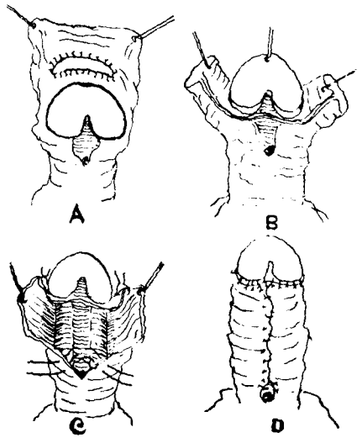

Fig. 6. Correction of chordee by the method of Edmunds.
A. Tubing of prepuce.
B. Division of tube.
C. Spreading of tube and excision of remains of corpus spongiosum. Suture started.
D. Suture complete.

penis. The transverse skin incision is then sewn up longitudinally with fine catgut (3.0), a dorsal incision is needed to relieve any tension in the suture line. Ribbon gauge, soaked in paraffin and flavin, is wound round the penis. This dressing keeps the organ straight and is left on for 8-10 days. The incision on the dorsum is not sewn up and it rapidly heals.

(2) Edmund's method (18 months to 2 years).

Marked chordee is usually associated with greater shortage of skin, and cannot be corrected by the simple transverse incision advocated by Denis-Browne. In Edmund's method, the large reservoir of preputial skin can be tailored into the ventral surface of the penis to make good the large skin defects which result when the penis is straightened.

(Fig. 6 A.B.C.D.) The prepuce is transfixed by a dorsal incision just distal to the corona. The margins of the buttonhole thus produced are united by fine sutures. By this means, the prepuce is converted into a small tubed pedicle deprived of its main blood supply from the dorsal vessels but gaining a compensatory collateral circulation from the sides of the penis. One month later, the small tubed pedicle is divided at its mid-point. A midline longitudinal incision is made on the ventral aspect of the penis, from the urethral orifice to the glans and continued laterally a short distance from the glans on either side to join the seam of the preputial "tube". It is continued along this to the cut end. The skin of the body of the penis is reflected and the two halves of the preputial tubes are opened out. This procedure provides two adequately large skin flaps which can be readily tailored to cover any large raw surface left by lengthening. These flaps are approximated in the midline by sutures which pick up deep tissue and so obliterate dead space and minimise haematoma formation.

Blair, Brown and Hamm employ a principle similar to the above, a combination of Edmund's first and second stage procedures, to bring the preputial skin to the ventral surface in an one-stage operation.

For minor degrees of bowing, when faced with slight skin shortage, we have occasionally sutured a V-shaped wound to an inverted Y, or where possible allowed redistribution of the skin by the well known Z-plasty procedure.

In this connection, it should be unnecessary to emphasise the importance of retaining the dorsal preputial skin as an invaluable skin resource, for any future contingency, and condemning the practice of circumcision, till the urethra has been completely reconstructed.

Reconstruction of the Urethra :

Of all the different methods proposed for reconstruction of the urethra, I have mainly used two methods. With small defects of the urethra, i.e. in a coronal or mid-penile hypospadias, the Ombredonne's procedure has been the method of choice. In the posterior penile, penoscrotal or even the perineal types, the Denis-Browne method is my elective procedure.

Ombredonne's operation :

This method of reconstruction of the terminal urethra has one distinct advantage over other methods in that, preliminary diversion of the urinary stream is not necessary. Another helpful factor, is that, should the prepuce slough during repair, which of course rarely happens, the wound heals minus the prepuce, i.e. in the hypospadiac state. The Denis-Browne operation is still available since in this method, the prepuce is not used. The other advantages of the Ombredonnne procedure are that

(i) it is simple to perform & (ii) no special instruments are necessary.

It is assumed that the penis has been lengthened and straightened at 18 months to 2 years of age. The first stage of Ombredonne's operation is best carried out when the child is 3-4 years old.

Technique : (Fig. 7)

The hooded prepuce is drawn taut with fine tissue hooks. An elliptical purse string suture is inserted (Fig. A), beginning at the apex of a flap from which the urethra is constructed, outlining the flap and ending at the apex. This encircles the hypospadiac urethra meatus which is at the centre of ellipse, the tip of the glans being the most distal point. The incision circles the purse string 1/8" outside as far as the glans, where it is carried to the other angles of the taut prepuce, only the ventral layer of the double fold of prepuce, being incised (Fig. B).

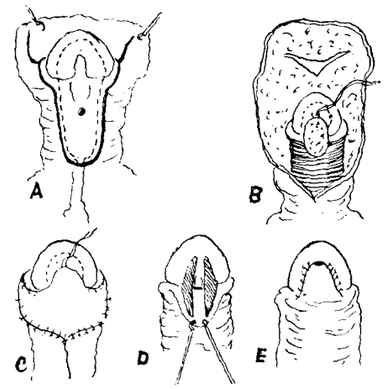

Fig. 7. Reconstruction of urethra by method of Ombredonne.
STAGE I.
A. Incisions in penis and prepuce. Placing of purse-string suture.
B. Dissection of penile and prepucial flaps. Purse-string lied "y" incision in prepuce.
C. Prepucial flap folded over and sutured to cover raw surfaces of penile flap.
STAGE II.
D. and E. Advancement of meatus to tip of glans.

Behind the glans, the limbs of the incision are joined, and with a little sharp dissection the prepuce is unfolded to one layer of thickness, i.e. the ventral component is peeled off the dorsal component to make a continuous sheet of prepuce one layer thick (Fig. B).

The urethral pouch is now freed as follows :— Steady traction is made on the purse-string suture and by a sharp dissection the whole of the skin enclosed within the purse-string suture is freed and drawn

towards the glans producing a funnel shaped continuation of the urethra. As a precaution a probe is introduced in the urethra as a guide to avoid injuring it, as the skin around the urethra is raised by sharp dissection. Steady tension on the purse string raises the pouch and draws it forward. Accurate haemostasis is secured.

An 'Y'-shaped incision is then made in the unfolded prepuce. Glans and pouch are then drawn through the Y. The rim of the glans and pouch are then sutured to the edges of the Y, and the remainder of the flap covers the raw ventral surface of the penis, and is sutured in position (Fig. C).

The purse string is never drawn tight or tied, and the ends which have been left long are used to suspend the penis to a light Kramer's wire bridge splint fixed to the child's thigh.

We have found that suspension through a weak elastic band is satisfactory, the band being detached periodically to permit the child to micturate. About a week later the purse string suture pulls out or is removed. No attempt in this stage is made to reduce the size of the bulky urethral pouch. It is obvious that the length of the preputial flap which will remain viable, limits the use of the Ombredonne repair, but it remains the method of choice in those cases where it will.

Second stage Ombredonne :

Three months after completion of the stage 1, stage 2 is carried out to remodel the urethral funnel. Tissue forceps are applied to the tip of the glans and the ventral edge of the pouch and the ball-mouth is opened out (Fig. D). A strip of skin and urethral pouch, beginning at the edge of the tip of the glans and carried continuously along the rim of the pouch is excised on either side. Thus the funnel shaped urethra is reduced to normal limits. The resulting new surface is closed in two layers with interrupted 3.0 silk sutures, and the stitch on the urethral side having the knots on the inside, the skin stitches with knots outside.

Denis-Browne procedure :

The other procedure used very extensively in our unit, is the one described by Denis-Browne. This method is applicable to all degrees of deformity, but we reserve it for cases where the urethra opens too far distally from the tip of the glans, where the Ombredonne procedure could not be attempted safely. The operation is based on the special characters of the penile skin which differs from any other skin in the body—"the reservoir" of skin in the redundant prepuce and the property of a buried strip of skin to form itself into a tube without suturing the edges together.

The penile skin is hairless, extremely mobile and rarely forms hypertrophic scars or keloids. It also possesses healing qualities associated with mucosa rather than with skin.

This procedure requires diversion of the urinary stream, if a normal rate of healing is to take place. There is general agreement that a perineal urethrostomy has many an advantage over a suprapubic cystostomy. The chief one is that dependent drainage is obtained with a perineal urethrostomy and it is difficult to keep urine out of the urethra if the bladder is drained by the suprapubic route.

Technique of Perineal Urethrostomy : (Fig. 8)

Although to many it is a routine operation, I shall describe the technical details, because urethrostomy is an operation which even experienced surgeons sometimes do extremely indifferently. A Malecot self retaining catheter is selected of such a size as wll be a reasonable fit. Mounted on a sound and lubricated, this is passed through the hypospadiac meatus of the urethra, into bladder. When urine flows the sound is withdrawn slightly and turned through 90 degrees so that the tip stands out in the perineum. The sound is

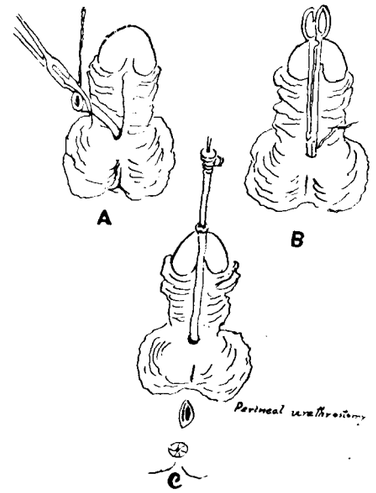

Fig. 8.
A. Denis Browne's method.
B. and C. Simplification of Denis Browne's method for use in suitable cases.

then held by an assistant and the operator fixes the tip with his left finger and thumb, exactly in the mid-line of the perineum. With the diathermy knife, a small incision is made and deepened until the rubber of the catheter is seen. The point of the sound is then insinuated into the wound, so that the catheter can be readily grasped by forceps. The hold must be firm and adequate lest the catheter slips back, on the withdrawal of the sound, which is the next step. The catheter is now carefully manoeuvred backwards, along the distal urethra, until it emerges through the perineal incision. If bladder urine is then found to be still flowing freely, the catheter is spigoted and stitched to the skin by two linen sutures, tied tightly round the tube and loosely in the skin, so that they do not cut out. If this is not done, even the best behaved child may pull the catheter out, particularly when half asleep.

The whole procedure sounds and looks pretty easy, but there are pitfalls. In incising the perineum, it is absolutely essential to keep strictly to the midline, otherwise unpleasant haemorrhage from the corpus veins is met with. Early in our series, we had a troublesome haemorrhage from this source, but since then, we have avoided it, by adhering to the midline.

It is also important to keep the urethral incision as small as possible, that is the catheter should snugly fit it. This ensures, rapid closure of the fistula after subsequent withdrawal of the catheter. If this is not done, and the catheter loosely fits the urethral opening, distressing leakage of urine occurs.

During the manipulations, the catheter may easily be withdrawn from the bladder. If urine fails to flow, the catheter must be manipulated into the bladder beyond all doubts, before it is fixed by suture.

"The end of the tube is then connected up to a reversed Wolff's bottle, giving a suction of about a foot of water, which will be enough to keep the bladder empty without discomfort."

If this is not possible, or the suction of the Wolff's bottle does not function due to any reason then the end of the catheter should be fixed to a glass connection, which in turn should be fixed to a rubber tubing leading on to a bottle fixed to the end of the bed containing some anti-septic solution. The rubber tubing fixed to the glass connection should be detached every day morning and evening, washed under a steady stream of the tap water and the bladder and urethra should be washed with a bladder syringe with weak acriflavine lotion. If this is not done, it has been our unfavourable experience that the catheter gets blocked, and ultimately, when the patient strains, urine jerks out with force through the suture line and inevitably leads to break-down of suture and formation of urinary fistulae.

Fashioning the new urethra : (Fig. 9)

A strip of skin 5 mm. in width is outlined from just below the tip of the glans to the hypospadiac meatus. The strip of

skin enclosed should be of adequate width. One of the common mistakes of inexperience is to make the strip too narrow, and this will result in an unsuccessful narrow urethra. On the other hand, it must not be needlessly wide or the covering flaps are likely to prove inadequate.

The lateral flaps are now widely and freely undermined by gentle dissection using fine scissors. Special attention must be paid to this undermining, below the urethral opening in the direction of the perineum. As far as possible the lowest point of suture when the flaps are united should be well forward of the urethral opening. Next the lateral skin flaps are widely elevated, if necessary, on to the dorsum of the penis and down into the scrotal skin. Great care must be exercised not to damage the skin flaps unnecessarily by rough handling with unsuitable instruments. The thin skin flaps should be held with very fine hooks and fine non-toothed forceps. The flaps should be undermined sufficiently to be made to overlap, to the extent of atleast one inch, like a double breasted coat. It is better to err on the side of too free mobilisation of skin, because the success of the operation depends upon complete freedom from tension in the suture lines. Sizable bleeding vessels are tied but the continuous ooze is ignored. Next a triangular piece of glans is made raw on either side of the new meatus by snipping off the skin by sharp scissors.

(Fig. 10) Tension stitches are now approximately every $\frac{1}{2}$" and at least $\frac{1}{2}$" away from the skin edge. Denis Browne calls them a "double stop suture." It consists of a glass bead and aluminium or metal stop which is threaded on to the stitch, and crushed to prevent the glass bead coming off the stitch. The slack is taken up in flaps so that the edges come into contact easily and with at least $\frac{1}{8}$"—$\frac{1}{4}$" of slack in the stitch, a glass bead is secured to the free end of the stitch by a bead of aluminium (Fig. 10-A). It is a mistake to have these stitches too tight, the beads cut into the skin and produce deep sloughs and possibly a row of fistulae.

(Fig. 10-B) The skin flaps are united with very fine catgut or silk, everting stitches. The penile skin is extremely thin and fragile. The subcutaneous tissues become very oedematus and erections may increase the tension on the suture line. To overcome these difficulties, relaxation is

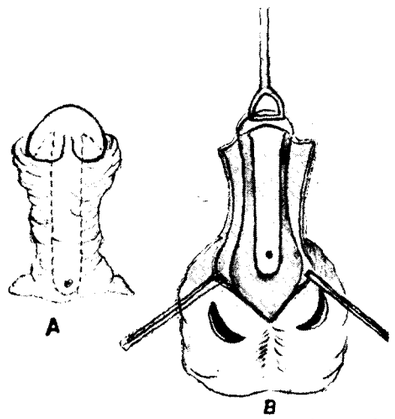

Fig. 9. Reconstruction urethra by the method of Denis Browne.

A. Incisions.
B. Outlining the ventral incisions and raising the lateral flaps of penile skin and the puncturing of the scrotum on either side to allow free egress of blood and serum.

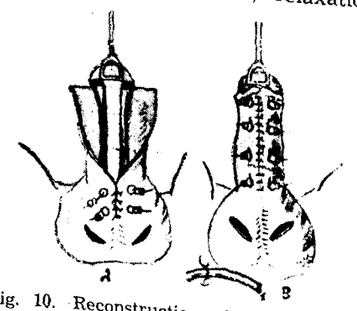

Fig. 10. Reconstruction of urethra by the method of Denis Browne.

A. Dissection, and commencement of suture, showing double-stop sutures.
B. The completed suturing. The sutures holding the drawing catheter in position are shown.

Fig. 11.
Showing the dorsal relaxation incision on the penis.

achieved by means of a dorsal incision which must be throughout the length of the penis (Fig. 11). Lastly two small stab drainage incisions are made on the scrotum, to let blood and serum escape.

The penis is covered by a pad of guage and wool and is anchored to the abdominal wall by means of a preputial stitch. After a few hours, the gauge and cotton pad is discarded and a chloramphenicol ointment is applied and is left exposed and kept dry.

If blankets are required during winter season then a metal cradle is put astride the patient's thigh and a clean sheet supervenes between it and the blankets.

The patient is nursed within a mosquito net.

The patient is put on alkalies and is encouraged to drink lots of fluids. Penicillin 50,000 units is given 4 hourly and after 3 days if he remains afebrile, then only one dose of Procain Penicillin of 4 lac units is given till stitches are removed.

From the first post-operative day, the patient is put on Stilboestrol 5 mgm. thrice daily, to an adult or proportionally less, if a child.

The tension stitches are removed in seven days and the urethrostomy catheter in 9-10 days. The perineal urethrostomy heals within a week.

Analysis of cases operated on :

Of the 62 cases operated on for reconstruction of the urethra 28 were repaired by the Ombredonne's method.

32 cases were operated on by Denis Browne's method. 2 cases were operated on by a single stage chordee correction and reconstruction of urethra by Mc Cormak method, but unfortunately, the anastomosis between the original urethra and the reconstructed one broke down and they were finally repaired by the Denis Browne method.

In all, 45 cases were operated on by Denis Browne's method, 32 cases as primary repair and 11 for secondary repair (2 as reported above and 4 cases treated elsewhere unsuccessfully) and 2 for congenital short urethra.

In the Ombredonne method of repair, the repair in each case was complete, no fistulae resulted and no secondary operations were needed.

In the Denis Browne method of repair, success in the primary repair was obtained in 23 cases, there were single fistulae formation in ten cases, multiple fistulae occurred in 7 cases. Secondary operations were required in 17 cases.

Recurrence of breakdown again occurred in 5 cases, and had to be repaired.

In assessing our results, the following criteria were used :—

Total no. of Cases	Glandular (30)	Penile (27)	Peno-Scrotal (11)	Scrotal (6)	Perineal (4)	Total
Persistence of Bowing	0	3	2	2	2	9
Good cosmetic result	28	25	7	3	2	65
Meatus at tip	12	21	8	5	1	49
Meatus on undersurface of glans	10	6	3	1	3	20
Meatus at original site	18	0	0	0	0	18
Good stream	12	25	10	5	2	44
Feathering of stream	10	13	3	2	1	29
Fistula (single)	0	3	3	2	2	10
Do (multiple)	0	0	4	2	1	7
Total no. of operations for dilatation of meatus	6	30	27	24	16	102

For complete repair—8 cases.

Havens and Litzwo of the Mayo Clinic (Journal of Urology, Vol. 72 no. 4, October 1954, p. 677) lay down the following criteria for a good result after an operation for hypospadias :—

(1) To be able to have a satisfactory sexual intercourse.

(2) To have an urethra of adequate calibre without hairs or sacculation.

(3) To have an urethral opening at or very near the tip of the glans penis.

Complications :

Post-operative complications of any serious import are uncommon, but haemorrhage, sepsis, sloughing of skin flaps, and, urinary infections sometimes do occur. They are common to all methods and the treatment is the same.

Haemorrhage :

Bleeding under the penile skin flaps, means haematoma formation, destruction of repair and sometimes loss of skin flaps. It is worth-while spending a few more minutes to assure perfect haemostasis by appropriate means, before commencing suture of flaps. I have found that the expedient of tying a rubber catheter round the root of the penis wherever possible, is very useful, in as much as it affords a relative avascular field during operation, and immediately before suturing the flaps, the same is removed, and bleeders are caught till complete haemostasis is obtained. Oozing is controlled by pressure with hot saline or adrenaline swabs.

Even the bleeding is arrested by pressure, the breakdown products of blood clot are not the best pabulum for healing tissues. Besides, the gross odema which accompanies small collections of blood may put a severe strain on a very delicate suture line. This is not apparent until about the fourth day, when the wound may break down.

Sepsis :

Frank sepsis is uncommon, and, with an adequate antibiotic umbrella, should not be serious. It becomes troublesome only when a haematoma becomes infected.

Urinary infection :

Mild degrees do occur as indicated by diminished urinary output and mild pyrexia. It is better to chart the fluid intake and output of patients with an indwelling catheter. Urinary infections are controlled by encouraging more fluid intake exhibition of alkalies and either streptomycin or chloramphenicol.

Sloughing of Skin flaps :

Is a disaster and is fortunately rare and has not happened in my cases. Avoidance of too much tension and planning the flaps with regard to their blood supply, are safe insurances against such a calamity.

Analysis of failures :

In our series, an enquiry into the possible causes of failures like breakdown of suture line and formation of fistulae revealed that more care is essential in :—

(a) handling of tissues—skin margins should be handled with due respect with non-toothed fine dissecting forceps and very fine skin hooks.

(b) using extra fine needles and suture materials and avoiding the use of too bulky beads and heavy metal stops.

(c) ensuring adequate haemostasis.

(d) scrotal drains and adequate dorsal incisions to prevent oedema and thus increased tension on suture line.

But in my opinion, the most important factor was the maintenance of the temporary diversion of the urinary stream. If, for any reason, the catheter got pulled out or was allowed to become blocked, then

breakdown of the suture line and consequent fistulae formation became inevitable. To me, it has been the greatest bugbear, and I have made it a routine practice to disconnect the catheter from the glass connection and to wash out the bladder daily with a weak acriflavine solution, in case the reversed Wollf's bottle did not function properly in producing suction. Whenever this was done regularly, healing had been uneventful.

Application of the operative principles of the treatment of Hypospadias to other allied conditions.

A. *Repair of fistulae :*

(a) Small fistulae—sometimes the fistulae are very small, and are only apparent during the act of micturition in the form of a fine spray, and which are easily controlled by the patient by putting a finger over them.

They are cured easily by destroying their thin epithelial lining by a diathermy pinpoint.

(b) Single big fistula—can be closed by inturning a local circular flap, in closing the fistulae to provide the lining and undermining the lateral edges of the incision and closing it over by the Marion Dupley principle to provide the cover. For success, it is absolutely essential to divert the urine by a preliminary perineal urethrostomy and to provide a dorsal relaxation incision. It is needless to emphasise, that no attempt to repair fistulae should be undertaken before all oedema has subsided. A wait of atleast three months after the preliminary operation is considered safe.

(c) Multiple sizable fistulae—follow as a result of generalised breakdown of sutures following sepsis of severe oedema. When this happens, there is not much point in closing the individual fistulae, but it is better to undo the whole thing, and do a definitive, Denis Browne type of repair again, after all oedema has subsided.

B. *Stricture :*

Operative repair for stricture of the urethra is not a new surgical procedure. Dugas in 1836, reported the first case of complete resection of the urethra for the repair of a stricture. It was treated postoperatively by an indwelling catheter without any attempt to suture the ends together. Many other urethroplasties have been devised since then, but are useful mainly in short stricture. The major premise of their technique is to dissect free and excise all involved scarred urethra and surrounding tissues, and then a direct end-to-end anastomosis of normal tissues is performed. Bengt Johanson of Stockholm has applied the principle of the Denis Browne type of repair in the operative treatment of urethral stricture, regardless of pathogenesis, extent or degree of severity of the stricture. The Johanson type of urethroplasty is an improvement on the previous urethroplasties, as no after treatment is required, specially dilations, and is applicable to all grades of strictures. The first stage of the operation creates an artificial hypospadias by excising all elements of scarred and strictured urethra and the next stage repairs it by the burried intact epithelial tract technique.

This open up a new field in the treatment of urethral fistulae and offers new hopes to thousands of these unfortunate victims whose strictures were presumed to be inoperable and where conservative treatment had either failed or became unbearable.

Summary of treatment :

Reviewing our results in the treatment of hypospadias, we have come to the following conclusions :—

(1) That every type of hypospadias, whatever the severity may be, is amenable to operative treatment.

(2) To achieve good results, bowing must be corrected at an early age at about $1\frac{1}{2}$—2 years by radical chordee resection.

(3) In glandular, coronal and up to midpenile hypospadias, Ombredonne's method of repair has been our method of choice. In our hands, the method has proved to be a great success, as we did not have a single operative failure. Within its limitations, as detailed earlier, it is an ideal method.

(4) For severe grade of hypospadias, extending from midpenile to perineal, we have used only the Denis Browne method of repair. Not having tried the McIndoe method of repair, we are not in a position to comment on its relative merits and demerits.

Summary

(1) A review of 78 cases of hypospadias has been presented.

(2) Clinical features, Pathological anatomy, Etiology, Embryology, and differential diagnosis of hypospadias has been described.

(3) Object of treatment of the condition, and evolution of the different methods of treatment has been assessed.

(4) Methods used in the treatment of cases in this series have been described in detail.

(5) Criteria for adoption of standards of success have been advanced.

(6) Results of cases treated in the series have been analysed and causes of failure, their prevention and treatment have been presented.

(7) Complications and their treatment have been discussed.

(8) The applications of the principles of treatment to other allied cases like congenital short urethra, epispadias, and urethral stricture has been discussed.

Treatment of hypospadias is not easy and has been far from perfect, but it is our firm conviction, that as time goes on, and our technique improves, we shall be able to repair a far greater number with a greater percentage of excellent results.

Acknowledgement

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3. I am indebted to the Professor of Anatomy of the P. W. Medical College for allowing the artist of his department, Sri Rambilas Prasad to sketch the illustrated drawings.

4. Lastly, I must thank the Superintendent, Patna Medical College Hospital for allowing me to use the records of cases operated on in the Hospital and Sri Vivekanand Lal of the office of the Head of the Department of Surgery for his secretarial assistance.

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STROMAL ENDOMETRIOSIS

by K. D. SHARMA, J. B. SHRIVASTAV and B. R. SOLANKI, Nagpur.

A rather uncommon type of uterine neoplasm has been described in which the invading elements are mostly stromal without any gland formation. The published datas indicate that these tumours closely resemble each other and their pathologic features are sufficiently distinctive to justify them a separate entity.

The earliest description of a case of this nature was given by Doran and Lockyer (1909) under the name "Perithelioma of uterus". Casler in 1919 reported a similar condition as a "Unique uterine tumour, really an adenomyoma with stroma but no glands". Since then these tumours have been described under various names, Frank (1932) as "endolymphatic fibromyosis"; Goodall (1940), Miller et al (1944), De Carb (1945), as "endometriosis intersititiale"; Robertson et al (1942), Goodall (1943), Kettle et al (1949) and Embrey (1952), as "Stromatous endometriosis"; Henderson (1946) as "endolymphatic stromal myosis". Park (1949) in an excellent review of the subject regarded the condition as an abnormal tissue overgrowth differentiating to a stromatoid appearance and suggested the name "Stromatoid mural sarcoma". Though the neoplasm has a characteristic macroscopic and microscopic appearance it is clear from the published reports that the nature and origin is still disputed. A total of about 50 cases have been reported in world literature. In Indian literature Dhirendra Kumar et al (1952) have reported two cases of stromatosis, one benign and the other malignant. We are reporting another case of this comparatively rare clinicopathologic entity.

CASE REPORT

Mrs. T., 40 years of age was admitted on 7th of July 1955, in the Medical College Hospital, Nagpur with complaints of occasional blood stained whitish discharge per vaginum for the last 4 months. Her menstrual periods had been regular. She had five full term normal deliveries. There was no relevent previous medical or family history.

General examination showed no abnormality except that she was anaemic and there was a soft systolic murmur in mitral area. On abdominal examination, a hard irregular mass in the hypogastric region extending upto 3" above symphysis pubis was felt. On bimanual examination it was found to be due to irregular enlargement of uterus of the size of 14 to 16 weeks of pregnancy. There was no other abnormal clinical finding. Urine was normal. Haemoglobin was 20%; and total R.B.C. count was made. During her preoperative stay in the hospital patient continued to get bleeding per vaginum. She was given repeated blood transfusions and prepared for operation. On opening the abdomen, uterus enlarged to a size of 20 weeks of pregnancy, was seen. There was no extension of tumour outside uterus. Tubes ovaries and abdominal organs were normal. A total hysterectomy and bilateral salpingo-oophorectomy was done. Her post-operative recovery was uneventful.

Pathological findings:

The uterus was apparently symmetrically enlarged, the body being 12 cms. long and its wall 2.5 cms. thick at the unaffected portion. The endometrial cavity was distended by a pale tumour mass 8 cms. long and 6 cms. at its widest part. The tumour did not involve the whole uterus but was arising eccentrically from the

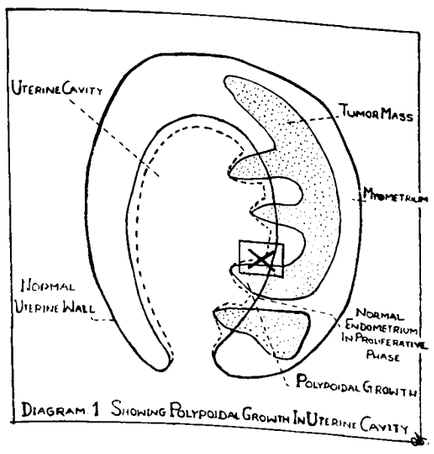

Diagram 1 Showing Polypoidal Growth In Uterine Cavity

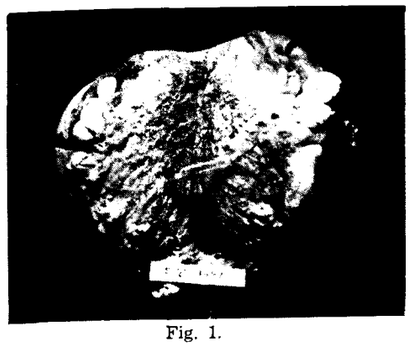

Fig. 1.

Photograph of the specimen showing the tumour mass. Note the polypoidal masses of varying sizes.

Fig. 2.

Showing polypoidal masses in the uterine cavity. Note at one corner a chink like space representing the uterine cavity.

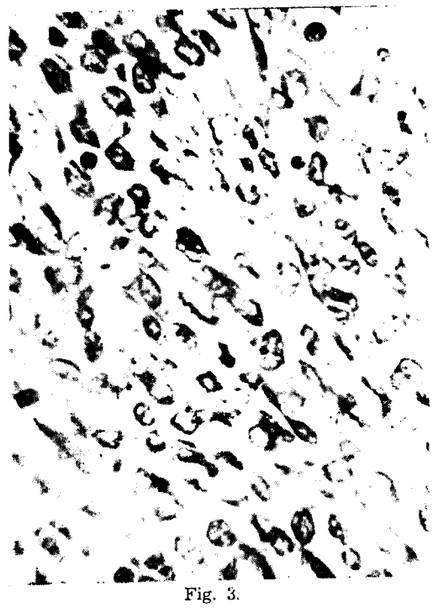

Fig. 3.

Photomicrograph showing stromal cells.

posterior wall and extending laterally to 6 cms. distance on one side, thus leaving the anterior wall of the uterus free. The uterine cavity was reduced to a narrow linear chink. Numerous polypoid masses of varying sizes, yellowish in colour, rubbery soft to feel and some of them showing haemorrhagic areas at the tip were arising from the tumour and occupying the uterine cavity (Figs. 1 & 2 and Diagram 1). The muscular wall showed a large number of radiating cords of tumour mass in "Worm like extensions". In the fresh specimen these extensions stood out prominently on the cut surface and could be pulled out like cords of rubbery tissue. The peritoneal surface was smooth and seemed to be free of tumour tissue, so were the tubes and the ovaries.

Microscopy:

Sections were taken from the uterus, Cervix, ovaries and fallopian tubes. The polypi in the uterine cavity were made up exclusively of stromal cell covered by a single layer of cuboidal epithelium. The component cells were round or oval, possessing a well defined nucleus and relatively scanty cytoplasm (Fig. 3). Mitosis was not seen. The general impression was that of stromal cells of mid-cycle endometrium. The mucosal blood vessels were unusually large in number and varied from capillaries to thick walled arterioles (Fig. 4). In no section was there any evidence of gland formation within the tumour mass. The polypi in the uterine cavity were the extensions of the tumour mass that had broken through the endometrium in the manner as shown in the diagram. Section from the base of the polyp and the intervening endometrium (from area marked X in Diagram I) shows glands in the proliferative phase and strands of stromal tissue (Fig. 5).

The stromal cells of the mucosa dip in broad strands into the intermuscular tissues of the mymometrium. These areas stained deeply with haematoxylin and very poorly with eosin, so that they can be traced with the naked eye quite easily, and better still, with an inverted eye piece of the microscope. Several of these intermuscular strands of stromal cells were directly continuous

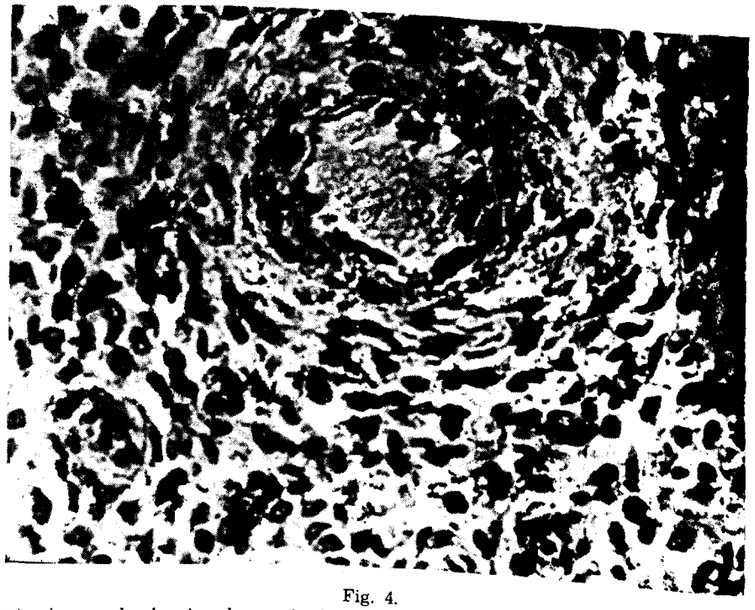

Fig. 4.
Photomicrograph showing large sized blood vessel in the midst of stromal cells. Note the stromal cells of varying sizes and form.

Fig. 5.
Photomicrograph showing endometrial glands in early proliferative phase, at the base of the polyp.

with the polypi projecting in the uterine cavity. There were no glands in these extensions. Some of these stromal cords were seen at places to be lying in smooth walled tunnels, formed by the myometrium (Fig. 6). Some of these tunnels were lined by a single layer of endothelium. It was not possible to indentify the nature of the tunnels. They could either be blood vessels, lymphatics or tissue spaces. At some places the stromal strands were partially separated from myometrium whereas at other areas they indistinguishably fused with the myometrium. It appears that separation of the cords at some places was due to shrinkage of tumour tissue. Invasion of blood vessels could not be demonstrated. The serosal surface was apparently free though in the subserosa cords of tumour tissue were seen. Tubes and ovaries were completely free of stromal invasion. Sections stained to demonstrate reticulin showed the same "basket-work" pattern in tumour tissue which is characteristic of endometrial stroma.

Discussion

Stromal endometriosis has now been accepted as a distinct pathologic entity; though the pathogenesis of the tumour still remains a debatable point. The views of various observers on the nature of the tumour have been exhaustively dealt with by Park (1949). There are two very important points related to this condition.

(1) Its degree of malignancy.

(2) Its relation to endometriosis.

With regard to its degree of malignancy out of 43 cases reviewed by Park (1949) 5 expired as a result of recurrence and local spread of neoplasm. Metastasis occurred only in 7 cases. Distant metastasis such as in lungs occurred only in two cases. The main risk to the patient is its local recurrence years after the removal of the neoplasm. Henderson (1949) regards the condition as a low grade malignancy with a tendency to late recurrence. In our case the tumour inspite of its big size does not show any evidence of spread beyond myometrium. It is too early to rule out any local recurrence unless the case is followed for a sufficient period of time. Till the time of reporting no recurrence has occurred. The histologic appearance in most of the cases is that of well differentiated mature type of cells showing no anaplasia or hyperchromatosis. Goodall (1940) describes a benign and malignant type of stromal endometriosis but this differentiation was based on clinical course of the disease rather than histologic criteria. Novak (1947) regards the cases showing histologic malignancy as a type of endometrial sarcoma. According to Henderson and Telinde (1946) it is difficult to classify them as benign or malignant.

The relationship of this tumour to endometriosis is uncertain. Goodall (1940) regards this condition as closely related to endometriosis. Whereas according to Henderson (1946) it is distinct from ordinary endometriosis for it does not show menstrual bleeding, forms solid tumours, spreads directly through lymphatics and blood vessels, and tends to recur after many years of removal. Additional points added by Telinde (1946) that the condition may occur first after menopause, some

Fig. 6.
Photomicrograph showing stromal cords lying in tunnels formed by the myometrium.

cases have recurred and progressed following complete removal of ovary, and percentage of malignancy in this condition is much higher than true endometriosis, further confirm the views of Henderson. Novak (1947) regards them as "Clearly only a variant of adenomyosis". According to Park (1948) it has all the characters of a true neoplasm showing progressive autonomous growth. The relationship to true endometriosis, if any, must be very distant. He puts forward the hypothesis that it is an abnormal tissue overgrowth developing from some precursor cells by a process of multifocal insitu tissue differentiation. The present case shows the features of a neoplasm consisting of a mature type of stromal cell. The manner of invasion by pushing between muscle bundles and along perivascular lymphatics resembles invasion of adenomyosis rather than sarcoma. But the absence of glands and no direct continuity with the endometrium is more suggestive of new growth. It would be rather unwise to speculate on the nature of stromatous endometriosis on the basis of this solitary case. But it may be observed that the pathologic features are more characteristic of a neoplasm rather than of endometriosis.

There is no distinctive clinical sign or symptom that can be assigned to this condition (Henderson, Park, Embrey). Meyer (1951) noted extensive haemorrhage as an outstanding symptom. Clinically the asymmetrical enlargement of uterus is another constant finding. The case presented showed blood stained discharge but no extensive haemorrhage. This appears to be from the excoriated surfaces of the polypoidal growths of the tumour mass that were seen in the uterine cavity.

The incidence of this tumour is regarded as extremely rare by Telinde (1946) who found only 4 cases out of 65000 specimens. Goodall (1940) does not regard it so rare as compared to sarcoma of the uterus. In our series out of 300 operated specimens of uterus examined over a period of 5 years only one case was seen. Finally, a word regarding proper terminology for this condition. Although there is much to be said for abandoning the term "Stromatous endometriosis" it would be wise to stick to this name till the nature of the condition is finally decided.

Summary

1. The clinical history, pathologic characteristic of a rare uterine tumour showing microscopic appearance of endometrial stroma are presented.

2. Relevant literature on this tumour has been reviewed and it has been suggested that it is a neoplastic condition arising from the stromal cells of the endometrium and not merely a condition of ectopic endometrial tissue.

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CONGENITAL DIAPHRAGMATIC HERNIA IN ADULTS

(With a Case Report)

by K. N. UDUPA, NIRMALA DEVI CHAND and M. L. AHUJA, Simla.

Congenital Diaphragmatic Hernia is not an uncommon condition in newly born infants and children, but its occurrence in grown up adults is comparatively rare. Recently we came across one such patient who was originally admitted as a case of pleurisy with effusion and who on radiological examination was discovered to be a case of congenital diaphragmatic hernia through the pleuroperitoneal canal. Because of its rarity in adults and because of the difficulty in arriving at a correct diagnosis it was felt that the report of this case would be of interest.

CASE REPORT

Mrs. G.D., a twenty year old woman was admitted to the H. P. Hospital, Simla on 3-11-1956 with a complaint of pain in the epigastrium and left hypochondrium for the last 3 months. Pain was constant and dull in nature, with acute excerbations once or twice in a day when the stomach was full. In the beginning there was only discomfort after taking meals, which used to be relieved after vomiting. Later on this discomfort accompanied with pain increased in intensity and lasted for longer periods. She never had any such trouble before, nor did she give any history of trauma. She was married about 4 years ago and so far she had no children. Her menstrual history was normal. On physical examination she was a moderately built woman with good general physique. Her pulse, temperature and respiration were within normal limits. B.P. 120/80 m.m.Hg. Physical examination of the chest revealed that the apex beat of the heart was medially displaced. On percussion, lower part of the left side of the chest was hyperresonant and the area of cardiac dullness was not present. On auscultation the heart beat, though normal was found behind the sternum. There was also deficient air entry into the lower part of the left lung. Examination of the abdomen showed, tenderness in the left epigastrium and hypochondrium. Liver and spleen were not palpable. All other systems revealed nothing abnormal. Laboratory examination of blood showed R.B.C. 4.1 millions, and haemoglobin 92%. The total leucocytic count was 9600 per cmm. with Poly. 57%, Lympho. 37%, Mono. 4% and Eosino. 2%. Urine and stool examinations did not reveal any abnormality.

Radiological examination of the chest (Fig. 1) revealed a horizontal fluid level on the left base with a gas shadow above. The heart was seen displaced to the right side. This aroused the suspicion of a diaphragmatic hernia with stomach and other bowels in the chest cavity. Therefore further barium meal studies were carried out. After this, the X-ray picture (Fig. 2) showed that the stomach was enormously dilated with an hour glass constriction at the site of defect in the diaphragm. The barium meal in the oesophagus showed that the oesophageal opening was in the normal place in the diaphragm, whereas the fundus and the adjoining part of the body of the stomach was seen in the chest cavity. Along with this, one could also see a loop of large bowel, filled with barium given a day earlier. From these findings a diagnosis of congenital diaphragmatic hernia, through the pleuroperitoneal

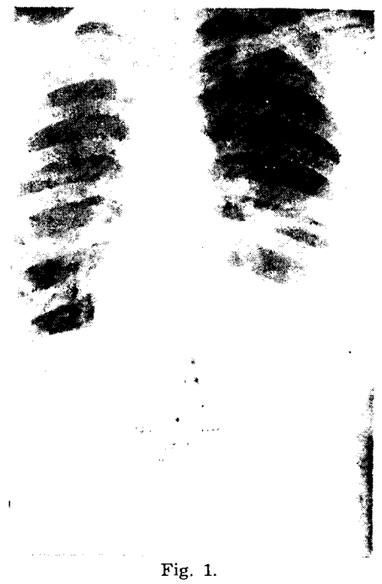

Fig. 1.

The plain X-Ray of the chest shows a horizontal fluid level in the left base with air above it. This aroused a suspicion of its being a stomach shadow. Please also note that the heart was displaced towards the right side.

Fig. 2.

This picture was taken on P.A. view. In this the barium filled stomach has passed into the chest cavity through a defect in the dome of the left side of the diaphragm with an hourglass contraction in it. Please note that the cardiac orifice is in its normal place.

canal was made and surgical repair was decided upon.

After doing all the preliminary preparation of the patient, under general anaesthesia of ether with controlled ventilation, the abdomen was opened by a left paramedian incision. On opening the abdomen one could see that most of the stomach, a portion of the transverse colon and omentum, were passing through a hole in the left dome of the diaphragm. As these structures were pulled down a gush of air entered into the chest cavity. There were a few adhesions between the omentum and the diaphragm at the site of the defect, which could be easily separated and all the structures could now be kept in the abdominal cavity without much difficulty. The defect in the diaphragm was somewhat oval in shape, and measured about 3" x 2" in diameter (Fig. 3-a). Medially it was about 2.5" away from the oesophageal opening and laterally it was about 1" from the chest wall. The left lobe of the liver and the spleen were seen on either side of the opening. As expected there was no hernial sac. The margins of the hernial orifice were roughened and brought together on the same principle as in Mayo's operation for the repair of umbilical hernia (Fig. 3, b & c). First of all a few Mattress sutures were taken to overlap the two margins of the defect and then several interrupted sutures were taken with strong silk to complete the overlapping. The administration of the Muscle relaxant "Curare," during this stage greatly facilitated the suturing. The air in the chest cavity was then aspirated and the abdomen was closed without putting any drainage tube. Postoperative course was uneventful, except for a slight rise of temperature for the first three days. Postoperative X-ray picture (Fig. 4) of the stomach after barium meal showed that the fundus of the stomach was under the left dome of the diaphragm and the heart above it was seen receding back to its original position. At the time of discharge she did not have any discomfort either in the abdomen or in the chest.

Discussion

Congenital Hernia in the diaphragm may appear in any one of the developmentally deficient areas in it. Amongst them, the postero-lateral portion of the diaphragm which is commonly known as Pleuroperitoneal canal (Foramen of Bochdalek) is the commonest site. Although it can occur both on the left as well as on the right side according to Gross [2] it is five times more common on the left side. Sometimes the opening may be very big with very little diaphragmatic rim around it, in which case it is called a congenital absence of a portion of the diaphragm. The other relatively uncommon sites for occurrence of congenital diaphragmatic hernia are Retrosternal area or Foramen of Morgagni and the Oesophageal hiatus. In this paper we are concerned mainly with the posterolateral type.

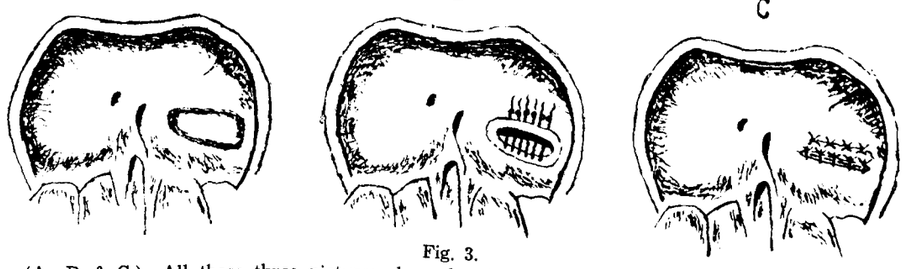

Fig. 3.

(A., B. & C.) All these three pictures show the size and shape of the pleuro-peritoneal canal usually seen in such cases and the methods of repair, that are usually adopted in such cases through the abdomen.

Fig. 4.

Shows the post-operative X-Ray picture. In this one can see the stomach below the diaphragm and the heart shadow receding towards its normal place.

In the congenital hernia through the pleuroperitoneal canal, there is usually no sac and hence the abdominal contents are found in the chest cavity freely. The symptoms of this type of hernia are very complex owing to mechanical interference with the functions of the heart and lungs. In this, the respiratory and the cardiac symptoms are most severe in the beginning and hence about 75% of the infants born with this congenital defect if not treated promptly die in the first few hours of life [4]. But according to Harrington [3], if the respiratory and the cardiac mechanisms are able to compensate for the presence of these abdominal viscera in the thorax, the patient may live upto childhood or even upto the adult age.

However there are very few case reports of such patients. Recently Campbell [1] reported a case who lived upto 80 years with congenital absence of the left diaphragm. The greatest risk in such patients in later life is the development of gastric or intestinal obstruction at any time during life. Our patient came to us when she started developing symptoms of partial obstruction of the stomach. In such cases diagnosis can only be confirmed by Radiological investigations. No sooner is the diagnosis definitely established, operative treatment should be given, no matter how old the patient may be, because of the risk of the complication of obstruction.

Approach to the diaphragm can be either through the abdomen or through the Thorax. Each route has its own advantages and disadvantages. We feel that the abdominal approach is preferable because it is safer and easier. However occasionally difficulties are encountered in the abdominal approach. The viscera may be adherent to any organ in the chest cavity, although this difficulty can be overcome by a careful dissection and manipulation. Further when the defect is due to incomplete development of the diaphragm, this defect has to be corrected by mobilising the muscles of the chest or by transplanting fascia lata under direct vision which can be done more easily through the Thorax.

But the disadvantage of the Thoracic approach is that if the contents of the abdominal cavity could not be reduced or pushed down into the abdomen through the hole, then there is no other choice left, than to open the abdomen and reduce it. Therefore it is our feeling as also suggested

by Harrington that most of the congenital diaphragm hernias can be repaired through the abdomen. Only one exception to this is that when the defect is very big, such as is found in congenital absence of a portion of the diaphragm when a thoracic approach is indicated.

Summary

1. Amongst all the types of congenital diaphragmatic hernias the one occurring through the pleuroperitoneal canal on the left side is the commonest one and about 75% of such cases die during infancy due to the cardiorespiratory complications.

2. Regarding the management, operation should be attempted no sooner the diagnosis is established and the abdominal approach is preferable for repair of this type of defect.

3. A case report of a congenital diaphragmatic hernia in an adult with symptoms of intermittant partial gastric obstruction is presented.

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EXPERIMENTAL HYDRONEPHROSIS — I

by B. N. BALAKRISHNA RAO and S. K. NAIR, Gwalior.

It was an established belief that sudden, complete ureteric obstruction led to primary atrophy of the kidney which was rapidly reduced to a flattened fibrous mass. This idea was as firmly believed in as it was taught and propagated in books. McCallum (1919) wrote, "Cohnhein made the statement that only partial or intermittant obstruction is followed by great distension of the pelvis, while complete obstruction results in cessation of the flow of urine and atrophy of the kidneys." As late as 1948 Winsbury White (Tex Book of Genito-urinary Surgery) says, "complete closure of the ureter does not lead to hydronephrosis; the outstanding change which occurs, is atrophy of the kidney."

The myth of these suppositions was exploded by E. Ponfick as early as 1911 by demonstrating experimentally that unlike the liver and pancreas where ligation of their respective ducts, the glands shrank and atrophied; in the kidney such primary atrophy never followed ligation of the urter. He showed conclusively that acute ureteric obstruction was invariably followed by distension of the ureter, renal pelvis and the collecting system. Such has also been our experience based on experimental work outlined below.

Methods and Materials

Fifty rats were used for the experiments. Under aseptic conditions the left ureter was exposed just above its opening into the urinary bladder and divided between two ligatures. This was to ensure that recanalisation of a merely ligated ureter would not occur.

The animals were killed in groups after the ureter had been ligated for periods ranging from four days to six months. The changes resulting from the ureteric obstruction were then studied, macroscopically and microscopically.

Macroscopic changes:

Progressive pyelo-renal enlargement, proportionate in degree to the duration of obstruction was the rule. Primary atrophy of the kidney could not be seen even in a single instance.

In rats the normal kidney has the following average dimensions. Length 12-14 mm., breadth 6-8 mm., thickness 5-7 mm.. volume 360 to 784 cmm. (Mean 572 cmm.)

After 4 days obstruction the ureter was definitely, though only slightly larger in calibre than its normal counter part. By 7 days (Figs. 1 & 2) both the ureter and renal pelvis were considerably enlarged and this continued progressively, till at 54 days, the dimensions of the hydronephrotic kidney reached 24 x 14 x 14 mm's (normal 13 x 7 x 6 mm). When the ureteric obstruction was maintained beyond 54 days (upto 180 days), the hydronephrotic kidneys enlarged no further in size showing that in the rat, hydronephrotic atrophy is usually complete in 54 days.

These changes in size were reflected in changes brought about in the volume of the pelvic contents following obstruction. In a normal rat kidney the pelvis and ureter at any given time contain such a small volume of urine that it is hardly measurable. As the ureter and renal pelvis enlarge following the obstruction the volume of their contents increases correspondingly from .8 ml. at 15 days to 1.4 ml. in 21 days, 2.3 ml. at 30 days and finally 2.4 ml. at 54 days; thereafter no further increase takes place even though the obstruction is maintained showing once again that hydronephrotic atrophy is probably complete by 54 days in the rat.

The progressive pelvic dilatation is at the expense, naturally of the renal parenchyma whose thickness gradually shrinks from the normal 4 mm. to reach to less than 1 mm. at 54 days. This is accom-

Fig. 1.
7 days' hydronephrosis.

Fig. 2.
7 days' hydronephrosis.

panied by a progressive loss of cortico-medullary differentiation as seen in the sectioned kidney.

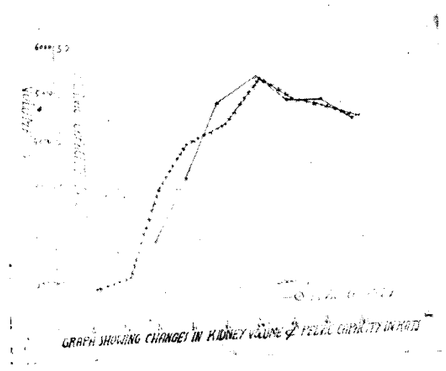
The gross changes in rats following ureteric obstruction are summarised in Table I and Graph 1.

TABLE I

GROSS CHANGES IN RATS

Group	Duration	Dimensions in mm.	Volume in cmm.	Thickness of surviving parenchyma in mm.	Cortico-medullary differentiation	Pelvic capacity
A	4 days	14× 9× 6	756	4	Present	Q. I. S.
B	7 days	14× 9× 7	882	3	Present	Q. I. S.
C	15 days	18×14×11	2772	2.5	Present	.8 ml.
D	21 days	20×13×14	3640	2	Faint	1.4 ml.
E	30 days	24×13×15	3980	1	Absent	2.3 ml.
F	54 days	24×14×15	5040	Filmy	Absent	2.4 ml.
G	60 days	24×14×14	4704	Filmy	Absent	2.2 ml.
H	90 days	22×14×15	4620	Filmy	Absent	2.3 ml.
I	180 days	22×14×14	4312	Filmy	Absent	2.2 ml.

Q. I. S. — Quantity insufficient.



Graph I.

Microscopic changes :

The progressive renal destruction so clearly shown in gross specimens was even more vividly shown by a study of the histology of hydronephrotic kidneys.

A section of normal kidney in the rat when examined under low power shows on an average of 10-15 glomeruli per field. The glomeruli show a number of distinct capillary loops surrounded by a narrow capsular space lined by flattened epithelium. The tubular cells are cuboidal with a granular cytoplasm and present a distinct brush order. The pelvic epithelium is low columnar in type and there is only a small amount of interstitial tissue.

Four days after ureteric ligation the pelvis is seen to be widely dilated and there is also a well marked dilatation of the collecting tubules. The epithelium lining them becomes flattened and a mild inflammatory cell reaction is seen in the sub-epithelial connective tissue which is seen to contain several enlarged dilated veins (pyelo-venous backflow ?). Even at this early stage there is an increase in the capsular space and glomerular tufts show

Fig. 3.
4 days' hydronephrosis showing moderate dilatation of collecting tubules and capsular space.

Fig. 4.
60 days' hydronephrosis. Section shows crowding of glomeruli, disappearance of tubules and fibrofatty tissue in the renal pelvis. (H. & E. x 85)

Fig. 5.

25 micron section of a normal kidney injected with Berlin Blue. The dye has diffused uniformly through the glomeruli and inter-lobular vessels. (Unstained x 85)

Fig. 6.

25 micron section of a 21 days hydronephrosis with Berlin Blue injection. The dye is irregularly distributed and has reached the capsular space due to damage to the epithelium of the glomerular tufts. (Unstained x 85)

a tendency towards lobulation. The lining cells of the convoluted tubules, though somewhat flattened are otherwise normal at this stage (Fig. 3).

With obstruction of a longer duration, the above early changes of dilatation become progressive and in addition, atrophic changes supervene. As is to be expected the degenerative changes first affect the highly specialised cells of the convoluted tubules which show them markedly at 21 days and these become progressively greater till at 60 days little, if any, normal tubular tissue can be made out (Fig. 4).

The glomeruli showed, with progressive obstruction, a gradual crowding so that dozens can be seen in one field in a kidney subjected to back pressure for 60 days. These crowded glomeruli show degenerative changes varying from lobulation to hyalinisation and ultimately complete replacement fibrosis as filtration is arrested because of mounting intra-pelvic pressure. Simultaneously there is a reduction in the vascularity of the hydronephrotic kidney as more and more glomeruli are replaced by fibrous tissue. Thus if thick sections of the affected kidney are compared with similar sections of the normal kidney after injection of Berlin Blue into the renal vessels (Figs. 5 & 6), it can be seen that while almost all glomeruli in the field in a section from the normal kidney contain the dye, only a few in the hydronephrotic kidney show the dye as others have been obliterated by fibrosis, and only their outlines can be made out.

Fig. 7.

Pyonephrosis following ureterostomy. The polyethylene tube can be seen in the lower part of the picture.

Stage of Irreversibility :

In the present work, an attempt was made to determine how long the obstruction could be allowed to proceed so that its removal would restore the kidney back to normal. With this end in view attempts were made firstly to obtain pyelograms after intra-muscular injections of radio-opaque materials into rats to find out at what stage a functional renal failure occurred. Secondly, attempts were made to drain the hydronephrotic kidneys to observe whether they would revert to normal.

Unfortunately, work along both lines was not successful. All attempts to obtain satisfactory pyelograms failed and cutaneous ureterostomy which was used to drain hydronephrotic kidneys was invariably followed by pyonephrosis (Fig. 7).

Summary

1. The results of experimental ligation of the ureter in rats are presented.

2. It has been shown that progressive ureteric and pelvic dilatation with atrophy of the renal parenchyma invariably follows such a procedure and not primary renal atrophy without ureteric and pelvic dilatation as is taught and written.

3. The macroscopic and microscopic changes in hydronephrotic kidneys are briefly described.

4. Failure to obtain satisfactory pyelograms and drainage of hydronephrotic kidneys is recorded.

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SUBDURAL SPINAL HYDATID

by PRITAM DAS, Lucknow.

Hydatid cysts are seen most *commonly* in the *liver*, but they have been reported to occur in *almost every* part of the body. They may occur in the brain, the vertebral canal or the vertebral bodies. The growth of these cysts into the subdural *space* is both surprising and interesting and so far as I am aware such a case has *not* been reported. The subdural cysts cannot obviously be a primary lesion. In the case reported here, the hydatid disease most probably originated in the sacrum and spread to the sacral canal and further extended to the subdural space from its lower end upto the level of the fifth dorsal spine. There was also a very large cyst in the space between the sacrum and the rectum, which is another interesting feature of the case.

CASE REPORT

Patient B.P., male, aged 28 years, farmer, was transferred under my charge at the Gandhi Memorial Hospital on 25-6-56. He had come in with the complaints of (i) difficulty of micturition and defaecation for the last nine months, (ii) weakness, numbness and tingling of the lower extremities for the last two months, and (iii) pain in the lower part of the back (lumbosacral region) for the last six weeks.

On questioning further it was found that the first neurological symptoms manifested about five years ago, when in 1950, he had an attack of pyrexia accompanied by diarrhoea and vomiting. In this attack he also developed severe pain in the left thigh and leg. The fever subsided in a few days but the pain persisted and was subsequently followed by weakness and wasting of the muscles of the leg. A local doctor gave him a course of twenty 'Berin' injections, which relieved him considerably but the weakness and wasting of the leg continued.

The disability was not severe and he kept on in his job till about December 1955, when he got another attack of pyrexia, and pain in the left lower extremity appeared again. This time he also noticed difficulty in passing his stools and urine. Later he developed incontinence of urine and could not pass his stools without the help of an enema. He also noticed loss of sensation on the buttocks, as he could not feel the ground when he sat on the floor. This led him to discover the loss of sensation on the back of the left leg and thigh. Later the weakness in the lower extremities became more and more marked and he developed pain in the lower part of his back.

At the time of admission he could pass his urine only after considerable straining, he could not stand or walk and he had constant pain in the lumbosacral region radiating down the back of the left hip, thigh and the leg upto the ankle joint.

On examination:

The patient was a young man, thin, run down and constantly groaning with pain. He needed a dose of sedative twice or thrice a day. He was slightly anaemic, his pulse was 94/m., his temperature was normal and blood pressure was 115/70 m.m.Hg. The respiratory and circulatory systems showed nothing abnormal. Abdominal examination showed the spleen to be four fingers enlarged, firm and smooth.

On examination of the nervous system, the cranial nerves and the superior extremities were normal. The abdominal reflexes were brisk in all the quadrants. Both the lower limbs were found to be affected as follows:—

	Right	Left
Nutrition:	Wasting in the leg muscles and glutei, and thinning of thigh muscles.	Wasting of the leg muscles and glutei was more marked than on the right side. There was thinning of the thigh muscles.
Power:	Movements at knee present though weak. Flexion being weaker than extension. Voluntary movements of ankle and toes not possible.	Voluntary movements at the toes and ankle not possible. Knee movement weaker than on the right side.
K.J.:	±	—
A.J.:	—	—
Plantars:	Absent.	Absent.

Sensation to touch and pin prick was lost on the buttocks, perineum, scrotum and the penis, and back of the thigh on both sides. On the left leg sensation was lost on the back and the lateral side and almost on the whole of the foot excepting the area supplied by the saphenous nerve. On the right leg sensation was lost on the back in the upper half only, the lateral side of the leg had more or less normal sensation although he missed the touch a few times. The lateral side of the right foot was mostly insensitive both on the dorsal and planter aspects, only a few pricks were felt in these areas (Fig. 1).

Laboratory investigations :

Lumbar Puncture — C.S.F. examination showed : Proteins 60 mgm., Chlorides 640 mgm., Sugar 33.3 mgm. Cells 26 cm.m. including R.B.C.

W.R. and Kahn tests negative in Blood and C.S.F.

Urine : Urine was alkaline in reaction, albumin was present in traces, few triple phosphate crystals were present.

Total W.B.C. : 5,100 cm.m. Differential white count was Polys. 65% Lymphos. 31% Eosinos. 4%.

Haemoglobin : 12.3 gms./100 c.c.

Skiagram : Straight skiagram of the lumbar spine was normal. The lamina of the fifth lumbar spine appeared deficient in the lower part.

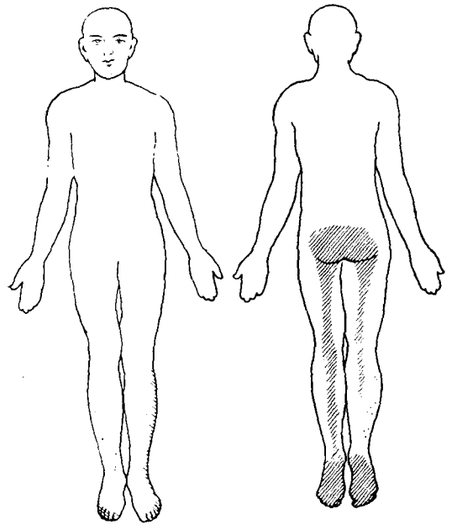

Fig. 1.

Showing areas of loss of sensation. Shaded areas represent complete loss to touch and pin prick, the dotted areas had partial loss.

There was an irregular erosion in the region of first, second and third pieces of sacrum on the left side of midline. This was missed preoperatively (Fig. 2).

Myelography could not be done because on repeated attempts lumbar puncture was dry.

Preoperative diagnosis :

A preoperative diagnosis of cauda equina tumour was made, although the two attacks of pyrexia accompanied by aggravation of the neurological condition could not be explained on the basis of a new growth.

Operation notes :

Operation was performed on 17-7-1956. A midline incision six inches long was made from the first sacral spine upwards. The lumbar fascia was incised and sacrospinalis muscle was separated with a broad blunt osteotome from the spines and lamina of third, fourth and fifth lumbar vertebrae. These lamina were then removed with bone nibbling forceps. The extradural fat was small in amount and dural pulsations were absent throughout the length of the exposure. The dura was then carefully incised so as to avoid injury to the underlying arachnoid. But on incising the dura a most unusual thing was observed. There were small rounded white cysts lying in the subdural

Fig. 2.

Photograph of the skiagram showing a large irregular cavity in the second and third pieces of sacrum on the left side.

space. One of these cysts was helped out entire with a blunt dissector. It was about the size of a cherry, white and translucent, and its appearance left little doubt that it was a Hydatid cyst. Cysts of similar size were found arranged in a single file along the space exposed, they were similarly removed. On examining the deeper aspect of the subdural space it was found to be covered with a thin layer of compact fibroareolar tissue and neither the spinal cord nor the nerve roots were visible.

It was soon discovered that cysts were visible above and below the level of the dural incision. It was decided to tackle the upper end first. The lamina of the second lumbar vertebra was nibbled away and three more cysts were removed entire. A curved blunt dissector was then passed upwards and a number of cysts were delivered out. It soon became apparent that removal of even several lamina higher up would not be able to expose the upper limit of the lesion, therefore it was decided to remove the remaining cysts by suction with a rubber tube. A rubber tube of as wide a bore as the space would admit was then passed up and suction applied. Dozens of cysts were removed in this way. The highest level from which the last cyst was removed was that of the fifth dorsal spine as measured by the length of tube which had to be inserted before the cyst was encountered (Fig. 3). Several cysts broke in this process spilling the fluid, however the entire cavity was left dry at the end. No formaline irrigation was done for fear of damaging the cord.

The lower end of the subdural cavity was then dealt with. Several cysts were first removed entire by helping them out and later suction was applied. The nozzle of the suction went easily into the region of the sacral canal and the larger cysts were soon replaced by smaller ones and occasionally bits of bone with a bunch of small cysts attached to them were observed. It appeared that there was an inexhaustable store of cysts somewhere in the sacral canal and so it was decided to expose the sacral canal at a lower level.

A separate midline incision was then made over the middle of sacrum, and the sacral second and third lamina were removed. This disclosed the existence of a large irregular cavity in the sacrum. Hundreds of small cysts of varying size were found clinging to the bone on the wall of the cavity. On putting a finger into the cavity a gap was found in the bone anteriorly and the finger went into the presacral space where a large soft mass was present (Fig. 3).

A rectal examination was made by one of the house-surgeons at this stage, when it was found that the posterior wall of the rectum was bulging forward. It was therefore surmised that a large mass of cysts was present in the space between the sacrum and the rectum. The cysts in the bone were removed by suction and curetage. A few of the nerve roots of the left side were visi-

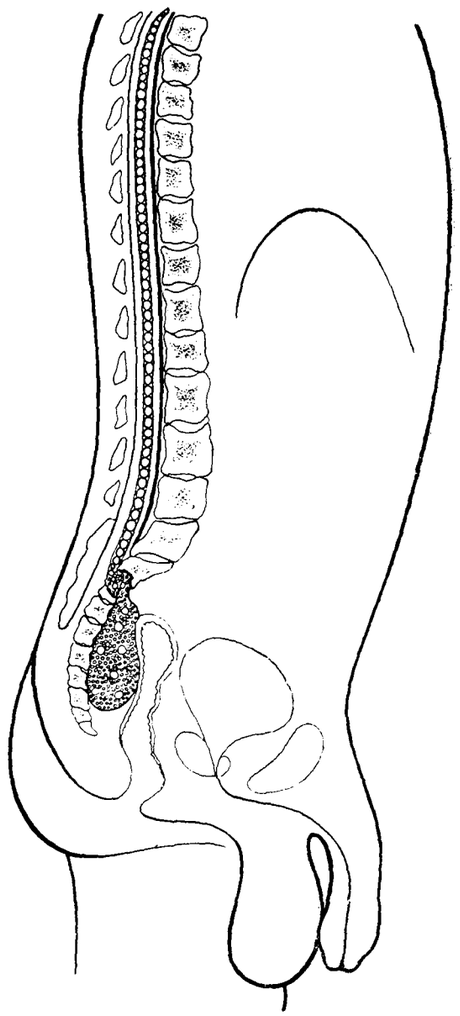

Fig. 3.

Diagrammatic representation of the lesion as found at operation. There is a large mass of cysts in the presacral region, an irregular cavity in the sacrum, and a long line of subdural cysts arranged in single file ascending upto the level of the 5th dorsal vertebra.

ble at this stage, having been pushed laterally. Scores of cysts of varying sizes were delivered out of the presacral space and in the end the wall of a huge cyst came into view which was caught with a dissecting forceps and was gently helped out. It was found to be a delicate endocyst whose diameter was no less than three to four inches, and it was presumed that this large cyst was the one which contained the other smaller cysts. A rectal examination done again at this stage showed that the bulge in the posterior wall of the rectum had disappeared.

Being satisfied, that the presacral space had been evacuated of all the cysts, and the spongy portion of the sacrum had been curetted to remove all the cysts attached to it, a soft rubber tube was left to drain the presacral cavity, and the sacral wound was closed. Gloves and towels and instruments were then changed and the laminectomy wound was also closed.

Supportive therapy during operation :

The operation was a prolonged one, lasting more than five hours. The blood pressure fell and the pulse was imperceptible during the last stages of the operation. A blood transfusion of 325 c.c. was given and was followed by a continuous drip of 5% glucose intravenously throughout the operation. When the blood pressure had fallen to low levels plasmosan drip was given in addition to the glucose drip and nor-adrenaline was added to the latter.

Post-operative :

The post-operative period was characterised by a severe reaction which lasted for three days. On the day of operation the pulse remained imperceptible most of the time. The glucose, plasmosan drip with nor-adrenaline was continued. In addition to these, Percorten 1.5 c.c. was administered every six hours intramuscularly and oxygen was given for half an hour, every two hours by nasal catheter. Avil, an antihistaminic was administered intramuscularly. A catheter was passed into the bladder and was tied in. There was good amount of urinary secretion. Penicillin 4,00,000 units and streptomycin one G. were also given on the first and sugsequent days. On the next day (18-7-1956) he developed a sharp rise of temperature (104°F.) and the pulse was feebly palpable and ranged between 160 and 180/m. The blood pressure was unrecordable most of the time. On this day also, glucose drip was given continuously and Percorten and Avil were continued. Digoxin, one tablet twice a day was given by mouth to steady the pulse rate and sedatives were given to allay pain. Abdominal distension was troublesome and was relieved by flatus tube. By the evening the pulse fell down to 150/m. and the systolic blood pressure could be recorded at 75 m.m.Hg. Late in the day he had frequent loose motions and there was a further rise in temperature. He was shifted to a cold room, to combat hyperpyrexia. On the third day (19-7-1956) the temperature remained at 104.6°F, pulse at 160/m. and the blood pressure was again not recordable. The supportive treatment was continued and by the evening the blood pressure could again be recorded at 80 m.m. systolic. The diarrhoea continued throughout the day.

The condition settled down on the fourth day (20-7-1956). The temperature fell down to 99°F, pulse slowed down to 132/m. and the blood pressure was recorded at 90/70 m.m. The number of loose motions also decreased to three only. The condition gradually settled down thereafter.

The tube left to drain the presacral region was removed on the fourth day when no more discharge was observed. The stitches were removed on the 9th day and the wound was found to have healed by first intention except for the site where the drainage tube was left.

On 6-8-1956, nineteen days after the operation the patient left the hospital because of family reasons. At the time of discharge his neurological condition was the same as before. The pain in the back radiating down the leg had been almost completely relieved, and sedatives were no more necessary. The wound had healed except for a small raw surface at the lower end of the wound over the sacrum ; there was no discharge from it. The general condition had improved considerably. He could pass his urine but after great straining. There was incontinence of faeces.

Discussion

This case has several points of interest. In the first place it has to be decided as to which was the site of primary lesion. Obviously the subdural space was involved secondarily and the primary lesion could have been either in the sacrum or in the presacral space. The presence of a primary lesion in the liver or spleen appears rather remote. The liver was not enlarged. The spleen was enlarged but it did not appear to be cystic clinically. It was smooth and firm like a tropical spleen. When we take into account the fact that the largest cyst was in the space between the sacrum and the rectum, it points to this being the primary site of the lesion. It will however not be easy to explain as to how the hexacanth embryo reached there. A blood borne lesion would settle down in a spongy bone rather than in the wall of a space. The only probable way in which it could reach the presacral space is by rupture of a hepatic or splenic cyst into the perito-

neal cavity, and some of the scolices settling down into the rectovesical pouch, forming a cyst which subsequently got covered by endothelial layer of the peritoneum, and thus the cyst became extraperitoneal. When a cyst ruptures into the peritoneal cavity a marked anaphylactic reaction occurs. The first run of symptoms which could be considered due to hydatid anaphylaxis in this case occurred in the way of fever and diarrhoea in 1950. At this time he also manifested the neurological symptoms by way of pain and weakness of the left leg. If a hepatic or splenic cyst had ruptured at that time there was no reason for neurological symptoms to develop. These symptoms indicate that the cyst was already present in the region of the sacral nerve roots at that time. Therefore it is likely that the cyst was present in the sacrum from the beginning and it leaked in 1950 causing an anaphylactic reaction, and by pressing on the nerve roots it produced the neurological symptoms. The leakage of the cyst probably occurred anteriorly, and a secondary cyst formed in the presacral space. This grew to a large size because of the space available to expand. Primary cysts in the bones are rare in adults, but they do occur and their incidence has been reported as 0.9%.

It appears he had another leakage in 1955 when his symptoms got aggravated. This time, most probably, the leakage occurred posteriorly into the subdural space. The cyst must have eroded the bone and the dura before a rupture of its wall occurred. There is no doubt that the cysts were in the subdural space, because during the operation the spinal cord and the nerve roots were not visible and there was no leakage of cerebro spinal fluid, when the cysts were being removed. Why the arachnoid did not get invaded and why the cyst did not grow in the subarachnoid space will not be possible to answer.

A still more interesting point is, as to how the cysts reached to the high level of the fifth dorsal vertebra. It could not have been possible for the hydatid fluid to have ascended so high carrying the Scolices or the brood capsules at the time of initial rupture. The subdural space is only a potential space and fluid cannot flow in it freely. Moreover only a small quantity of fluid is present in the bone hydatid. Another possibility is that a cyst formed at a lower level which ruptured, thus spilling the fluid to a higher level where a cyst formed again and this process continued till the present stage reached. This means that rupture of cysts occurred many times which should have given rise to repeated anaplylactic reactions. Such reactions did not occur and therefore this possibility is also ruled out. The next method of spread which is offered as an explanation for this case, is the possibility that the cysts formed originally in the sacral region and they ascended upwards by the force of more cysts forming below.

The preoperative diagnosis of cauda equina lesion was the only alternative under the circumstances. But a more accurate diagnosis could have been arrived at if a rectal examination had been done before the operation when a mass would have been discovered. The irregular cavity in the sacrum on skiagram was also missed pre-operatively. These two observations would have focussed attention to the mid-sacral rather than the lumbosacral region. Hydatid disease is not common in this part of India and the idea of performing a Casoni's test before the operation did not occur. Although the two attacks of fever and diarrhoea pointed to something unusual, gastroenteritis is so common a malady that this was dismissed as a mere chance association. The lumbar puncture was positive once, but attempts on later occasions for performing myelography failed. The neurological symptoms were obviously due to pressure on the nerve roots either in the sacral canal or in the sacral foraminae. Whether the sacral plexus was pressed upon by the large presacral cyst would be difficult to say, since the case reached us late at a stage when most of the muscles supplied by the sacral roots were affected.

It is generally believed that anaphylactic reaction does not occur under anaesthesia. However, the circulatory collapse that occurred in this case towards the later stages of the operation was most probably due to anaphylactic reaction. The blood loss during the operation was minimal and the duration of the operation could also not explain the severe extent of circulatory failure. The same type of reaction continued after the operation too and there is every reason to believe that the fall in blood pressure during the operation was also due to the same cause. It is quite possible that due to bursting of many of the cysts during the operation, some of the fluid got absorbed leadinig to the reaction.

Is the patient going to get cured is the question that naturally arises. The operation was prolonged and was persisted with in the hope that the disease would be completely eradicated. However there remains a suspicion whether the disease has been eradicated to the last seedling of the hydatid. Formaline could not be used for nearness to the nerve roots and the spinal cord. However there is every reason to believe that muscles of the leg would improve considerably.

Follow-up: A letter from the patient at the time of the report said that no improvement had occurred in the paralytic condition till then.

SUMMARY

A case of subdural spinal hydatid in a young man presenting the cauda equina syndrome is reported. The primary site of lesion, the mode of ascent of the cysts from the sacral to the upper dorsal region and other interesting points are discussed.

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HYDATID CYSTS IN MULTIPLE ORGANS ASSOCIATED WITH CHANGES IN THE LIVER

by D. J. REDDY, K. GOPALAKRISHNIAH GUPTA and K. R. VENKIAH, Guntur.

Reports of hydatid disease in men from South India are fairly frequent and occasional reports from other parts of India are noticed. In recent years Bhat and Carman from Vellore, Reddy and Anguli, Thangavelu and Reddy, Rao and Balasubramanian from Madras, Mahadevan and Menon from South India, Atmaram Rao from Visakhapatnam, Reddy et al from Guntur, Koshal from Gwalior, and Nigam and Gharpure from Nagpur had recorded hydatid disease and pointed out the ubiquity of these cysts in relation to their occurrence in the viscera. Some of the authors have recorded occurrence of these cysts in the brain, vertebral column, etc. But yet, in text books on medicine or parasitology under Indian or foreign national authorship, mention is not made of the incidence of hydatid disease in men in India and is conspicuously omitted in the epidemiological map of taeniasis. While it is true that hydatid disease is alarmingly high in sheep rearing countries where man associates with the dog frequently, clinicians are beginning to realise that man acquires the disease through ingestion of contaminated food, vegetables and water.

Hydatid cysts are usually recognised in adults, although it is believed infestation with the oncospheres occurs during infancy. For the cysts to reach appreciable size in order to exert pressure over the organs a variable period of 4 to 20 years is expected. But many reported their recognition in children of six and below. In our series a boy aged six harboured hydatid cyst in the kidney and sought medical aid for a mass in the loin. All published reports reveal that liver is the most frequent site of hydatid cysts and sometimes it is riddled with several cysts. Dew stressed that hydatid cysts occur in multiple organs and not uncommonly some of the organs may be the site of several cysts. Clinical recognition of hydatid disease is beset with difficulties, since for a long time it is quiescent and asymptomatic. The surgeon is wise in excluding hydatid disease in all cases of a palpable cystic swelling. Many attach little significance to the so-called hydatid thrill infrequently elicited in cysts located superficially. Periodic attacks of fever and urticaria as clinical manifestations of allergic reaction due to rupture of the cyst offers clue to the existence of the cysts. Blood eosinophilia is an inconstant and undependable finding. Bhat and Carman recommend Casoni test as a reliable aid in the detection of hydatid disease and they found the test positive in 90% of their series. Unaccountable calcific spots in the presence of a suspicious swelling is highly suggestive of hydatid disease. Circumscribed roentgen shadows in the lung are characteristic of hydatid cysts as was found in our case and also recorded by Bhat and Carman. The pressure effects of hydatid cysts on adjacent organs often present deceptive clinical manifestations and unless the surgeon bears in mind the existence of these cysts he is likely to miss them.

The authors recently reported 5 cases of hydatid disease from Guntur and since then met with four more cases, all within the short period of two years. A few particulars of these cases are given in the table below. Case no. 9 is interesting in several aspects and posed a diagnostic problem. Many of the organs were the sites for one or more cysts and some had ruptured. We feel that the clinico-pathological findings of this case would interest the clinicians in general and surgeons in particular.

[redacted]

A female aged abou[redacted] under Dr. M. Seethara[redacted] the treatment of a lun[redacted]

TABLE I

Serial No.	1	2	3	4	5	6	7	8	9
Sex & Age	F20	F20	M40	M6	F45	F30	M40	M45	F35
Site of Cyst	Breast	Liver	Pancreas	Kidney	Liver	Liver	Liver	Muscle (Supraspinatus)	Liver, Lung, Kidney, Spleen & Psoas muscle

Some particulars of cases of Hydatid disease registered at the dept. of Pathology, Guntur Medical College.

months duration. She complained of anorexia, and dull pain in the region of the lump. She had noticed the lump gradually increasing in size. There had been progressive deterioration in her general condition.

Main clinical findings :

Suspicious tinge of icterus was observed. Fullness of the abdomen was noticed in the upper half and the mass moved with respiration. This mass appeared to be continuous with the liver. Visible peristalsis could not be elicited. P.V. and rectal examinations were not contributory.

Investigations :

Urine : Nil contributory.

Blood : Total W.B.C. count : 7,050 ccm. Total proteins 8.03 gms.%. V.D.R.L. positive in 32 dilutions. Thymol turbidity test : 16 units. Serum bilirubin 0.4 mgms.%. Fasting sugar 64 mgms.%.

X-ray : Plain X-ray of the chest disclosed circulo-ovoid shadow in the mid region of the right lung (Fig. 1). Barium meal picture of the stomach and intestinal tract was suggestive of a neoplasm in the stomach (Fig. 2).

The clinical and roentgenological findings were clinically suggestive of primary carcinoma of the

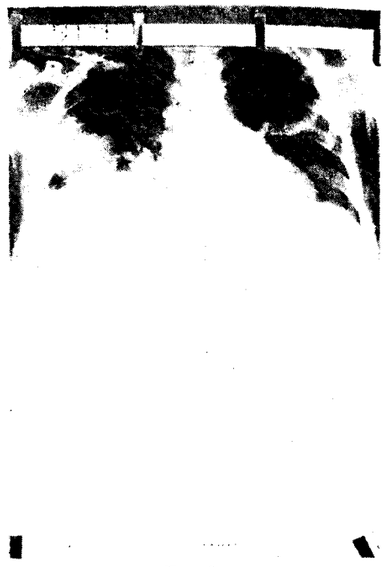

Fig. 1.
Reduction photograph of chest X-ray illustrating a circulo-ovoid shadow in the lower portion of the rt. lung, suggestive of hydatid cyst.

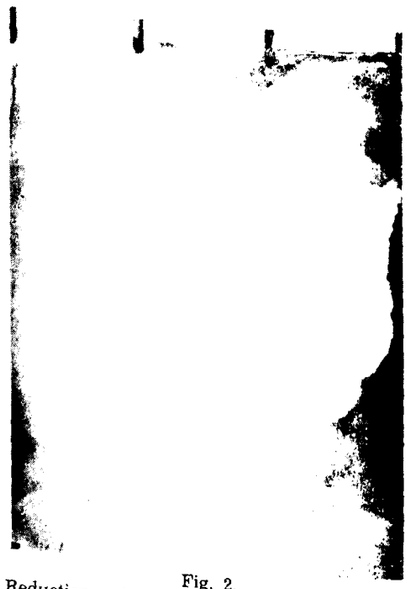

Fig. 2.
Reduction photograph of X-ray illustrating Barium meal picture of gastrointestinal tract. The stomach is not visualised properly.

stomach with secondaries in the liver and lung. On 24-3-1957 the patient complained of acute pain in the abdomen and it was associated with signs and symptoms of shock and collapse. The patient expired the following day.

Chief necropsy findings inclusive of morbid histology :

The abdomen was distended with 42 ozs. of frank pus. Flakes of fibrin were seen in the pus. The liver was greatly enlarged and was the site of several cysts each of the size of a duck's egg (Fig. 3). Some of them were superficial and at the free margin of the liver while others were buried in the substance of the liver. One of them was found collapsed and adherent to the omentum. Puncture of some of the cysts released clear distilled water like fluid, while others contained thick greenish yellow pus. The liver in general was lightly tinged green. The cysts were lined with a soft opaque white substance resembling the white of hard boiled egg, characteristic of the endocyst wall of hydatid cyst. The liver weighed 4,860 grammes and this was mostly contributed by the cysts ; the liver tissue in between the cysts was negligible. Similar cysts were noticed in the lower lobe of the right lung, in the substance of the middle of the left kidney, in the dependent portion of the spleen (Fig. 3), and over the right psoas muscle (Fig. 4). Scrapings from the inner surface of the endocyst under the microscope showed scolices (Fig. 5). Stomach was of normal dimensions but was wedged in between the hepatic and lineal cysts. Similar cysts were not noticed in the other parts inclusive of bones.

Sections from multiple blocks of the liver were studied. (N218-220/57). The fibrous wall of the hydatid cyst was seen in all. Beyond the ectocyst the liver cords were compressed and many cells had disappeared and in their place fibrous tissue was seen (Fig. 6). Most of the sections showed multiple abscesses, the cells composing these being polymorphonuclears (Figs. 7 & 8). In places appearances similar to biliary cirrhosis with bile duct proliferation were prominently seen (Figs. 9 & 10). Round cell infiltration was also noticed. Sections of the spleen, kidney and lung revealed typical components of the hydatid cyst wall associated with compression of the parenchyma around it and round cell infiltration. Collapse of the lung tissue bordering the cyst was observed (Fig. 11).

Morbid Anatomical Diagnosis :

"Hydatid Cysts in multiple organs associated with rupture of hepatic cyst and peritonitis".

COMMENT

It is not surprising that the clinician on the history and roentgen findings, suspected carcinoma of the stomach with pulmonary and hepatic metastases. Pressure exerted by the cysts of the liver and spleen resulting in compression and distortion of

Fig. 3.
Photograph illustrates sectioned surfaces of liver riddled with multiple hydatid cysts with the endocyst inside them (marked 4), circumscribed cyst in the kidney (marked 1), cyst in the lower lobe of the lung (marked 2) and in the dependent part of the spleen (marked 3).

Fig. 4.
Photograph illustrates an ovoid hydatid cyst perched over the rt. psoas muscle.

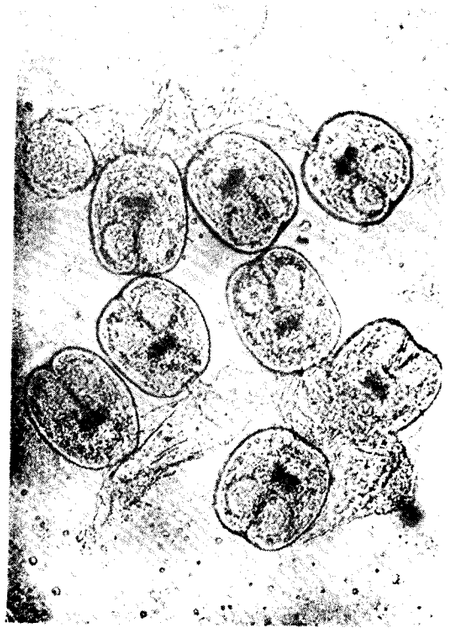

Fig. 5.
Photomicrograph illustrates scolices from the scrapings from one of the cyst walls. (x 226)

Fig. 6.
Photomicrograph illustrates fibrous wall of the cyst beyond which the liver cords are seen compressed, liver cells destroyed and fibrous tissue taking their place. (H & E x 60)

Fig. 7.
Photomicrograph illustrates a couple of abscesses in the liver. At the periphery is seen remnants of surviving liver cells. (H & E x 60)

Fig. 8.
Photomicrograph illustrates high power view of figure 7 and the polymorphonuclears composing the abscesses are well seen. (H & E x 320)

Fig. 9.
Photomicrograph illustrates appearances suggestive of biliary cirrhosis. (H & E x 72)

Fig. 10.
Photomicrograph illustrates bile duct proliferation in an area of biliary cirrhosis. (H & E x 90)

Fig. 11.
Photomicrograph illustrates ecto and endocyst walls of hydatid cyst lung. Beyond the cyst collapsed portion of the lung alveoli are seen. (H & E x 60)

the stomach threw a roentgen shadow suggestive of slowly growing neoplasm of the stomach. These cysts have on several occasions been wrongly recognised as liver abscess, pyelonephritis, or pulmonary neoplasm. Bhat and Carman recorded an interesting case of hydatid cyst of the liver in a girl clinically mistaken for a pedunculated benign tumour of the lesser curvature of the stomach. It was later disclosed at operation that the hydatid cyst in the free margin of the liver was pressing on the stomach, accounting for the filling defect noticed on the barium meal series pictures of the stomach. The multiple abscesses noticed in the liver were the result of rupture of some of the cysts and release of bile which usually initiates inflammatory reaction. Compressive effects of the cysts again account for the biliary type of cirrhosis noticed in our case. It is remarkable that in spite of the massive destruction of the liver, the serum bilirubin content was within normal limits.

Barnett recorded 15 to 16% mortality in hydatid disease. Multiple hydatid cysts in one organ, or rupture of these with attended peritonitis is largely responsible

for deaths in hydatid disease. Involvement of many organs and the liver being riddled with these cysts, rupture of some of them and subsequent peritonitis in our case accounted for the death. Seven out of nine of our cases survived thanks to the appropriate and timely surgery. This was possible because only one organ was affected in each case, which could be either excised, or the concerned organ removed in case normal function was not impaired by such a procedure. Similar encouraging results of surgery in hydatid cysts are recorded by many. Taiana from Buenos Aires in 200 patients with 273 hydatid cysts in the lungs gave relief to the patients by carrying out pulmonary resection, lobectomies, and pneumonectomies to suit individual cases. Successful removal of hydatid cyst from vertebral spine and restoration of the function of the limbs to normal are recorded by Nigam and Gharpure. Rao and Balasubramanian reported recently splenectomy with gratifying results in two cases of hydatid cysts of spleen. In all our cases eosinophil counts in blood were of equivocal importance. We could not carry out the skin tests for want of material.

SUMMARY

1. *Published literature* in India regarding *hydatid disease* is briefly reviewed with emphasis on the need to realise its high incidence in our country.

2. The value of laboratory and roentgen aids in the recognition of the disease on the basis of published reports is critically evaluated and the usefulness of Casoni's test in the clinical recognition of the disease is impressed.

3. The need to spot these cases early and the gratifying results of surgery in appropriate cases are stressed.

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INTUSSUSCEPTING LEIOMYOSARCOMA OF TERMINAL ILEUM

by R. NIGAM and A. M. GHOOI, Nagpur.

Smooth muscle tumours of the gastro-intestinal tract are sufficiently infrequent conditions to warrant publication of a case, presenting some unusual features. The common site of occurrence of such tumours is the stomach, but they are also observed in the ileum, colon, oesophagus and in the retro-peritoneal tissues, in that order of frequency. Oberhelman (1952) reviewed the literature and has described the relative incidence according to site as shown in chart no. 1. The usual symptoms associated with the tumour are recurrent attacks of gastro-intestinal haemorrhage, anaemia, weakness, and subsequently symptoms of bowel obstruction. The tumour is slow in growth and metastasizes late. Golden and Stout (1941) prefer to call these tumours as malignant leiomyoma rather than as leiomyosarcoma, thus indicating their slower growth as compared to other sarcomata of the bowel. Surgical extirpation is the only satisfactory method of treatment, the tumours being radio resistant.

Chart No. 1

Incidence of smooth muscle tumours in G. I. tract (Oberhelman et. al.)

Author	Total cases	Oeso-phagus	Sto-mach	Small Int.	Colon
Smith (1951)	513	50	321	109	33
Golden & Stout (1941)	975	51	629	197	98
Oberhelman et. al. (1951)	1105	66	705	225	109

Golden and Stout (1941) reviewed 60 cases with a site incidence of 33 stomach, 3 duodenum, 1 jejunum, 5 ileum, 3 colon, 5 rectum and 9 in the retroperitoneal tissues. The stomach was the commonest site of the tumour and was associated with symptoms of peptic ulcer, with repeated haemorrhage and ultimately pyloric obstruction. Crile and Groves (1953) describe a cause of massive leiomyosarcoma of the stomach arising from the muscularis mucosa, associated with symptoms of pain, anaemia and with a palpable tumour. Poskanzer and Schmidt (1953) reported 7 cases with local metastasis in 50% of the cases. Three of the patients survived surgical treatment for two to five years. Ripstein and Flint (1952) report 8 cases with an incidence of three in the stomach, two in the duodenum, one jejunum, and two in the ileum. There were no metastases and the rate of tumour growth was slow in all their cases. Dixon and Kratzer (1951) report one case of intussuscepting leiomyosarcoma of terminal ileum amongst a group of other malignant tumours of the gastro-intestinal tract. Elgood (1950) reported a case of gastro-duodenal intussusception caused by a large leiomyosarcoma of the stomach, treated by subtotal gastrectomy. Cullen (1950) describes a case of leiomyosarcoma of Jejunum presenting features of bowel perforation and peritonitis, which was treated by resection. Kenneth Watson (1949) described a case of leiomyo-sarcoma of the stomach which was operated on as a case of carcinoma. Marshall and Cherry (1955) in a review of smooth muscle tumours of the G.I. tract. observed six cases in the oesophagus, five in the stomach, and five in the colon. Their observation of such a high incidence in the oesophagus, as compared to the other sites, is unique. Dockerty and Gibson (1954) reviewed 40 cases from the Mayo Clinic, giving details of the clinical and histological features. The response to surgical extirpation was good.

The case reported by us is unusual in having no symptoms of gastrointestinal haemorrhage. He came with a relatively short history and a rapidly growing tumour. The histological features revealed a high degree of malignancy.

CASE REPORT

History: C. 32 years. Male. Admitted on 11-1-1957 with six months history of pain in the abdomen, which was later associated with a swelling in the right iliac fossa for 2½ months duration. He had increasing weakness and loss of weight. *Past Illness, Family* and Social history was of no significance.

On Examination: Thin built man with obvious loss of weight. Tongue dry and coated on admission. *Oral hygiene poor.* Abdomen scaphoid with a large lump 6" x 8" in the right lower quadrant of the abdomen. No visible peristalsis. Lump well defined and slightly tender. No movements with respiration. Only slight mobility of its own in the horizontal axis. Liver and spleen normal. No free fluid. P.R. normal. Other systems normal. Patient was admitted with a provisional diagnosis of ileocaecal tuberculosis or carcinoma of the colon.

Investigations: R.B.C. 3.98 mill/cu. mm. Hb. 78%. E.S.R. 75 mm./hr. Stool normal. No Acid Fast Bacilli seen on concentration. Barium enema showed visualisation of colon only to mid transverse colon, beyond that level *barium could not* be passed, an obvious filling defect being present.

After preoperative preparation with I.V. fluids and haematinics, patient was operated on, on 2-2-1957 under I.T. Gas Oxygen anaesthesia, by a right paramedian incision. A large growth found in the region of caecum and ascending colon. No *glands were* palpable. The area was very vascular. A right hemi-colectomy was done with end to side anastomosis. Postoperative course was uneventful. Patient recovered completely and was discharged cured on 11-3-1957. He has been subsequently examined, without any evidence of recurrence.

Operation specimen showed an ileocolic intussusception with a large proliferating and friable growth 4" x 3" arising from the tip of the ileum and forming the apex of the intussusception. The tumour was infected and showed evidence of necrosis (Figs. 1 & 2).

Histological report: Tumour shows histological features of a leiomyosarcoma arising from the muscular wall of the intestine. Histologically the tumour is very malignant (Figs. 3 & 4).

Barium enema done on 4-3-57, prior to patients discharge from the hospital, *shows* ileocolostomy *functioning* well.

DISCUSSION

The usual history of gastrointestinal haemorrhage associated with smooth muscle tumours of the bowel was not present in the case under discussion. Golden and Stout (1941) have described three types of smooth muscle tumours in the bowel wall, depending on their site of origin, viz. submucous, subserous, and dumbell tumours. The latter variety involve both the surfaces of the bowel equally. The submucous tumours are commoner, undergo ulceration at an early stage, and cause intestinal haemorrhage. They may be the starting point of an intussusception as in the case reported here. The subserous tumours assume a large size and cause mechanical obstruction. The tumours are generally low in their degree of malignancy particularly the submucous variety. Metastasis in the regional glands being uncommon.

The histological features of the tumour are characteristic. The smooth muscle cells with their myofibrils and accompanying frame work of connective tissue are arranged in bundles which tend to interlace with each other. The spindle shaped cells resemble smooth muscle cells to a greater or lesser degree, depending apparently upon the rapidity of growth and regularity of mitotic division, but also upon the phenomenon of degeneration occurring in the tumour. These tumours are radioresistant and surgical extirpation is the treatment of choice.

SUMMARY

1. Leiomyosarcoma of the bowel is a relatively uncommon tumour. The stomach is the commonest site of its occurrence.

2. Literature on the subject has been reviewed.

3. Case report of an intussuscepting leiomyosarcoma of the ileum has been described.

4. The important features of the case were rapidity of growth, fixity of the tumour mass, but absence of haemorrhage from the bowel.

5. Gross and microscopic features have been described.

Fig. 1.

Fig. 2.

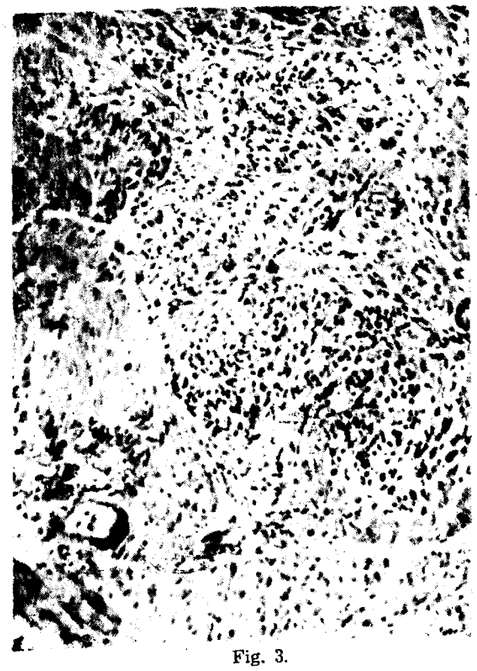

Fig. 3.

Fig. 4.

ACKNOWLEDGEMENT

We are grateful to Dr. J. B. Shrivastava, Professor of Pathology for the histological report and for the photomicrographs.

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PERFORATED IRGAPYRIN INDUCED PEPTIC ULCER

by S. L. MALHOTRA, Bhusaval.

The danger of peptic ulceration developing with phenyl butazone therapy has been emphasized by many workers. Hart (1953) has warned against the use of this drug in ulcer patients. Among others Smyth and Huffman (1953) have reported cases of this complication. Their case, a 56 year old physician developed a duodenal ulcer which bled following prolonged phenyl butazone and cortizone therapy.

Bentler et al's case (1953) had a perforated duodenal ulcer with neutropenia following phenyl butazone and ended fatally.

Shields et al (1953) also have reported peptic ulcer perforation following phenyl butazone administration.

Raffensperger (1953) reported a case of multiple gastric ulcers following two weeks treatment with phenyl butazone.

One case of gastric ulcer perforation is reported in this paper. This case emphasizes two points :—

(i) that the peptic ulcer perforation can develop with such smaller dosage and with therapy given for as short a period as five days.

(ii) Peptic ulcer perforation can take place in cases with no previous ulcer history.

In the case reported here oral irgapyrine was used. This substance is one of a group of pyrazole derivatives developed by the chemists of J. R. Geigy Co. of Basle, Switzerland. It contains 15 percent Amidopyrine with 15 percent diphenyl-butyl-pyrazolidine.

CASE HISTORY

G.R.B., 53 years old male clerk, a sufferer from rheumatoid spondylitis of seven years duration, was unable to go to work on 7th January 1956 on account of an acute recurrence of his arthritis. For this he was treated with short wave diathermy and milk with iodine injections, twice a week, a total of six injections. There was no improvement. He was then given Irgapyrin tablets, one three times daily for 5 days.

The last dose of the tablets was taken on 27-2-1956. His joint pains were considerably relieved and he went to his work on 2nd March 1956. After his usual breakfast he attended his work, but at dinner time he had no appetite and felt an uneasy sensation in his epigastrium which was relieved with an alkaline powder. On the 3rd March 1956 he had another attack of epigastric uneasiness which got aggravated by a cup of coffee. An hour later he felt a sudden unbearable and unremitting pain in the right hypochondrium. The family physician who was sent for, found the patient drenched in perspiration and in acute agony due to epigastric pain. There was no vomiting.

When seen on admission to the Hospital, the patient looked very ill due to severe abdominal pain. He felt cold to the touch. Pulse was 72 per minute of low volume, temperature was 97°F, Respiration 24 per minute and Blood Pressure was 105/35.

Abdomen showed no distension. There was board-like rigidity over the upper abdomen with tenderness over the right rectus. Fluoroscopic examination showed air underneath the diaphragm.

After pre-operative intravenous infusion of normal saline, gastric aspiration and morphia, laparotomy through a supra-umbilical right paramedian incision confirmed the diagnosis of an acutely perforated gastric ulcer. Simple closure of the perforation without drainage of the peritoneal cavity after aspiration of the peritoneal exudate resulted in an uneventful recovery.

Radiological examination of the stomach and duodenum on 16-7-56 and 20-10-56 and 8-1-57, showed no evidence of ulcer and the patient has had no ulcer symptoms. It appears that peptic ulcers due to irgapyrin heal satisfactorily ahd cause no further disturbances if the drug is discontinued.

DISCUSSION

It has been suggested that both activation of existing ulcer or the formation of ulcers denovo are presumably due to irritation of the gastro-intestinal mucosa which may lead to bleeding or perforation (Benstead 1953 ; Christenson 1954).

Burns et al (1953) showed that the drug was almost completely absorbed from the

alimentary tract as the absorption was slower after intramuscular route due to the drug becoming fixed to the muscle.

They therefore, advised the oral route for administration as the best. It is difficult to accept this view as due to its irritant action on the gastro-intestinal mucosa it appears that the oral route is the most dangerous and is likely to either produce peptic ulcers or activate an existing one.

Bruck, Fearnley et al (1954) have shown that there is a definite correlation of gastritis with the dosage. In their cases toxic effects developed only after the 2nd or 3rd week of treatment. 600 mgm. is regarded by them as a safe dosage. In the patient reported, perforation developed without any previous ulcer history, on a much smaller dosage and therapy given for as short a period as 5 days.

SUMMARY

1. One case of gastric ulcer perforation following irgapyrin is reported in a patient with no previous ulcer history.

2. This complication can appear after after low dosage and short course of administration of irgapyrin.

3. It appears that oral administration of irgapyrin is not a safe route for administering the drug.

4. Ulcers due to irgapyrin, appear to heal satisfactorily and do not recur if the drug is discontinued.

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THE XIX ANNUAL CONFERENCE

The XIX Annual Conference of the Association of Surgeons of India will be held at the Medical College, Nagpur from the 28th December to 31st December 1957 inclusive. Dr. R. Nigam, M.D., M.S., F.R.C.S., Professor of Surgery, Medical College, Nagpur, is the Local Secretary and is making arrangements for the Conference.

The following subjects will be discussed at the Conference:

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

Besides this, a few 'Short Papers' will also be read at the Conference.

* * *

Subjects for discussion at future meetings

20th Meeting:

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

21st Meeting:

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

RAILWAY CONCESSION

Railway concession certificates for attending the XIX Annual Conference of the Association of Surgeons of India at Nagpur in December 1957 will be ready by the 10th November 1957.

Members of the Association, who are entitled to draw travelling allowance from the Central or State Governments, Local Body or Statutory Authority, are requested not to apply for Railway concession certificates (vide Railway Board Letter No. 8208-TC dated 22-4-1957).

Members who are desirous of attending the Conference and availing of the Railway concession are requested to send in their application for the same in the following form :—

From

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To

The Hony. Secretary,

Association of Surgeons of India, Madras-10.

Sir,

I wish to attend the 19th Annual Conference of the Association of Surgeons of India from the 28th to 31st Dec. 1957 at Nagpur. Kindly let me have a Railway concession certificate to avail myself of the Railway concession. I wish to travel from.....to Nagpur and back.

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I hereby declare that

(i) I am not entitled to draw any T.A. from the Central or State Governments, a Local Body or Statutory Authority, &

(ii) My travelling expenses to attend the Surgeons' Conference at Nagpur in Dec. 1957 will be met from my own funds.

Station :

Date :

Yours truly,

(Sd.) .....

NOTICE

THORACIC SURGERY SECTION

Finalised programme of the Sectional meeting of the Thoracic Surgery Section of the Association of Surgeons of India to be held at Irwin Hospital, New Delhi, on the 15th & 16th November 1957 has been arranged as follows :

15TH NOV. '57 — FRIDAY

9 A.M. — REGISTRATION & INAUGURATION.

10 A.M. —	Resection treatment in Pulmonary Tuberculosis Experience in 75 Cases	— Dr. J. S. Karanwal, New Delhi.
10-45 A.M. —	Study of Resected specimens of lungs in Pulmonary Tuberculosis	— Dr. A. K. Basu, Calcutta.
11-30 A.M. —	Decortication of lung	— Dr. E. B. Sundaram, Bareilly.

LUNCH RECESS

2 P.M. —	Constrictive Pericarditis	— Dr. S. S. Anand, Amritsar.
2-45 P.M. —	Pulmonary Arteriovenous Aneurysm	— Dr. A. G. Fletcher, Miraj.
3-30 P.M. —	Extraperitoneal approach for Porta-caval Anastomosis	— Dr. V. K. Saini, Vellore.

16TH NOV. '57 — SATURDAY

9 A.M. — PANEL DISCUSSION ON "THE PRESENT POSITION AND THE FUTURE OF CARDIAC SURGERY IN INDIA"

MODERATOR — DR. R. H. BETTS, VELLORE.

MEMBERS OF THE PANEL

Dr. P. K. Sen, Bombay.
Dr. S. S. Anand, Amritsar.
Dr. A. K. Basu, Calcutta.
Dr. S. Padmavati, New Delhi.

LUNCH RECESS

2 P.M. —	Mediastinal Tumours	— Dr. G. S. Karai, Calcutta.
2-45 P.M. —	Problems and Experiences in the treatment of extensive benign stricture of Oesophagus	— Dr. R. H. Betts, Vellore.
3-30 P.M. —	Investigations in Empyema Thoracis (Non-Tubercular)	— Dr. M. K. Roy Chowdhury, Calcutta.

All Surgeons interested in Thoracic Surgery are invited to attend this meeting and take part in its deliberations.

The arrangements as regards accommodation and other details are being made by Dr. S. K. Sen, F.R.C.S.E., whose address is given below.

Dr. S. K. Sen, F.R.C.S.E.,
Dr. Sen's Nursing Home,
Hardinge Bridge, New Delhi.

Dr. Sen should be contacted for this purpose.

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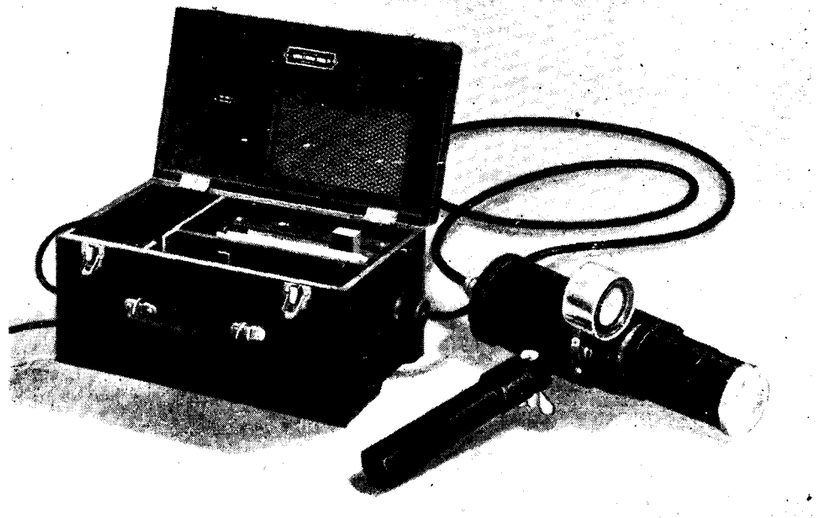

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ORTHOPAEDIC SECTION

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

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

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THE
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CARCINOMA OF THE OESOPHAGUS AND CARDIA

(A plea for salvage from the hopeless group)

by A. W FAWCETT and B. S. DHILLON, Sheffield.

Since the first successful case of resection of the thoracic oesophagus was reported by Torek [7], great advances have been made in resection of carcinoma of the oesophagus and cardiac end of the stomach with re-establishment of the continuity of the alimentary tract. The low operative mortality has been achieved by careful pre-operative treatment, improvement in anaesthesia, better operative technique and improved post-operative care of these patients. There is marked pessimism towards the surgical treatment of carcinoma of the oesophagus among the medical profession. This springs from two sources, from the medical practitioner who is honestly misinformed and believes the immediate operative mortality to be formidable, and surgeons themselves who find that five year survival rate is distressingly low. We have been several times faced with patients whose relatives have been advised against the operation by the family doctor. The immediate mortality rate for resection for carcinoma of the oesophagus situated below the aortic arch is not more than 10% [1]. In our last 60 consecutive cases there have been 5 deaths during the first 6 weeks following resection of the growth, three of these deaths were due to thrombo-embolism. Adams [1] gives his five year survival figures as 22.5% and Sweet [6] in a much larger series has 17% of his patients alive at the end of five years. These figures speak for themselves, all we need is a planned and resolute attack on the disease [2, 3, 4, 5].

In this article we would like to make a plea that some patients from the "hopeless" and "bad risk" group can be salvaged and their end made more bearable. The misery and distress suffered by these patients cannot be expressed by any known mathematical figures.

We are reproducing case histories of four patients who were judged to be bad risk cases either on account of their age (too old — 83) or (too young — 26), or presence of palpable mass in the abdomen, or "solitary" secondary deposit in the spine. All these patients were successfully operated on, with complete restoration of swallowing.

CASE REPORTS

CASE 1.

Hospital No. 449235. A male patient aged 83 years was admitted to hospital on 19-9-1955 with history of progressive dysphagia for the past 4 months.

Physical Examination :

An old man, who could not swallow even fluids for the past few days and was dehydrated. He was remarkably alert but had senile tremors of the hands and feet. B.P. 160/110. E.C.G. showed abnormal left ventricular preponderance.

Laboratory findings :

Hb. 14.8 g/100ml. W.B.C. 7.000 c.mm. Blood urea 58 mg 100ml. Serum Sodium — 139 m-equiv. 1 (320 mg. 100ml.). Serum Potassium — 5.1 m-equiv. 1 (19.5 mg. 100ml.). Serum Chloride — 95 m-equiv. 1 (555mg. NaCl 100ml.). Barium swallow was suggestive of carcinoma involving the lower end of the oesophagus.

On 22-9-55. (A.W.F.) Oesophagogastrectomy (Transthoracic and transdiaphragmatic) was carried out. The growth involved the lower 2 cms. of the oesophagus. About 4 cms. of the oesophagus

was resected and end to side anastomosis performed between the oesophagus and the stomach.

Histologically the growth proved to be a fairly anaplastic squamous cell carcinoma. The patient made an uninterrupted recovery with complete restoration of swallowing and was discharged home on 8-10-1955.

CASE 2. (Palpable epigastric mass)

Hospital No. 329720. A male patient aged 48 was admitted to hospital on 29-10-1954, who complained of having lost 4 stones in weight over the past four months, and constant sickness after each meal.

Physical Examination:

Emaciated, pale looking individual with a large palpable mass in the epigastric region which appeared to be arising from the stomach. No other abnormality was detected.

Laboratory findings:

Hb. 13.1 g./100ml. W.B.C. 1,200 c.mm. Blood urea 31 mg. 100ml. Serum Sodium — 140 m-equiv./1 (322 mg./100ml.). Serum Potassium 5.7 m-equiv. 1 (22.3 mg./100ml.). Serum Chloride — 97 m-equiv./1 (567 mg. NaCl/100ml.). Barium meal showed a large filling defect in the fundus of the stomach.

2-11-1954. Oesophagoscopy (G.A.) — No abnormality.

11-11-1954. (B.S.D.) Thoraco-abdominal approach, through the bed of the resected left 8th rib. A bulky growth involving the fundus of the stomach and invading the left lobe of the liver, diaphragm and pancreas was found. There were several enlarged glands along the lesser and greater curvature of the stomach. The growth was mobilised with difficulty: total gastrectomy, with partial hepatectomy, partial pancreatectomy, partial diaphragmectomy and splenectomy was performed. All these structures, together with the enlarged lymph nodes were removed in a single mass. An end to end anastomosis was performed between the duodenum and the oesophagus.

His post-operative progress was smooth and he was discharged home on 30-11-1954.

CASE 3.

A male patient aged 26 was admitted to the Royal Infirmary on 28-2-1956 with a history of progressive dysphagia for the last 10 months, and he had lost 1½ stones in weight in the past 6 months. Physical examination revealed no other abnormality.

Barium swallow showed irregular narrowing of the lower end of the oesophagus and on oesophagoscopy, carcinoma was seen at 38 cms., which proved to be Grade IV squamous cell carcinoma on histological examination.

Laboratory findings:

Hb. 14.8 g. 100ml. W.B.C. 9,000 c.mm. Blood urea 26 mg. 100ml. Serum Sodium — 143 m-equiv. 1 (329 mg. 100ml.). Serum Potassium — 4.3 m-equiv. 1 (16.8 mg. 100ml.). Serum Chloride — 95 m-equiv. 1 (533 mg. NaCl 100ml.).

On 1-3-1956. Oesophago-gastrectomy was carried out (B.S.D.). The growth involved the lower 2" of the oesophagus which had invaded the fundus of the stomach and there were multiple enlarged glands surrounding the coeliac axis and cardiac end of the stomach. The lower 4" of oesophagus, proximal half of stomach, enlarged lymph glands and spleen were resected en bloc. The continuity was restored by end to side oesophago-gastrostomy. Post-operative progress was smooth and patient was referred to Mr. Blomfield for D.X.R. therapy. He has been doing a full-time job for the past 9 months.

CASE 4.

Hospital No. 329707. A male patient aged 61 years was admitted to hospital on 27-10-1954 with a history of progressive dysphagia for the last 6 months, and for the past few weeks he could not swallow even fluids. He had lost over one stone in weight and was very distressed with constant feeling of sickness and regurgitation of frothy mucous.

Barium swallow showed marked irregular narrowing of the oesophagus below the aortic arch and oesophagoscopy confirmed it to be due to carcinoma of the oesophagus at 32 cms. (Fig. 1).

On 2-11-1954 oesophago-gastrectomy (S.B.D.) was carried out and end to side anastomosis performed between the oesophagus and the stump of the stomach.

His post-operative progress was smooth. On 24-6-1955 he was seen in the follow-up Clinic when he appeared to be very distressed by pain in the cervical spine for the past 2 weeks. He admitted that he had pain in the neck even before his operation but it had recently become worse. X-ray of the cervical spine showed complete destruction of the body of the 5th cervical vertebra (Fig. 2). His cervical spine was immobilised in thoraco-cervical plaster jacket and a course of D.X.R. therapy was given through the windows cut in the plaster jacket. This completely relieved his pain and he was fitted with a plastic cervical collar and discharged home on 29-7-1955 (Fig. 3). He went on a long holiday to the Lake District and came back looking very fit and pleased with himself. In February 1956 it was noticed that he developed an indolent ulcer on the tongue which proved to be carcinoma and Mr. Blomfield treated it successfully with interstitial radiation (Fig. 4). He was seen in the follow up clinic on 27-4-1956

Fig. 1.
Barium swallow showing malignant stricture of the oesophagus just below the aortic arch.

Fig. 2.
Showing destruction of the body of 5th cervical vertebra by secondary deposit.

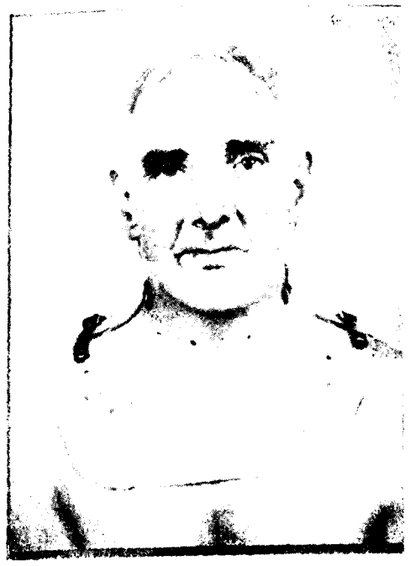

Fig. 3.
Showing immobilisation of the neck in plastic collar.

Fig. 4.
Showing the healed carcinoma of tongue following interstitial radiation.

Fig. 5.

Showing extension of the destructive process involving the bodies of the 4th and 5th cervical vertebrae two years following oesophago-gastrectomy.

when the ulcer on the tongue had healed: he looked remarkably fit and had no difficulty in swallowing. It is a remarkable case, the patient has been successfully treated for two separate primary malignant growths and relieved of pain in the cervical spine by palliative D.X.R. therapy. Though extension of the destructive process in the cervical spine cannot be halted (recent radiograph of the cervical spine shows destruction of C4 and C6) (Fig. 5), nevertheless he has proved an invaluable companion to his wife for two more years who gratefully acknowledges this, as the couple is childless.

Discussion

The misery suffered by a patient who cannot swallow and constantly regurgitates frothy saliva can be well imagined. Even if radical cure is not achieved, oesophago-gastrectomy offers the best form of palliation, and dysphagia, which is the chief cause of the patient's distress, is completely relieved.

Fig. 6.

Barium swallow 18 months following oesophago-gastrectomy. The line of anastomosis between oesophagus and stomach is clearly seen and a large part of stomach lies in the chest.

The danger of major operations on the aged is well recognised, they do not stand prolonged intra-thoracic manipulations well and it is imperative that tissue trauma should be reduced to minimum by shortening the operative time. In Case 1, oesophago-gastrectomy was completed within one hour (A.W.F.) and the patient who was 83 years old made an excellent recovery. In young people the malignant process is supposed to be so aggressive and rapidly progressive that a major surgical procedure is considered waste of time and it is argued that surgical interference may actually shorten life by initiating widespread dissemination. Such fears were expressed for Case 3, who was 26 years old, a radical oesophago-gastrectomy was carried out (B.S.D.) followed by post-operative radiation. This patient is now working and has been doing a full time job for the past nine months. It is clear from the history of Case 4 that he must have had a secondary deposit in the cervical spine at the time of oesophago-gastrectomy, but his life has been made more comfortable by palliative treatment; this case also illustrates that a secondary deposit in spine may progress slowly over a considerable period and if the primary growth can be successfully dealt with useful prolongation of life may be achieved. This patient also developed carcinoma of the tongue, fourteen months after oesophago-gastrectomy and was successfully treated with interstitial radiation. Thus by combining all the relevant therapeutic weapons that are available to us, we can in some cases achieve remarkably good results.

The presence of a palpable carcinoma of the fundus of stomach need not be a contra-indication for operation: Case 2 had a large palpable epigastric mass, but a radical total gastrectomy with partial pancreatectomy and partial hepatectomy was carried out with an excellent result.

Summary

1. Two patients — one 83 years, and the other 26 years old — are the oldest and youngest patients who underwent successful oesophago-gastrectomy for carcinoma of the oesophagus.

2. The presence of a palpable carcinoma of the fundus of stomach need not be a contra-indication for radical surgery.

3. Case 4 developed two primary malignant growths over a period of fourteen months: carcinoma of the oesophagus was successfully treated with oesophago-gastrectomy, and carcinoma of the tongue with interstitial radiation. It is fairly certain that he had a secondary deposit in the cervical spine at the time of oesophago-gastrectomy though radiographic proof of this was not obtained until 7 months following the operation.

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EXPERIMENTAL HYDRONEPHROSIS — II

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The common prevailing concept that sudden *complete* ureteric obstruction does not lead to hydronephrosis has been shown to be an untenable view by Balkrishna Rao and Nair. It was surmised that if sudden *obstruction* produced hydronephrosis, then it is reasonable to assume that hydronephrosis is not a *static* state, but is in a continuous state of flux. If this be so, it is reasonable to conclude that a kidney under *stress* of complete ureteric obstruction and undergoing hydronephrotic changes, should be able to recover if the causative factor is either removed or overcome. It is possible that there may be some permanent damage to the kidney and some temporary; and it is also possible that the temporary damage is related to the duration of stress. If this be so, then there should be an optimum period, when with the removal of the cause, thereby decompressing the hydronephrotic kidney, the kidney should regain normal function either partially or wholly so as to sustain the animal. This knowledge would be of considerable clinical value in conditions of hydronephrosis either postoperative or due to calculus obstruction, so that a fair assessment of the time when an irreversible process in the kidney occurs, can be made. Therefore, if a hydronephrotic kidney could be decompressed before such irreversible changes occur, then the possibility of saving the kidney would be considerable.

This paper deals with the preliminary work regarding assessment of this critical period of reversibility of the kidney.

In a previous article (Balkrishna Rao & Nair) work was conducted on white rats. The present work on the effect of decompression had to be done on dogs, as in rats the tissues were very small and friable and were difficult to handle. Therefore all the work done on rats was repeated on dogs to prove that, as in rats, so in dogs also, hydronephrosis always develops when there was a complete and sudden obstruction in the ureter. After this preliminary restudy in dogs, the work of decompression of the hydronephrotic kidney was started in order to assess the critical time of reversibility of kidney changes under stress of obstruction.

Methods, Materials & Technique

Mongrel dogs quarantined for 12 days, weighing on an average 35 Kgm. were used in these experiments.

The principle of the study was to establish hydronephrosis of varying duration and then to decompress the hydronephrotic kidney by draining the dilated ureteric segment either internally or externally. Histological studies of the kidney and a few biochemical studies of the dog were made.

This paper is a preliminary study of the effect of sudden and complete obstruction to urinary outflow in dogs and the effects of decompression on the kidney.

(a) Hydronephrosis in dogs was produced by surgical ligation of the left ureter under aseptic conditions near the uretero-vesical junction using pentothal and ether anaesthesia. A segment of the ureter between two ligatures was excised to ensure that recanalisation of a merely ligated ureter would not occur.

(b) With a view to study the reversibility of the changes in the kidney, various drainage operations were tried. First cutaneous ureterostomy was tried, but drainage was not successful as after a few days of drainage, the opening contracted, besides developing kidney infection. This procedure was therefore abandoned. Uretero-colic and uretero-ureteric anastomoses were also tried to drain the hydronephrotic kidney. The former was given up as sterilisation of dog's bowel could not be achieved satisfactorily and the latter procedure abandoned due to technical difficulties of performing such an anastomosis. Implantation of the dilated ureter directly into the urinary bladder gave satisfactory and successful results (ureterovesical implantation). The hydronephrotic ureter exposed, mobilised and cut obliquely was anastomosed to the bladder. The anastomosis was done by using eyeless catgut needles (Figs. 1-6)

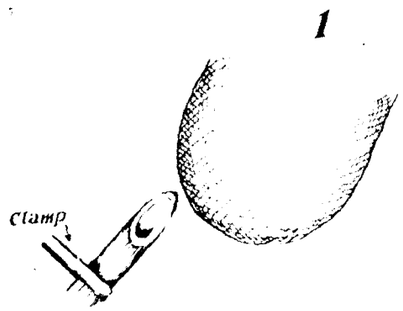


Fig. 1.

Fig. 2.

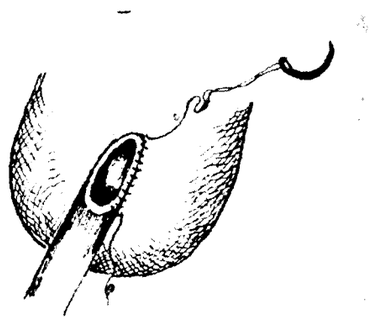


Fig. 3.

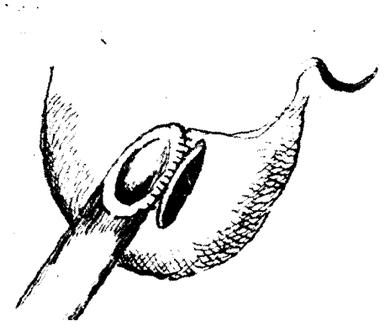


Fig. 4.

Figs. 1 to 4. Steps of uretero-vesical implantation.

(c) Blood urea estimation was done by King's technique.

(d) Both the normal and hydronephrotic kidney and the drained hydronephrotic kidney were sectioned

Fig. 5.

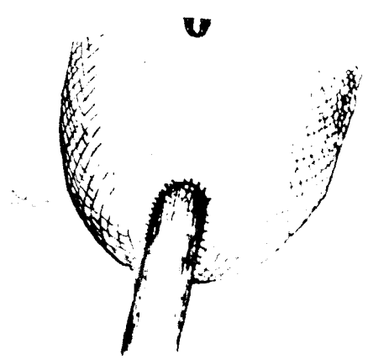


Fig. 6.

Figs. 5 & 6. Steps of uretero-vesical implantation.

in the sagittal plane. One half was mounted after taking photographs and the other employed for histological studies.

(e) A few of the dogs were sacrificed by injecting rapidly 20 ml. of pentothalsodium to study hydronephrotic changes.

Observations

Normally the kidney is surrounded by a quantity of fat, mostly dispersed around the hilum and posterior surface. The normal dog's kidney varies widely in dimensions as shown below.—

Length	—	5.4 to 7.26 cms.
Breadth	—	3.4 to 4.1 cms.
Thickness	—	2.41 to 3.1 cms.
Volume	—	45.77 to 78.64 ml.
Weight	—	24-27 gms.

The normal renal parenchyma varies between 1.1 to 2.4 cms. in thickness. The capacity of the pelvis of the kidney is between 4 to 6.8 ml.

(a) Gross changes in hydronephrotic kidney:

Hydronephrosis was always produced in all the dogs in the present work subjected to sudden complete obstruction of the left ureter. The hydronephrotic kidney was palpable in the left hypochondriac and pelvic regions and bore all the clinical features of a reniform swelling.

Perirenal fat: The perirenal fat was always observed, at autopsy and at the time of ureterovesical implantation, to be increased. In hydronephrotic kidney in which accidental infection occurred, the amount of fat was considerably larger, the kidney being surrounded by a dense mass of fatty tissue, embedded in between and around dense fibrous adhesions. Large, newly formed blood vessels were traversing through the perirenal adhesions. These were always more marked near the upper pole of the kidney. The site of ligature and division of the ureter was found to be embedded in a fair amount of fibrofatty tissue.

Fig. 7.
6 days hydronephrosis (dog).

Fig. 9.
100 days hydronephrosis.

Fig. 8.
21 days hydronephrosis.

Size: Progressive pyelorenal enlargement proportionate to the duration of obstruction was seen and primary atrophy of the kidney could not be seen even in a single animal.

In a one day old hydronephrosis, the ureter was definitely though only, slightly larger in calibre than its normal counterpart.

By 6 days, the ureter had swollen noticeably and the kidney was also obviously larger than normal in breadth, thickness and length (Fig. 7).

By 21 days, the hydronephrosis displayed a marked increase in size. The length, breadth and thickness increased to 7 x 2 x 3 cms. respectively and the kidney volume increased to 88.2 cubic cms. from an average of 67 cubic cms. (Fig. 8). These changes progressed further, so that at 100 days (Fig. 9) the kidney measured 12 x 8 x 4 cms. and volume 384 cubic cms. and after 100 days the enlargement was slow and at 175 days the measurements

were 13.2 x 8.3 x 4.1 cms. giving an average volume of 499.2 cubic cms.

Depth of surviving renal parenchyma: It was observed that with progressive dilatation of the pelvis the normal thickness of 1.1 to 2.4 cm. gradually diminished. This was proportional to the duration of hydronephrosis.

Thus for 10 days there was no disparity between the two kidneys. In 21 days the parenchyma of the affected kidney thinned down to 1 cm. In a 52 days' hydronephrosis the surviving renal parenchyma was only 0.8 cm. and at 100 days it was only 0.4 cm. and afterwards no appreciable change occurred even up to 175 days.

Corticomedullary differentiation: The cortex and medulla could be differentiated from each other in the specimens of 7, 15 and 21 days and was very difficult to distinguish after 30 days of obstruction. Specimens of hydronephrosis of more than 36 days' duration showed no delineation between the cortex and medulla.

Capacity of the pelvis: The pelvic capacity gradually increased. In 15 days hydronephrosis it was 12 ml., in 21 days it was 25 ml., in 49 days it was 40 ml. and in a 100 days animal it was 47 ml.

Stretching and elongation of calyces: With prolonged obstruction the calyces were found to be markedly elongated and stretched from the pelvis to the periphery. This feature was most marked in kidneys subjected to prolonged obstruction.

The gross changes are summarised in Graph 1 and Table 1.

TABLE NO. 1

Gross changes after ligation of left ureter

Name of Dog	Duration of hydronephrosis in days	Dimension in cm.	Volume in cu. cm.	Thickness of surviving parenchyma in cm.	Corticomedullary differentiation	Pelvis capacity in c.c.	Remarks
W	1	6.1× 3× 2	36.6	1.9	Well marked	5.0	No Infection
I_1	6	6.2× 3× 2	37.2	1.8	Present	7.0	Do.
L_1	10	6×3.2× 2	38.4	1.7	Do.	8.0	Do.
P	15	6.1×3.4× 2	41.48	1.6	Do.	12.0	Do.
J_1	21	6.8×4.2× 3	75.68	1.1	Do.	23.8	Do.
H	29	6.9×4.0× 3	82.8	0.9	Do.	25.0	Do.
F	36	6.6×4.5× 3	89.1	0.85	Very faint	30.8	Do.
D	52	7.9×4.3× 4	135.88	0.8	Absent	49.0	Do.
V	58	8× 6× 4	192.0	0.7	Do.	52.0	Do.
K	100	8.2×5.8×4.3	200.21	0.4	Do.	170.0	Do.
M	109	10.5× 7× 4	294.0	0.3	Do.	190.0	Do.
E	112	12× 8× 4	384.0	0.25	Do.	520.0	Do.

(b) Microscopic changes in hydronephrotic kidney:

The 6 days' hydronephrotic kidney section showed dilatation of capsular space, engorgement of veins and occasionally dilated collecting tubules containing colloid material. There was no lobulation, no hyalinization of the glomerular tufts and

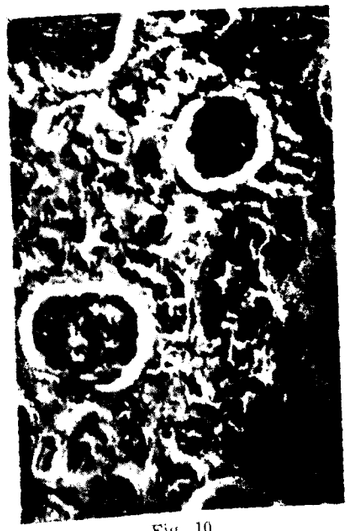


Fig. 10.
Microphotograph from 6 days hydronephrosis (dog).

Fig. 11.
Microphotograph of 15 days hydronephrosis.

Fig. 12.
Microphotograph of 21 days hydronephrosis.

Fig. 13.
Microphotograph of 100 days hydronephrosis.

TABLE No. 2

Histological changes in Hydronephrotic dogs

Name of Dog	Duration of hydronephrosis in days	General appearance	Glomeruli					Tubules					Interstitial tissue				Blood vessels		Remarks
		Distortion of Architecture	Distortion of capsular space	Lobulation	Crowding	Hyalinisation and fibrosis	Periglomerular fibrosis	Disappearance	Dilatation	Epithelial atrophy	Colloid cast	Disappearance	Round cell infiltration	Condensation	Inflammatory cell infiltration	Abscess formation	Venous dilatation	Obliterative arteritis	
W	1	–	–	–	–	–	–	–	+	+	–	–	–	–	+	–	–	–	–
I_1	6	–	+	+	+	–	+	+	+	–	–	+	+	–	–	–	–	–	–
L_1	10	–	+	+	+	+	+	+	+	–	–	+	–	+	–	–	–	–	–
P	15	±	+	+	+	+	+	+	+	–	–	+	–	+	–	–	–	–	–
J_1	21	++	+	+	+	+	+	+	++	–	–	+	–	+	++	–	–	–	–
C	23	++	+	+	++	++	++	+	++	+	–	++	++	++	+++	–	++	–	Pyelovenous & tubulovenous shunt
O	24	++	+	+	++	++	++	+	++	+	–	++	++	++	–	–	–	–	–
H	29	++	++	+	++	++	++	+	++	+	–	++	++	++	–	–	–	+	–
B	51	+++	++	++	++	++	++	+	++	+	+	++	–	++	++	–	+	+	Infection +
D	52	+++	++	++	++	++	++	+	–	–	++	++	–	++	–	–	++	++	–
V	58	+++	++	++	++	++	++	+	–	–	–	+++	–	++	–	–	++	++	–
N	74	++++	+++	++	++	++	++	+++	–	–	–	+++	–	+++	–	–	–	–	–
K	100	+++++	++++	–	–	–	–	+++	–	–	–	+++	–	+++	–	–	–	–	–
E	112	+++++	++++	–	–	–	–	+++	–	–	–	+++	–	+++	–	–	–	–	–

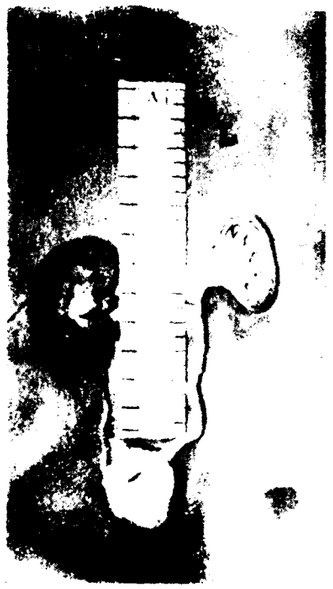


Fig. 14.

Left kidney (dog) of a 76 days hydronephrosis after drainage by uretero-vesical implantation.

no periglomerular thickening and fibrosis (Fig. 10).

The 15 days section displayed most of the characteristic features of hydronephrosis. The glomerulus had become markedly lobulated. There was evidence of considerable periglomerular fibrosis and the capsular space was dilated. The tubule showed both dilatation and early signs of atrophy. Thus the epithelium was debased in several areas. There was still a wide area of normal kidney tissue; between these areas of normal kidney tissue, there were areas of tubular degeneration (Fig. 11).

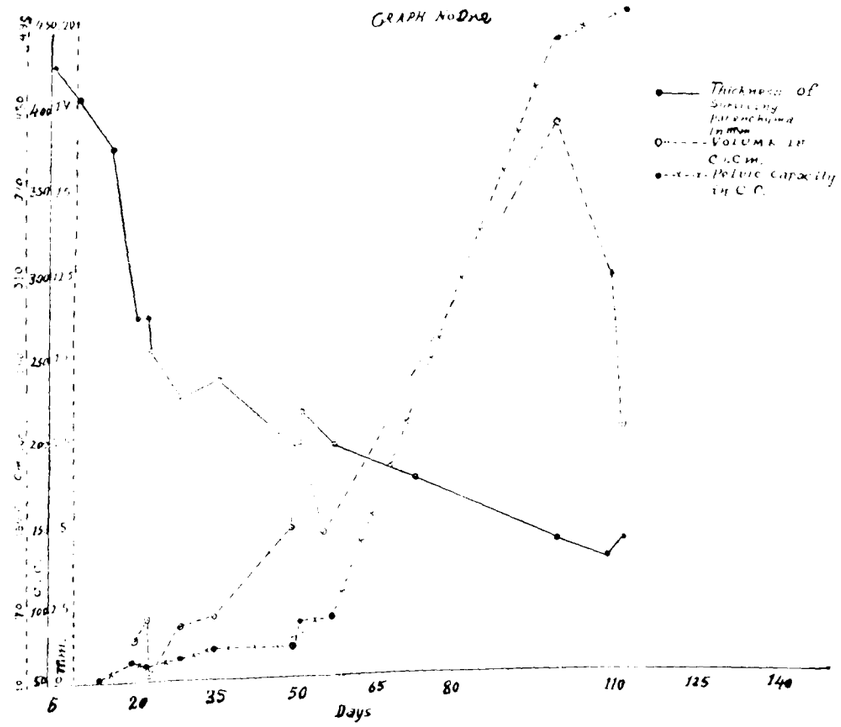
In 21 days hydronephrosis, the section showed further changes of hydronephrosis (Fig. 12). The 30 days section showed the characteristic changes of hydronephrosis. Due to condensation of parenchyma the glomeruli were condensed together, and presented varying degrees of lobulation, hyalinisation and the periglomerular fibrosis. Occasional glomeruli had disappeared. The tubules were dilated and contained colloid material. Their epithelium was granular and degenerated in several places.

The kidney section beyond 100 days presented the most advanced state of renal destruction (Fig. 13). Thus 180 days kidney section showed extreme condensation of the parenchyma which had been almost completely replaced by connective tissue with sparse inflammatory cell infiltration of a reactive nature. Though no tubular elements could be recognised, there were occasional ghosts of glomerular remnants restricted under the capsule. These glomeruli were mere whorls of fibrous tissue which was still cellular in nature. The blood vessels were markedly thickened and almost completely obstructed.

To sum up, the early changes were dilatation first of the collecting tubules but later also of the convoluted tubules. The tubules after an initial dilatation rapidly exhibited degenerative changes in their epithelium and presence of colloid material in their lumen. At a slightly later stage they disappeared completely and were then replaced by fibrosis. The glomeruli also exhibited changes early in the progress of obstruction. The initial changes of lobulation and hyalinisation were followed by fibrosis of the glomerular tuft and periglomerular fibrosis with gradual collapse and condensation of parenchyma; the glomeruli crowded together and then gradually disappeared, resisting for a longer period than the tubule. These changes are summarised in Table 2.

(c) Gross changes in hydronephrotic kidney drained by uretero-vesical implantation:

The hydronephrotic kidney after drainage by uretero-vesical implantation shrinks invariably to a size smaller than that of the opposite kidney (Fig. 14). The perirenal fat which increased as a result of hydronephrosis does not appreciably alter. The



depth of renal parenchyma almost approached the normal. The calyces which were found stretched in the hydronephrotic kidney from the pelvis to the periphery appeared thicker and shorter than normal. The corticomedullary differentiation though not clearly defined reappeared. In hydronephrotic kidneys of 21 days duration and less drained by ureterovesical implantation there was evidence of surviving functional renal parenchyma. The pelvic capacity always returned to within normal limits. The ureterovesical implantation was always found to be patent with no evidence of stricture at site of anastomosis.

(d) Microscopic changes in hydronephrotic kidney drained by left end to side ureterovesical implantation :

The kidneys that had been drained by ureterovesical implantation specially of 21 days duration, showed a fairly respectable amount of renal cortex showing larger number of glomeruli, the proportion of the glomeruli in relation to the tubules being considerably more. Only a few glomeruli were showing evidence of tubular degeneration and atrophy. Only a few areas of patchy atrophy of collecting tubules in the medullary zone are seen, and at places these areas showed replacement fibrosis with hyalinised connective tissue. Some of the surviving tubules showed evidence of degenerative changes in the epithelial cells. The blood vessels showed marked perivascular fibrosis. There was only a little condensation of connective tissue in the cortex. The drained kidneys of later duration showed more degenerative changes with very little evidence of functional renal parenchyma. Another important feature of 21 days drained hydro-

nephrosis, was the presence of a large number of tubules leading from cortex to the pelvis suggesting thereby that there is a respectable amount of functional renal parenchyma (Figs. 15 & 16).

(e) Blood urea :

Blood urea in normal dogs varies between 24 to 32 mg. per 100 ml. No change in the blood urea level was observed even in hydronephrotic dogs of very long duration.

(f) Hydronephrotic sac contents :

Normal urine of dog has the following important chemical constituents :—

Urea	—	1.8 Gm.—2.0 Gm.%
Chlorides	—	480—560 mgm.%
Protein	}	Nil.
Sugar	}	

With production of hydronephrosis the chloride starts increasing and urea starts decreasing till in hydronephrosis of long duration the hydronephrotic sac merely contains salt ; sugar in traces appeared in very late hydronephrosis. The results are shown in Table 3.

TABLE No. 3

Hydronephrotic sac content

Name of dog	Duration of hydronephrosis in days	Urea mg/100 cc.	Chloride mg/100 cc.	Protein	Sugar
G	175	30	680	.4%	In traces
M	109	40	660	.4%	,,
I	76	50	630	.4%	Nil
R	60	58	610	.5%	,,
Q	40	61	580	.6%	,,
U	21	70	552	.5%	,,
F_1	21	75	550	.5%	,,
G_1	21	72	548	.5%	,,
X	15	39	490	.6%	,,

DISCUSSION

The changes of back pressure, whether the primary obstruction is urethral, vesical or pelvic irrespective of the mechanical or neurogenic cause, are always of importance with respect to the ultimate effect on the kidney. Discussion on the subject has long interested pathologists, physiologists as well as clinicians and urologists. Important changes in the renal parenchyma are vital and these changes must be given prior clinical consideration in every obstructive condition in the urinary tract.

It has been proved beyond any doubt in the present work that sudden complete obstruction of the ureter always leads to hydronephrosis and never to a primary renal atrophy. It is pertinent to enquire as to how hydronephrosis really develops. For the glomeruli to secrete to produce hydronephrosis, the intrapelvic pressure must be lower than the pressure in the glomeruli which is possible because of the reabsorption of contents of the dilated renal pelvis. This phenomenon of reabsorption prevents intrapelvic pressure from rising above the level of the effective filtration pressure and thereby allows continuous production of hydronephrotic contents. Had there been no outlet for these dammed up products in the renal pelvis a stage would naturally have arisen when intrapelvic pressure due to ureteral ligation would have equalled the effective filtration pressure and the secretion would have ceased. Such an arrangement is naturally not consistent with the progressive dilatation met with in hydronephrosis and naturally some explanation has to be provided for such a discrepancy. That such an outlet exists in every kidney which develops a hydronephrosis following complete ligation is proved, if proof is needed other than the facts that hydronephrosis does develop. Three possible modes for such reabsorption has been suggested namely pyelovenous backflow, tubular backflow and interstitial backflow.

The histology of early stage of hydronephrosis in the present work has been extremely suggestive of the existence of pyelovenous backflow, e.g. an enormous dilatation of the pelvis, degeneration of its epithelium and presence of large engorged veins in the subepithelial layer of the pelvis. Evidence of presence of tubular backflow has been afforded in the present work by the presence of tuft formation on renal calyces in some pyelograms (to be described in detail in a later article) of more than 15 days hydronephrosis. It is concluded that probably, pelvic outlet in early stages of hydronephrosis has been through pyelovenous backflow and at late stages tubulovenous backflow.

Work on reversibility of hydronephrosis to study and determine the critical time period for reversal of hydronephrotic changes will be dealt with in a subsequent article.

SUMMARY

1. The results of experimental ligation of the ureter in dogs are presented.

2. It has been proved that hydronephrosis invariably follows sudden complete obstruction to outflow of urine.

3. The probable means of resorption of hydronephrotic sac contents is discussed.

4. The preliminary results of drainage of hydronephrotic kidney by ureterovesical implantation with view to study the stage of reversibility have been recorded.

ACKNOWLEDGEMENT

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"MALIGNANT PHAEOCHROMOCYTOMA"

by A. K. BASU and B. K. AIKAT, Calcutta.

In recent years many reviews and case reports of Phaeochromocytomas have been published.

The chromaffin tumours arising from the adrenal medulla or the organs of Zuckerkandl are usually benign. The malignant phaeochromocytomas are extremely rare and the histological criteria of malignancy in such tumours are still debatable.

Of the several reportedly malignant phaeochromocytoma cases, Symington and Goodall (1953), King (1931), Eiserberg & Wallterstein (1932), Belt & Powell (1934) and others accepted only seven cases as definitely malignant. Two of the cases, one reported by Belkin et al (1953), and the other by Davis et al (1955) may be added to make a total of 9 cases. In these cases, the rigid criteria of demonstration of metastases with or without specific secreting function have been followed for the diagnosis of malignancy.

With the newer pharmacological methods, the "provocative" and the "adrenolytic" tests and also with the introduction of the more reliable test of estimating the urinary excretion of Catechol amines, it has become possible to predict the biological behaviour after the removal of the primary tumour in some of the cases with functioning metastases. Unfortunately, the number of accepted cases with functioning metastases are even smaller and so far 4 such cases have been reported: Bannon & Allen (1952), Chamovitz & Fanger (1949), Belkin et al (1953) and Peter Davis (1955).

Most pathologists recognise the difficulty in the histologic diagnosis of this group of chromaffin tumours. However, it may be of practical and prognostic value if some idea as to the nature of the primary tumour may be arrived at after its removal. Functioning metastases are unpredictable and evidence of abnormal secretions may not appear for months after the removal of the primary tumour. In tumour pathology, the ultimate biological behaviour may not always correspond with the histology. If the limitations of the histological diagnosis of tumours in general and phaeochromocytomas in particular are recognised by both the clinicians and pathologists, an attempt at histological diagnosis of malignancy in phaeochromocytomas may be both worthwhile and of practical utility.

In the following case report, such an attempt at histological diagnosis of malignancy in the primary tumour is being made.

CASE REPORT

S.M., lady aged 42 years was admitted under one of us on 5-5-1956.

History on Admission:

Headache and giddiness — 4 years.
Progressive dimness of vision — 4 years.
Palpitation on exertion — 2 years.

On Examination:

Build and nutrition — average.
Anaemia — +
Neck veins — Not visible.
Oedema feet — Nil.
Pulse — 80/min.
Resp. 20/min.
B.P. — 160 110 mm. of Hg.

C. V. System:

Apex beat — Not palpable.
Aortic 2nd sound accentuated.
Soft systolic murmur in all the areas.
Pulsation in all superficial arteries within normal limits.

Resp. System:

N.A.D.

Alimentary System:

Abdomen — Soft.
Spleen — 3 fingers.
Liver — Not palpable.
No lump felt.

Investigation :

6-5-56 — *Blood*

Hb. — 60%
R.B.C. — 4,000,000/cmm.
W.B.C. — 7,500/cmm.
D.C. — P 54%
L 40%
M 4%
E 2%
B 0

Urine

Sp. Gr. — 1010
Albumin — + +
Sugar — Nil.
M.E. : Pus cells — 2-4/field.
R.B.C. — 8-10/field.
Epithelial cells +
Hyaline casts - +
Stool — N.A.D.

Ophthalmoscopy :

25/5 — R.E. Sup-haemorrhage with slight oedema disc.
L.E. Marked oedema of disc with sup-haemorrhage & exudates ; marked arteriovenous compression.

23/6 - R.E. Condition much improved. No oedema. A patch of retinitis proliferance.
L.E. Oedema disc + + ; Exudate + + : Haemorrhage absorbed.

8/5 - *X-Ray Chest & Heart :*

Classical appearance of aortic configuration. High prominent aortic knuckle. Increased concavity of pulmonary artery-conus segment. Left ventricular enlargement. Healed miliary calcification in left lung. Fibrotic nodule at the periphery of right lung. No active lesion.

Biochemistry :

	11/5	26/6
Sugar	90 mgm%	105 mgm%
Urea	24 „	52 „
N.P.N.	28 „	40 „

Urine Culture Sterile.

I.V. Pyelography :

20/6 : Excretion of dye has very poorly delineated the calyces of kidneys.
Right kidney upper pole looks denser.

Urinary Noradrenaline (24 hours):

Total Adrenaline & Noradrenaline — 80 microgram.
(Normal 50 microgram).

Catecholamine 9852 microgram in terms of adrenaline.
Total volume 2010 c.c.

Presacral perirenal Pneumography :

No definite abnormality detected.

"Regitine" Test :

I. 11-6-56
Fall from 240 140 mm. of Hg. to 55 0 mm. of Hg.

II. 16-7-56
Fall from 232 132 mm. of Hg. to 124 36 mm. of Hg. within two months.

"Ansolysen" Test :

26-7-56 :	*Resting B.P.*	*Max. fall after Ansolysen Injection.*
Standing	200 120 mm. Hg.	102 75 mm. Hg.
Seated	180 120 mm. Hg.	124 85 mm. Hg.
Lying	200 130 mm. Hg.	130 90 mm. Hg.

Glucose Tolerance Test :

25-6-56

Blood Samples	*Blood Sugar*	*Urine Sugar*
1	136 mgm%	+
2	220 „	+
3	232 „	+
4	156 „	Trace

Course :

Patient was put on a regime of rest, sedatives and salt free diet and a course of "Serpasil" was started to which "Apresoline" was later added.

With this treatment Blood pressure was found to fluctuate widely maximum 220 160 and minimum 110 80. The fluctuation of B.P. sometimes occurred from hour to hour.

Massage of abdomen over the adrenal regions was found to increase the B.P. by about S D 30 20 mm. of Hg.

Although the history and the clinical behaviour of the patient in the hospital was not characteristic and resembled more that of a malignant type of hypertension, the diagnosis of Phaeochromocytoma was seriously entertained and this was based on the following :

(1) The fluctuating character of the hypertension sometimes occurring hour to hour.

(2) Occasional hypertensive episodes produced by massage of the abdomen.

(3) The positive "Regitine" test.

(4) Increased excretion of Catecholamines in the urine.

It was decided to give the patient the benefit of abdominal exploration and this was done on 16-8-56.

Operation Note :

Transverse incision above the umbilicus about 12" long across both sides of the abdomen. The spleen was enlarged for 2 fingers below costal margin. The liver was also big and there were evidences of perisplenitis and perihepatitis involving the left lobe of the liver. Left kidney and the suprarenal glands were exposed. The left suprarenal gland appeared to be normal in appearance and in size. On the right side a firm tumour of about the size of a golf ball was found above the upper pole of the right kidney and just below the liver. It involved the right suprarenal gland. This tumour was retroperitoneal in position and covered by fascia containing vessels. It was fairly mobile and could be grasped easily by the fingers. Medially it was in close relation with the inferior vena cava although the tumour could be separated from it. The peritoneum and the capsule overlying the tumour were separated and some of the adhesions were divided between ligatures. At the upper end, separation of the tumour from the vena cava accidently caused injury to a fairly large feeding vein. This was at first controlled by forceps and later by ligatures. The separation of the rest of the tumour was easy and the tumour was removed in its enurety. The left kidney appeared normal. The patient's blood pressure was fluctuating acutely from very high to very low figures throughout the operation and just before the removal of the tumour there was an acute hypotensive phase which continued till the end of the operation and afterwards. The gall bladder was thick-walled and contained many stones. Abdomen was closed in layers. Patient was given Noradrenalin drip from the onset of the acute hypotensive phase. This was continued afterwards.

Post Operative Phase :

The patient was in a moribund state at the end of the operation. Blood pressure could not be recorded. She was cold. I.V. Noradrenaline drip was infused at the rate of 80/mg/min. At the end of 8 hours, the systolic pressure rose to 80/90 mm. Hg. and from then on the pressure continued to improve. The concentration of noradrenaline solution was progressively lowered (as shown in Chart 1) but the drip had to be maintained for 96 hours before the pressure was stabilized at about 100 mm. Hg. Her mental and physical state gradually improved and she was discharged on 3-9-56.

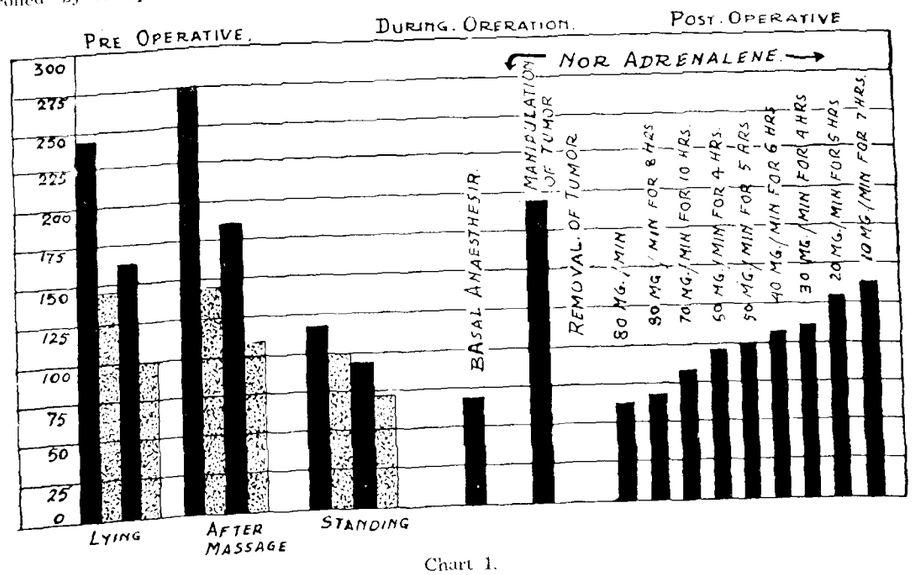

Chart 1.

Chart shows the blood pressure record before, during and after the operation. The acute fall of pressure after the removal of the tumour and administration of nor-adrenaline infusion at a very high concentrated dose and the slow recovery of the pressure is well shown. Nor-adrenaline infusion was maintained for 96 hours.

Fig. 1.
Macroscopic appearance of the tumour (½ natural size).

Description of the Tumour:

Macroscopic Appearance — The tumour was well circumscribed and measured 3.8 cm. x 2 cm. The cut surface revealed homogenous yellowish brown tumour tissue with one cystic space and small haemorrhagic areas (Fig. 1).

Slices of the tumour tissue kept in neutral formol saline turned the fixative brown. The slices kept in potassium bichromate solution, stained the tumour tissue rich brown in colour in patches. It took a longer time for the brown colour to appear than was met with in other similar tumours. Sections from several blocks taken from both the formol fixed and dichromate fixed tissue, were examined.

Histology:

The tumour consisted of sheets of large polygonal cells of various shapes and sizes with a very vascular and delicate stroma. The cells showed wide variation in their shapes and sizes, the nuclei were hyperchromatic and mitosis was seen fairly frequently (Fig. 2). There were areas of haemorrhages and sheets of loose tumour cells were seen in pools of homogenous eosinophilic material which stained deep brown in the chromate fixed tissue. The bichromate reaction was variable, the intensity of the brown stain varied from one group of cells to another and often from cell to cell. In the formol fixed material, eosinophilic granulations were seen in some of the larger cells.

Tumour emboli were seen inside many large blood vessels (veins) (Fig. 3) and also in the perineural lymphatics (Figs. 4 & 5). The fibrous capsule of the tumour was infiltrated at several points by the tumour cells.

The overall picture was quite distinct from other similar tumours seen and the histological evidences were considered significant for a tentative diagnosis of malignant phaeochromocytoma.

Discussion

It is realized that the ultimate criteria of the malignancy of a tumour is based on the demonstration of metastases having structural and sometimes functional behaviours similar to the parent tumour. However, if one were to depend only on this biological behaviour of a tumour, one would have to wait for a long time and many histologically proved malignant neoplasms would prove benign in the ultimate analysis. As opposed to tumours elsewhere in the body, there is perhaps need for more care in diagnosing phaeochromocytomas as 'malignant' on histological basts alone. It is known that the microscopic appearance of a benign phaeochromocytomas may be pleomorphic. Also they may show unusual vascularity and degerative changes in the parenchyma.

Our diagnosis of malignancy in the case reported here was based on:

(1) Demonstration of frequent mitoses within the cells.

(2) Demonstration of actual tumour cell emboli within well formed vessels.

(3) Invasion of the capsule by tumour elements.

(4) Marked cellular pleomorphism.

It is submitted that when all the above criteria are taken together, the histological picture is confirmatory of the malignancy of the tumour.

Apart from the histological interest, there are two other factors of clinical interest in the case reported here. It should be noted that in many respects the case appeared to resemble one of malignant hypertension. Suspicion of phaeochromocytoma was based on occasional postural hypotension, positive 'regitine' test and increased catechol amine excretion in the urine. Also, the need for prolonged (96 hours) administration of noradrenaline

Fig. 2.
Section showing the pleomorphic cell pattern and their arrangement in alveolar grouping separated by a loose vascular stroma. The nuclei are hyperchromatic and shows frequent mitoses. (H.E. x 240)

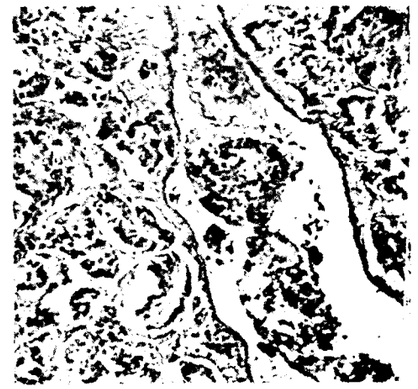

Fig. 3.
Section showing tumour cells inside a fairly large well formed vessel (vein). (H.E. x 120)

Fig. 4.
Section showing perineural infiltration of the tumour cells. (H.E. x 240)

Fig. 5.
A higher power view showing tumour cells in perineural lymphatics. (H.E. x 520)

drip in the post-operative period and its very high concentration deserve some comment. It would be seen that from a sudden acute hypotensive phase it was necessary to administer noradrenaline in a concentration of 80 mg min for 8 hours, 70 mg min for 10 hours, and 60 mg/min for 4 hours before the systolic pressure could be stabilized to about 100 mm. Hg. (Fig. 6). This concentration is about 3 to 4 times the highest recommended dose and demonstrates that noradrenaline can be well tolerated and may be useful even in this high concentration in selected cases. Also the need for the noradrenaline drip for a total period of 96 hours should be noted. A polythene tube in the vein is very useful for such prolonged intravenous administration and was used in this case.

SUMMARY

A case of 'malignant' phaeochromocytoma is reported. This should be the 10th case recorded in the literature as far as we can find.

Diagnosis in this case was based on rigid histological criteria. Allowances were made for occasional cellular pleomorphism and other abnormal appearances that may be noted in microscopic appearances in 'benign' phaeochromocytomas.

Two other features of clinical interest are the pre-operative behaviour of the case as one of 'malignant' hypertension and the post-operative use and satisfactory toleration of very high concentration and prolonged use of noradrenaline.

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INCONTINENT EPISPADIAS

Reconstruction of Bladder Sphincter by musculo-fascial slings (Report of 3 cases)

by M. MUKHERJI, Calcutta.

The incidence of Epispadias is very low, approximately 1 in 45,000 births. Epispadias is 5 times more common in males than in females. The epispadias may be of different types as :—

(1) Balanitic.
(2) Penile.
(3) Peno-Pubic.

The penopubic type of epispadias is of interest in this series of cases as the other two varieties are associated with complete control over the bladder sphincter. The penopubic type may be associated with varying degrees of extrophy of the bladder and is almost always complicated with incontinence of Urine.

History and literature on the treatment of incontinent epispadias :

On October 8, 1920 Young repaired an incontinent epispadias for the first time in history. He did a suprapubic cystotomy and explored the neck of the bladder. The anterior wall of the bladder neck was removed. Then he found evidences of sphincter muscles on each side of the urethral floor. Then the muscles of the prostatic portion of the urethra and vesical neck were approximated with chromic catgut over a narrow catheter inserted into the bladder. A suprapubic drain was provided at the upper angle of the bladder.

The main principle in Young's operation was to reform a patulous bladder neck and prostatic urethra into a tube of smaller calibre.

Gross and Cresson reported 9 cases of incontinent epispadias of whom 4 failed and had to have an urethrosigmoidostomy done.

Howard May reported one case of complete epispadias treated by plastic reconstruction with success.

Dees has done six of these patients with success.

All these Surgeons followed more or less Young's procedure, i.e. opening the bladder, resection of the excess of tissues of the bladder neck and then forming a narrow canal trying to suture the internal sphincter if any.

The operations done in our Plastic Unit were reconstruction of bladder sphincter by two musculofascial slings :—

Terrence Millin utilised an aponeurotic sling having a muscular pedicle at each end to suspend the neck of the bladder in cases of stress incontinence in females whose vaginal repair resulted in failures.

It was thought that if these two musculo-aponeurotic bands could go round the patulous neck of the bladder like two collars one above the other, then contraction of the abdominal muscles would make a fairly broad sphincter at the neck of the bladder.

Preliminary investigations :—

1. *Age of the patient and general health.* The patient should be at least 8-10 years old, so that he can be taught to do abdominal exercises. The patient should be of good health and the abdominal muscles fairly strong.

2. An X-ray of the Pelvis is taken to see if there is any gap at the symphysis pubis.

3. An I.V. Pyelography is done to delineate the kidneys and ureters in order to see the function as also any dilatation of the ureters and pelvis of the kidneys.

4. Cystogram — To show the holding capacity of the bladder.

5. Cystometry — To show the complete incontinence.

6. Depth of the bladder — A catheter is passed to find the length it goes inside the bladder in order to obtain its capacity.

7. Photographic record of the local conditions.

Preparation of the patient :— The whole of the abdomen and perineum is prepared aseptically, the bladder is evacuated with a sterile catheter. Patient is placed on half Trendelenberg position.

Technique :

A transverse curved incision is made from one anterior superior iliac spine to the other, the centre of the curve reaching an inch from the upper margin of the epispadias. A big skin and subcutaneous tissue flap is raised upwards almost to the level of the umbilicus. The rectus sheath and the aponeurotic layers are cleaned thoroughly. Two strips of fasciomuscular slings are demarcated on the lower part of the exposed and cleaned aponeurotic surface. In order to gain length the slings are extended 1″ to 2″ across the middle line to the opposite side. Each sling is pedicled by oblique muscles at their base. The bases are near the anterior superior iliac spines of each side. The slings are then kept wrapped in warm saline gauze.

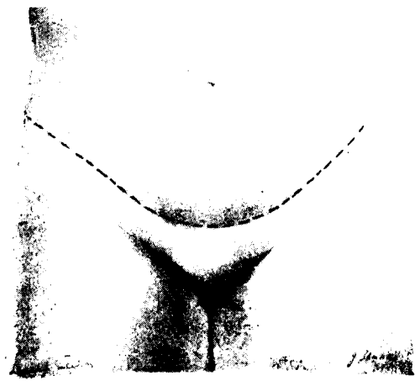

Fig. 1.
Line of incision.

Then a medium sized (size 14) catheter is introduced into the bladder and the same is fixed to the prepuce.

The space between the two rectus muscles is opened by retracting the two muscles. The bladder neck is palpated and it is dissected off the surrounding tissues. It is very difficult to dissect the bladder neck all round particularly from the anterior wall of the rectum. The bladder wall is very thin in these patients and the rectum and anal canal are much anteriorly placed. Some times one has to ask the assistant to put in a finger into the rectum while dissecting on the posterior aspect of the bladder neck. An aneurysm needle is passed across the posterior aspect of the bladder neck from one side to the other.

The fasciomuscular slings are then passed through the middle of the rectus muscle belly of the respective sides. A strong silk suture is introduced into the tip of each sling with the help of an aneurysm needle, the slings are then passed across the posterior aspect of the bladder neck to the opposite side. Then the fascial portions of the slings are encircled round the bladder neck and sutured on to their respective bases making a tight ring round the bladder neck having the catheter inside

Fig. 2.
Preparing musculofascial slings and passing through Rectus Abdomen.

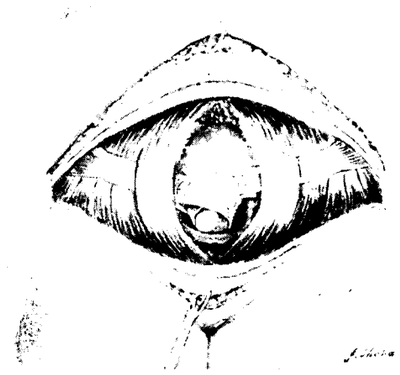

Fig. 3.
Musculofascial Sphincters made.

it. These sutures are made with silk. It is not advantageous to dissect the bladder neck very thoroughly as then the slings have a tendency to curl upwards on to the base of the bladder. It is best if only two holes can be made across the posterior aspect of the bladder neck in between the adhesions of the neck with the anterior rectal wall. The operation is completed by suturing the margins of the gap in the aponeurotic layer of the abdominal wall and by apposing the skin and fasciae without putting any drain.

Post-operative management :

1. Urine is drained through the catheter for 10 days.

2. Combiotic is used as the antibiotic of choice.

3. Patient is kept in comfortable Fowler's position.

4. Stitches are removed after 8 to 10 days.

5. Bowels are kept locked for 4 days and then moved by enema and laxatives. One week after the catheter is removed patient is asked to do exercises of the abdominal muscles (contractions and relaxations). The control on the bladder neck develops slowly and in gradually increasing capacity. In the course of 2-3 months the patients can hold the urine for hours.

Second operation :

The operation for correction of the epispadias is done about a month after the sphincter reconstruction. The urethra is reconstructed keeping it fixed to one of the crura penis. The glans penis is also kept fixed to the same crus. Then the crus is rotated to 180° at the tip so that the opening of the urethra comes to the ventral aspect of the penis. This makes a curve in the course of the urethra and may help in the urinary control.

Post operative investigations and follow up :

3 months after sphincter reconstruction the preoperative investigations are repeated, e.g. cystometry, cystogram, etc.

Patients are questioned whether they were having any leakage of urine in times of stress, e.g., coughing, or during sleep. They are asked whether the periodic fevers due to urinary infections previous to operation have stopped or not. Lastly their mental and physical well-being are observed.

Results :

3 patients with complete incontinent epispadias have been operated on by reconstruction of the sphincter of the bladder taking the idea from Millin's sling operation for stress incontinence.

All three patients are hundred percent cured.

1st case has a follow up for 2½ years.

2nd case has a follow up for 1½ years.

3rd case has a follow up for 6 months.

CASE REPORTS

CASE 1.

B.R., Hindu male, aged 13 years admitted on 4-7-1954.

Complaints — (1) Dribbling of urine all the time (e.g. once in every five minutes or so en

lying in bed or constantly while standing up since birth. (2) Maldevelopment of Penis and external urinary passage.

On examination :

The penis was small and curved dorsally. The incomplete prepuce was on the ventral aspect. The urethral groove was on the dorsal aspect and the opening was on the dorsal aspect of the root of the penis just below symphysis pubis.

The margin of the opening was formed by thin mucous membrane and urine was seen to dribble through the opening. A probe, sound and even a finger tip could easily be passed into the cavity of the bladder. There was no resistance of the sphincter. The external sphincter could not be seen or palpated. The pubic bones were found to be united at the symphysis pubis.

Rectal examination :

No prostate was felt, the perineum in front of the anus was found to be very thin.

Past history :

Patient used to have attacks of fever with chills at frequent intervals due to urinary infections.

Investigations :

Blood — Urea, N.P.N. etc. were normal

Urine — No growth on culture.

I.V. Pyelography — Both kidneys were normal. Bladder showed a small collection of dye with a lot of air above the dye.

Cystometry could not be done as there was constant dribbling.

Sphincter reconstruction was done in August 1954 and urethral construction was finished on 10-9-1954.

Results :

When the catheter was taken out after the second operation the patient could hold the urine for more than 1 hour while lying in bed and he could stand up and pass the urine in a kidney dish in the standing posture without any dribbling for the first time in his life. The boy was very keen to get cured and he went on doing abdominal exercises trying to hold the urine for longer periods while lying in bed and standing up. In another 10 days he could sit on a chair for 1 hour without leaking urine. About a month after the two operations, he could keep dry the whole night (from 11-30 P.M. to 5-30 A.M.) for the first time in his life. Two months after the operations he could keep dry for 2-3 hours during the day while getting up and about but he kept dry for the nights all along. Now he goes to School and urinates like any other normal student. His penis is small and so he has to be careful while passing urine. He is having a course of anterior pituitary injections for the development of the sexual organs.

Follow up investigations (3 months after operation):

Cystometry — (a) When 3 oz. of N. saline were put into the bladder he had a desire to pass water and the inside pressure ranged from 10-20 c.m. of water. (b) 5 oz. of N. saline could be passed into the bladder without any leakage. He could stand up with 5 ozs. of saline inside the bladder and pass that in a kidney dish without leakage. Pressure inside rose to 30-40 cm. of water while he attempted to pass the saline out.

Cystogram — Cystogram with sodium iodide solution showed the muscle sling working at the bladder neck. The periodic attacks of temperature with chill stopped 6 months after the operations. Patient is much improved both in physique and in mind.

Fig. 4.
Epispadias showing big dorsal opening of the urethra.

Fig. 5.
Showing urethral opening rotated to lower and right side.

(Case 1)

Fig. 6.
I.V. Pyelogram with Cystogram showing air inside bladder along with dye.

Fig. 7.
Cystogram with full control.

(Case 1)

CASE 2.

A.B., Hindu male, aged 10 years, was admitted on 1-4-1955. The boy had a small penis with penopubic type of Epispadias having no control over micturition; the pants and the bed of the boy used to be wet all the time. The clinical features were exactly the same as the first case, even the periodic fevers of urinary infections.

Investigations :

I.V. Pyelography — Both kidneys were normal but ureters were dilated.

Cystogram — showed air above a small collection of fluid.

Blood examination — nothing abnormal.

Operation :

On 6-7-1955 sphincter reconstruction operation was done. Patient started to have some control after the catheter was removed. He had too much induration in the suprapubic region along the incision line. He was having some residual urine in the bladder after voluntary micturition. Once the rubber catheter was removed it could not be passed again. The penis was so acutely angled dorsally that the pulling of the bladder neck produced an angulation on the urethra behind the symphysis pubis. So a female metal catheter was passed and about 1½ oz. of residual urine was removed.

On 4-8-1955 patient came back with an attack of cystitis. The lump or thickening above the suprapubic region was found to have increased. Antibiotics and bladder washes relieved the condition. In November the child came to the hospital with retention of urine. He could pass a few drops of urine but could not empty the bladder. No catheter, metal or rubber, could be introduced.

Operation on the neck of the bladder :

The scar in the suprapubic region was excised and a lot of fibrosis was detected around the bladder neck. The fibrous tissues were fixing the bladder neck on to the posterior aspect of the pubic bone. After most of the hard fibrous tissues had been removed a rubber catheter could be passed into the bladder with ease and it was kept in place. The patient got cured in 10 days but on removal of the catheter he used to leak a little.

Follow up and Investigation :

4-8-56. The child can control his urine fully during day time. At night he passes urine in bed at times.

Fig. 8.

Fig. 9.

Figs. 8 & 9. Epispadias showing small penis and dorsal opening.
(Case 2)

Fig. 10.
Pre-op. cystogram showing bladder containing air.

Fig. 11.
Post-op. cystogram with full control.

(Case 2)

Fig. 12.

Fig. 13.

Figs. 12 & 13. Epispadias showing small penis and big dorsal opening of the urethra.
(Case 3)

Fig. 14.

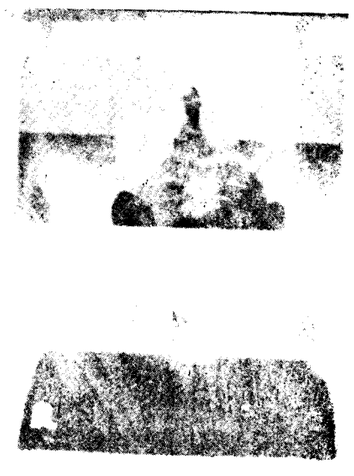

Fig. 15.

Figs. 14 & 15. I.V. pyelogram with cystogram showing bladder filled with dye and air.
(Case 3)

Cystometry — 150 c.c. of N. saline raised the intravesical pressure to 15 c.m. of water. 175 c.c. of N. saline raised the pressure to 20 c.m. and the child could not hold any more.

Cystogram — 6 oz. of sodium iodide solution was introduced into the bladder. The sphincter working at the bladder neck was very well demarcated. After evacuation there was some dye left in the bladder.

Results :

Patient's general health has improved. He has no more attacks of Cystitis. He is attending school and is quite happy.

CASE 3.

K.N.C., Hindu male, aged 16 years, was admitted on 14-8-1956.

Diagnosis :

Incontinent epispadias with small curved penis.

Investigations :

Blood — Urea, N.P.N. etc. normal.
Urine — no growth on culture.

I.V. Pyelography — kidneys are normal. Bladder showed collection of dye with air on top of the dye indicating incontinence.

Question of Cystometry did not arise.

24-8-56. The reconstruction of sphincter was done. When catheter was removed 10 days' later, patient could hold the urine for an hour or so. He could stand up and pass the urine in a kidney dish without any leakage for the first time in his life.

19-9-56. The second operation for reconstruction of the epispadias was performed.

Result :

Patient is developing the urinary control slowly and gradually.

Conclusion

It is certainly gratifying to see the results of sphincter reconstruction in incontinent epispadias cases. Attempts are being made to reconstruct the bladder sphincter in ectopia vasicae cases. These patients are operated for reconstruction of bladder first, then the urethra is constructed. Lastly the sphincter is constructed across the thick bladder neck. So far results are not promising as the capacity of the reconstructed bladder is small and the bladder neck is very thick.

Small children with ectopia vesicae are being fitted with a cup and catheter after the bladder and urethra are reconstructed. The sphincter reconstruction will be attempted when they grow up to 10 years of age.

ACKNOWLEDGEMENT

In concluding my article I must thank Lt. Col. N. C. Chatterjee, Surgeon Superintendent, S. S. K. M. Hospital for allowing me to use the hospital records and I also appreciate with gratitude the help and good will of my medical and nursing staffs.

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LYMPHANGITIS CARCINOMATOSA OF THE LUNG (MILIARY CARCINOSIS)

Secondary to Squamous-Cell Carcinoma of the Penis

by D. J. REDDY, T. SURYAPRAKASA RAO, K. GOPALAKRISHNIAH GUPTA and V. KAMESWARA RAO, Guntur.

Secondary tumours of the lung are common. These may be discrete and nodular or diffuse and miliary. The latter kind is less common and the tumour cells are exclusively found in the pulmonary lymphatics and may in addition permeate the venules and arterioles. This type of generalised cancerous permeation of the pulmonary lymphatics known in continental literature as "Lymphangitis Carcinomatosis" is a relatively rare condition. Andral [1] in 1829 and Virchow [13] in 1855 were the earliest to note this unusual lung condition. Demme [2] in 1858 recorded 7 cases of the same under the title "Carcinosis Miliaris Acuta". Troisier [12] in 1873 gave detailed description of the lung in this condition and coined the term "Lymphangitis Carcinomatosis of the Lung". The pathology, pathogenesis and the probable mode of endolymphatic spread of the lung in this condition were described by Troisier [12], Raynaud [10] in 1874, Girode in 1889 and Von Myenburg [14] in 1919.

Harold [5] while recording 24 cases of the condition reviewed 154 cases reported between 1840 and 1950 and concluded that the condition occurs more frequently than is reported and that the lesion is likely to be overlooked clinically, roentgenologically and even at autopsy unless a detailed examination is made. The clinical manifestations of the primary growth very often overshadow the clinical picture as a result of the involvement of the lungs. Sometimes the primary tumour may remain asymptomatic. Hacking nonproductive cough, at times not unlike that of asthma, rapidly progressive breathlessness, cyanosis and weakness often characterise the clinical picture. Roentgen findings of the lungs at this stage are typical, though not diagnostic. In these cases one often finds miliary mottling (confused with miliary tuberculosis) or fine stringline shadows stretching from the hilum to the periphery of the lung to be distinguished from the vascular shadows of the lung. A certain diagnosis can only be based on the above roentgen observations, during life. Death occurs in a few months of recognition of the condition and the surgeon needs to be aware of this so that the patient may be saved from drastic surgical measures.

Lymphangitis carcinomatosis of the lung is reported frequently in young adults. Harold [5] found the primary tumour in his series of 24 cases in the bronchus, stomach, pancreas, breast, prostate, rectum, teratoma and kidney in that order of frequency. Wu [16] in 1936 observed in over 75% of his cases metastases were from the primary tumour of the stomach. Harold [5] suggested from a study of his material that endolymphatic spread of carcinoma into the lung was frequently found with adenocarcinoma of the bronchus and not in the case of squamous or oat cell carcinoma. But Wu [16] reviewing the morphology of the lesion in 26 cases from his series concluded that there was no correlation between the histological features of the primary neoplasm and the development of lymphangitis carcinomatosis. From a study of the literature on the subject it is apparent that the commonly occurring squamous cell carcinomma very seldom contributes to development of miliary carcinosis of the lung. Mendeloff [7] in a review of 4892 autopsy protocols at Peter Bent Brigham Hospital, found only 96 metastasised into lungs and 30 of these were of endolymphatic type. Not one case in the analysis was contributed by primary carcinoma of the penis.

Knowledge of the exact pathogenesis of lymphangitis carcinomatosis of the lung and the pathway through which tumour

cells reach the lungs are still in doubt. The spotting of this condition at necropsy in a case recently and the interesting changes the lungs had presented prompted us to record the clinico-pathological findings.

CASE REPORT

K.V., Hindu male, aged 30 was admitted under the care of Dr. J. S. Serma, Govt. General Hospital, Guntur, on 2-2-1957 for ulceration of the penis and swelling of the scrotum and rt. lower limb since two months. Originally the lesion started as a small ulcer which at the time of admission had destroyed the entire penis and only a large fungating ulcer was seen at the root of the penis. The ulcer was being constantly kept wet by urine discharged periodically The regional lymph nodes were enlarged and firm. The skin over the scrotum and also in the crural region was thickened.

The patient was treated with 20 grammes of streptomycin for venereal granuloma 3 months prior to admission by the same clinician.

Investigations :

Blood : V.D.R.L. was negative.

" Microfilaria not found.

" Urea 141 mgms. percent.

Urine nil remarkable.

Biopsy from the bit of th ulcer zone taken on 14-2-1957 : Chronic granulomatous reaction was noticed. Repeated biopsy done on 14-3-1957 disclosed squamous-cell carcinoma. The patient expired two days later.

Chief autopsy findings inclusive of morbid histology :

Marked pitting type of oedema of the rt. lower limb was noticed. The penis was absent and was replaced by an ulcer with indurated edges. The scrotum was swollen and the cuts over it was hard and riddled with multiple nodules. These nodules were also seen underneath the skin of the genito-crural folds (Fig. 1). The inguinal lymph nodes were greatly enlarged and were the sites of white tumour deposits. Sectioned surface of the scrotum revealed many tumour deposits in the lymph nodes (Fig. 2). These lymph nodes were matted together and subcutaneous tissues in and around the scrotum were infiltrated by the tumour cells.

Fig. 1.

Photograph shows excavating ulcer at the root of penis, swelling of the scrotum and multiple nodules underneath the scrotal tunic.

Fig. 2.

Photograph shows sectioned surface of the tumour. Discrete tumour deposits in the lymph nodes are well seen.

The lymph nodes in the abdomen and thorax were exclusively and significantly infiltrated with tumour cells. The para-aortic, iliac, mesenteric, mediastinal, tracheo-bronchial, the lower deep cervical and supra-clavicular lymph nodes were greatly enlarged and sectioned surfaces of them disclosed circumscribed whitish deposits. There were whitish plaques of tumour tissue over the parietal peritoneum. Similar plaques of varying size were seen scattered over the parietal pleura on both sides. Most of the thoracic duct was lost during dissection but a bit about 1" long was noticed over to the left of the median line near about the 12th thoracic vertebra. This was solid and and no lumen could be made out (Fig. 3). Sections of this showed undifferentiated squamous-carcinoma completely filling the lumen.

Sections of the scrotum showed well differentiated squamous-cell carcinoma and deep in the subcutaneous tissue were seen tumour emboli filling the small lymphatics (Figs. 4 & 5). Similarly the sections of the inguinal lymph nodes showed secondary deposits of squamous-cell carcinoma of the keratinising type (Fig. 6).

Both the lungs appeared normal in size, the rt. weighed 750 grammes and the left weighed 610 grammes. Over the visceral pleura of both the lungs were seen raised white plaques of different sizes and shapes and some of them appear to demarcate the small lobules of the lungs (Fig. 7). They were firmer than normal and deep palpation revealed the presence of minute nodules. Sectioned surface of the lungs showed whitish streaks of varying thickness radiating from the hila towards the pleura with white collars of neoplastic and fibrous tissue thickening around bronchi and in the interlobar septa. Scattered all over the surface of the lungs were seen small nodules (Figs. 7 & 8). Sections from multiple blocks representing both the lungs (N 173-176. 184-187 a-h) were studied. Conspicuously the peribronchial, perivascular and subpleural lymphatics were distended with tumour emboli of squamous-cell carcinoma. Some of these tumour laden lymphatics were ballooned to the extent of rupture. In places the neoplastic cells in the lymphatics were not differentiated (Fig. 9) while in other places specially close to the pleura the differentiation had proceeded to the extent of pearl formation and prickle-cell differentiation (Fig. 10). The same was noticed in the case of subpleural lymphatic emboli (Fig. 11). Peribronchial lymphatics of all sizes were filled with the tumour emboli (Fig. 12). Occasionally groups of alveoli distended with squamous-cell pearls were

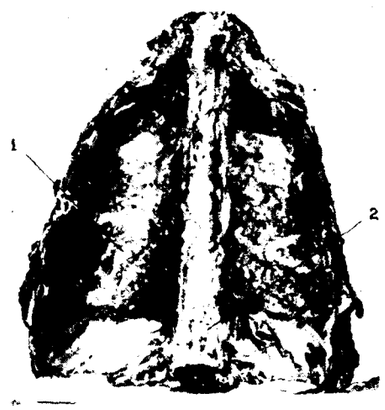

Fig. 3.

Photograph shows multiple tumour plaques over the parietes of the thoracic cage -marked 1 and remnant of the thoracic duct occluded with tumour cells -marked 2.

Fig. 4.

Photomicrograph illustrates tumour embolus deep in the scrotal connective tissue.

(H & E x 110).

Fig. 5.

Photomicrograph illustrates the tumour embolus in the scrotal lymphatic magnified. (H & E x 340)

Fig. 6.

Photomicrograph illustrates squamous-cell carcinomatous deposits well differentiated in the inguinal lymph nodes. (H & E x 170)

Fig. 7.

Photograph shows external and sectioned surfaces of the lungs. Plaques carcinomatous deposits of varying size are seen covering the visceral pleura. Close to the hilum is seen thick collar of neoplastic tissue encircling the bronchi and vessels. Dot like spots represent miliary secondary deposits.

Fig. 8.

Photograph illustrates sectioned surface of the lung. Tumour plaques are seen over the under surface of the lung. Radiating from the hilum are seen streaks of neoplastic tissue around the bronchi and vessels.

Fig. 9.

Photomicrograph illustrates multiple tumour emboli distending perivascular lymphatics. The tumour deposits are highly undifferentiated. (H & E x 60)

Fig. 10.

Photomicrograph illustrates multiple tumour emboli of well differentiated squamous cell carcinoma in the peribronchial lymphatics. (H & E x 90)

Fig. 11.

Photomicrograph illustrates squamous-cell carcinomatous deposit in the subpleural lymphatic and also considerable amount of fibrosis. (H & E x 102)

Fig. 12.

Photomicrograph illustrates peribronchial lymphatics filled with undiffiated variant of squamous-cell carcinoma. (H & E x 120)

Fig. 13.

Photomicrograph illustrates a group of alveoli filled with squamous-cell carcinomatous deposits. (H & E x 108)

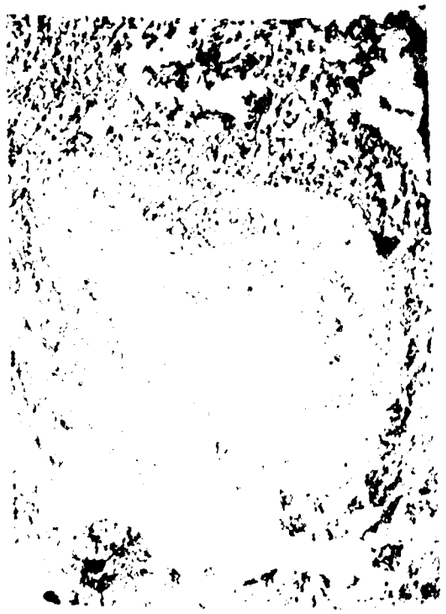

Fig. 14.

Photomicrograph illustrates the vessel wall of the lung penetrated by the neoplastic cells and the lumen filled with an organising thrombus. (H & E x 120)

seen (Fig. 13). These were usually located in the vicinity of peribronchial or perivascular lymphatics containing the neoplastic emboli. Desmoplastic reaction around the bronchi, vessels and the pleura was considerable and many of the tumour cells enclosed in the fibrous tissue had changed their morphology. This fibroblastic reaction was largely responsible for whitish cuffs of tissue seen around apparently stiff and gaping bronchi and vessels of the lungs. In many places the neighbouring vessel walls were infiltrated with tumour cells and the lumina of some of these vessels were the sites of thrombi at different stages of organisation (Figs. 14 & 15). The endothelial lining of some of the vessels was paved with the tumour cells (Fig. 15). Many of these vessels showed changes typical of endarteritis. The bronchial lumen was free from tumour emboli and the lining epithelium of the bronchioles were normal.

Sections of tracheo-bronchial and mediastinal lymph nodes disclosed squamous-cell carcinomatous infiltration of the keratinising type (Fig. 16). Sections of heart, liver, spleen, brain, kidneys and thoracic vertebrae showed no tumour deposits. The tumour emboli in the inguinal lymph nodes presented calcific spots, not an uncommon finding.

Comment

The clinico-pathological findings observed by us in the case well exemplify the rare occurrence of lymphangitis carcinomatosis of the lungs secondary to squamous-cell carcinoma of the penis. In the large majority of published reports the primary growth was located in the stomach, bronchus, breast, or pancreas in that order of frequency and this according to Wu [6] is due to the short distance that separates the lymphatics of the organs mentioned above from the lungs. In most of the reported cases the victims of this lesion were young adults and our patient was only 30 years old and we are not able to offer any explanation for the rapid and fatal course pursued by the penile lesion in our case. This is probably due to the poor nutritional state of the individual. The general condition of the patient was very poor and we

Fig. 15.

Photomicrograph illustrates twin pulmonary vessels, sites of tumour cell invasion and endarteritic changes. (H & E x 150)

Fig. 16.

Photomicrograph illustrates keratinising type of squamous-cell carcinomatous deposit in the mediastinal lymph nodes. (H & E x 78)

are forced to surmise that the clinician overlooked the minimal symptoms the patient would have presented due to the wide-spread involvement of the lungs and also presume that particular attention was not paid to elicit physical signs depicting lung involvement. This had lead to the regrettable omission of the roentgenological examination of the lungs which would have given the characteristic string-line shadows of lymphangitis carcinomatosis of the lungs judging retrospectively from the necropsy findings.

We are inclined to think that the intial biopsy from the penile lesion did not represent the zone of neoplastic tissue and hence accounted for the discomforting report given by us as granulomatous reaction and this is nothing unusual. The rapid transformation into carcinoma which was the site of granuloma venerium in view of the short interval following the latter is rather difficult to convince scientific minds but no material of the venerial lesion was available for us for review. Rajam & Rangiah [7] and Reddy, K. G. K. Gupta and Venkiah [1] had reported malignant change supervening granuloma venerium.

The primary growth is a well differentiated squamous-cell carcinoma and the secondaries in the inguinal and mediastinal lymph nodes have maintained the differentiation and matured to cornification. This is also the feature of the emboli noticed in some of the peribronchial and subpleural lymphatics. But poorly differentiated or anaplastic squamous-cell carcinomatous emboli in large numbers were recognised in sections of the lungs screened. This only emphasises the false assurance the patho-

logist makes to his surgical colleague as regards the degree of malignancy and this practice must be discouraged so that surgeon could decide the plan of treatment based on the clinical picture and on his wisdom based on past experience. The surgeons we hope will not insist on grading of tumours and more important than this that they will not embark on any enthusiastic radical surgery or roentgen therapy solely based on the report of the pathologist.

Somewhat difficult to understand is the path of dissemination of tumour cells in this condition. The recognition of tumour emboli and secondary deposits in our case exclusively in the lymph nodes along the route of the thoracic duct and in the lymphatics of both the lungs offer itself for easy explanation. We feel that the view sponsored by Troisier [12] in 1874 and later expanded by Von Myenburg [14] explains the spread of tumour cells from the penile lesion in our case. The tumour cells in our case gained entry into the thoracic duct and obstruction by the enlarged mediastinal lymph nodes engendered stasis of lymph in the lungs. This had lead to retrograde dissemination from the hilus to the pleura. Intercommunication between the deep pulmonary and superficial pleural lymphatics normally exist and this had assisted in the wide dissemination of the tumour cells in the lungs inclusive of the pleura. Some of the vessels in the lungs were the sites of tumour collections and also of thrombi in our case and this was noticed in close proximity to the zones of marked tumour desmoplasia. We are to agree with the claim of Von Myenburg [14] in that the continuity of cancer strands can be traced from the perivascular lymphatics to the lumer of the arterioles and that this is possible only by penetration of the cancer cells in the vascular lumina from the lymphatics. We found abundant evidence in support of this finding of Von Myenburg [14] and we are convinced that in the absence of gross and microscopic evidence of secondary deposits in other viscera in the deceased, the dissemination of the cancer cells into the lungs was through lymphatics and not through blood. The occurrence of obliterative changes in the pulmonary vessels observed by us were recorded by Von Myenburg [14] and Greenspan [4] and they suggested that these changes account for the Ayerza's like syndrome manifested by these cases.

The finding of groups of alveoli filled with tumour cells is nothing surprising when we realise the fact that they are far and few and are in close proximity to the perivascular, or peribronchial or subpleural lymphatics containing the tumour emboli. This was recorded by Wu [16] also. This is due to the spilling over phenomenon of cancer cells from the adjoining ballooned and ruptured lymphatics containing the cancer cells. A large neoplastic deposit in the lung was significantly absent and this definitely excludes the most remote possibility of blood dissemination.

Summary

1. Literature on lymphangitis carcinomatosis of the lung is briefly reviewed.

2. Clinico-pathological findings in a case of lymphangitis carcinomatosis of the lung secondary to squamous-cell carcinoma of the penis is recorded. The rarity of this condition associated with squamous-cell carcinoma and in particular of penile lesion is stressed.

3. The mode of spread of the cancer cells from the penile lesion to the lungs is discussed and convincing evidence is adduced in support of spread solely through the lymphatics.

4. The fact that very often disease process (specially oncology) discloses the minute normally nondetectable anatomical structures and throws light on the hitherto unknown links in histology, is impressed, in that many of the collapsed and insignificant lymphatics distended with tumour emboli were manifestly seen in the case recorded.

Acknowledgement

We thank Dr. J. S. Serma, M.B.B.S., D.V., for the case notes. We acknowledge with pleasure the help rendered by our photoartists Venkateswara Rao and Narasimha Rao.

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Fig. 3.

Skiagram of the chest taken on 16-4-1957 showing a uniformly expanded lungs with haziness at the left base due to pleural thickening.

Macroscopic examination: The tumour was about 1 cm. in diameter, pink in colour, spherical in shape with a nodular surface. It was firm. The cut surface showed areas of calcification.

Microscopic examination: This revealed a tumour mainly composed of cartilage cells. The periphery and a few clefts in the tumour were lined with ciliated epithelium. No carbon pigment was noted in the tumour (Fig. 2).

On 10th February 1956 a left thoracotomy was done through the sixth interspace. The lung was free except for some adhesions over the anterior segment of the upper lobe. There was about 300 c.c. of clear, straw coloured fluid in the pleural space. Inspection and palpation of the lung revealed an obviously inflammatory mass in the anterior and lingular segments of the upper lobe. The interlobar fissure was obliterated. It was partly freed up. The anterior and lingular segments and a sub-segment of the posterior segment of the upper lobe were excised. Bronchotomy of the anterior segment of the upper lobe was done before closure in order to make sure that there was no tumour present centrally. The chest was closed in the usual fashion with two drainage tubes. The patient received two litres of blood during the operation. The post-operative period was uneventful.

Examination of the specimen macroscopically showed the bronchi to be free of tumour. The lung on section showed evidences of chronic inflammatory process. The lingula was solidified. Microscopically there were dilated bronchi surrounded by a dense inflammatory infiltrate and in areas the mucosa was replaced by fibrous tissue. The lung parenchyma showed chronic inflammation with thickening of alveolar walls and also fibrosis. There were numerous foreign body type giant cells.

Interval postoperative check-up on 28-2-1957 (a year after the operation) indicated that the patient's condition has remained good and he is asymptomatic. The roentgenogram of the chest is satisfactory (Fig. 3). Bronchoscopic examination did not reveal recurrence of the tumour.

Discussion

Chondromata of the lung are quite common benign tumours, but primary chondroma of the bronchus is a rare entity. The latter produce symptoms either by obstructing the major bronchi or producing secondary changes distally such as bronchiectasis, atelectasis, abscess formation or recurrent lung infection. In this case the cough was probably due to the bronchiectatic changes in the lung distal to the obstruction as well as to the irritation of the tumour itself. The clear straw-coloured pleural effusion was due to pleural irritation by the infectious process.

Chondromas of the lung are benign and there is no instance in the literature of a hamartoma of the bronchus turning malignant.

Endoscopic resection of the growth, if possible, should give complete relief if there are no secondary changes distally. The case described by Davidson[7] was treated by this method and the patient was completely cured. More often, as in our case, distal secondary changes are present which require resection.

Summary

A case of endobronchial chondromatous hamartoma has been presented. Though small in size the tumour produced severe symptoms by blocking a segmental bronchus. These tumours are essentially chondromatous in nature, though sometimes other bronchial elements as ciliated epithelium or muscle may be found. Recent studies regarding its origin are more in favour of its arising from the connective tissue of the bronchus rather than from the cartilaginous rings. The treatment of this condition is endoscopic resection of the tumour if possible or and resection of the part of the lung affected.

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ARGENTAFFIN CARCINOMA OF SMALL INTESTINE

*by S. P. SRIVASTAVA and S. P. ATRI, Agra.**

The argentaffin carcinoma or "carcinoid" of the small intestine forms a well defined group of tumours. Because of their rarity and their altered behaviour in different anatomical situations, only on rare occasions has a correct diagnosis been made preoperatively.

Complete identification requires the demonstration of the characteristic argentaffin granules in the tumour cells. According to Willis (1948), the histological structure is often sufficiently distinctive to enable confident diagnosis without the use of silver stain. Hence the identity of many of the earlier reported tumours of this class was clear, although silver impregnation was not employed. The tumours were incidental autopsy findings and were yellow or white in colour. Because they had the histological structure of an undifferentiated carcinoma and appeared to be slowly growing and non-invasive, Oberndorfer (1907) called them "carcinoid" tumours. The term "carcinoid" implying a reputation of innocence, is an unfortunate one, as full fledged malignancy and widespread metastases sometimes occur.

In 1914, Gosset and Masson showed that the cells of the intestinal chromaffin tissue when stained by ammoniacal silver salts, exhibited black granules in their cytoplasm. By this method they were able to demonstrate similar cells near the bases of the crypts of Lieberkuehn. They also showed by using similar stains that carcinoid tumours were composed of cells of the same type. They therefore added the term "Argentaffin" to these tumours. There is almost general agreement that carcinoid tumours originate from the Kultschitzky cells of the crypts of Lieberkuhn. These tumours should be called "Argentaffinomas", but the term carcinoid is so deeply entrenched in the medical literature that its continued use seems justifiable.

In recent years a very large number of papers have been wriitten about these tumours. It is now known that they may occur anywhere in the gastrointestinal tract from the cardiac orifice of the stomach to the anorectal junction, although the majority are found in the appendix and the lower part of the ileum, and constitute about 20 percent of all malignant tumours arising in the small intestine. Upto 1948 over 300 argentaffin carcinomata of the jejunum and ileum had been reported (Reid 1948). Inspite of the rather extensive literature concerning them, such tumours are rare.

Characteristically the tumour consists of a yellow nodule of varying size which occupies submucosa. The mucous membrane overlying the nodule is usually intact, although occasionally some superficial ulceration occurs. The nodule is firm and of rubbery consistency and may extend through muscular layer to involve the serosa. In the appendix the tumour may cause obstructive symptoms by obliterating the lumen, not by contraction of the fibrous stroma, but by its bulk. On the other hand, the lesion may be so small, as to be found only on microscopic examination. Elsewhere in the gastrointestinal tract, where the lesions are often multiple, the growths usually project into the lumen of the bowel as polypoid masses, over which the mucosa is intact. Intense fibroplasia accompanies the invasion of the mesentery resulting in kinking of the bowel by contraction of the fibrous tissue.

Microscopically the tumour consists of clumps and masses of large spheroidal cells closely packed, lying in a fibrous stroma, with here and there small glandular lumina or distinct acini. The cells have

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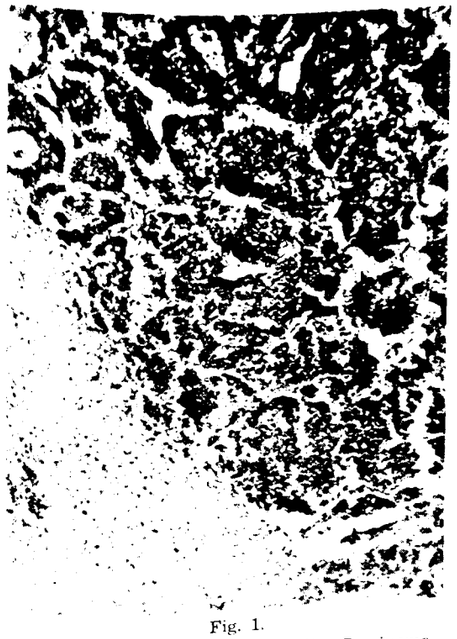

Fig. 1.

Liver metastases of Argentaffin Carcinoma intestine. (x 50)

Fig. 2.

Liver metastases of Argentaffin Carcinoma intestine showing pseudo-rosettes, which closely resemble rosettes of Neuroblastoma. (x 430)

round, distinct nuclei but often the cytoplasmic borders are ill defined. They bear no resemblance to the ordinary columnar or mucous cells lining the intestinal glands. There is no true glandular formation, but occasionally the central portion of the cell masses exhibit a vacuole which contains an eosin staining material. This formation may closely simulate the rosettes which occur in neuroblastomas.

In the small intestine the argentaffin carcinoma occurs during middle or old age, and the multiplicity of the primary lesions is in contrast to the single primary nodule occurring in the appendix in the younger age group. The mean age of 8 necropsy cases of Willis was 60 years, of Dockerty and Ashburn's 13 cases 58 years, and of the cases reviewed by Ariel 57 years.

The most common clinically observed syndrome in cases of argentaffin carcinoma of intestine, is recurrent attacks of partial intestinal obstruction associated with colicky pain, diarrhoea and weight loss. According to Cooke, 50 percent of malignant argentaffin carcinomas produced clinical symptoms. It is apparent that these neoplasms should no longer be regarded as clinically silent lesions. In 13 cases described by Dockerty and Ashburn (1943) the average duration of symptoms was three and a half years. Obstruction is usually caused by kinking of the bowel, the result of fibrosis which occurs when the growth penetrates the muscular coats and proliferates in the subserous layer. Occasionally it is due to annular constriction, intussusception, or adhesions of the neighbouring loops to the tumour. Diar-

rhoea is not only common, but often very severe. Only rarely blood has been found in the stools, as ulceration of the mucosa is not a common feature. Abdominal masses are palpable in very few cases and their presence indicates metastatic spread since the primary lesions are almost always small.

Inspite of suggestive clinical syndrome, the diagnosis of the argentaffin carcinoma of the bowel is made but rarely before operation. With regard to radiological diagnosis, Miller and Herrmann (1942) have demonstrated a small filling defect and kinking of the bowel at the site of the partial obstruction in two cases. They believe this appearance is highly suggestive of an argentaffin carcinoma and were able to make a correct preoperative diagnosis in one of their cases.

Although, the argentaffin carcinoma or "carcinoid" was described originally as benign, it is now generally agreed that malignant change may occur. Spread occurs by continuity and contiguity of tissues, as well as, by invasion of lymph and vascular channels. In the series reported by Grimes and Bell, metastases occurred in the regional lymph nodes, the mesentery, and the adjacent peritoneum, but distant metastases were much less common, although they occurred in the liver, spleen and even within the thorax. Once the tumour reaches the peritoneal surface of the bowel, it may implant itself elsewhere just as other malignant tumours do. Ariel, in 1939, summarized the literature reported to that date, only 24.9% showed evidence of metastases. Dockerty and Ashburn studied 30 carcinoid tumours of the small bowel in which 13 showed undoubted evidence of metastases. Dangremond reviewing 42 cases in 1942, found metastases in 24 cases (52 percent). According to Willis (1952), probably the first recorded case of small intestinal carcinoid with metastases was that of Ransom (1890) who saw invasion of small veins in the primary growth in the ileum and multiple metastases in the liver only.

Gastrointestinal argentaffin carcinoma has lately been recognized as an endocrine growth which may cause flushing attacks and cyanosis and perhaps stenosis of the pulmonary valve of the heart. The existence of this syndrome was suggested by Biorck, et al (1952) who described the post-mortem discovery of argentaffin carcinoma of the ileum in a patient who had complained of cyanosis, flushing attacks, dyspnoea, abdominal pain, and diarrhoea, and who had a pulmonary valvular stenosis. These symptoms are due to an excessive circulation of 5 hydroxy-tryptamine (5 H.T.) which is produced by argentaffin cells, is a normal constituent of the platelets and is excreted in urine as 5 hydroxy-indoleacitic acid (Duncan, Graven, Gibbons, 1955).

As the tumour has malignant tendencies, the treatment should be as radical as possible and it is fortunate that most of the lesions in small bowel occur in the terminal ileum where extensive resections are possible. Horsley has advocated resection of the argentaffin carcinoma of the small bowel even in presence of metastases and in the opinion of some authors it is not unusual to see the metastatic deposits become stationary after removal of the primary tumour. The prognosis depends upon the presence or absence of irremovable metastases. Grimes and Bell's patient lived 10 years before succumbing to a large pelvic metastasis after removal of a primary growth of ileum. Stewart and Taylor's patient was alive 10 years after developing metastases and Mallory's patient lived for 20 years. The relative longevity may be found even in those cases in which short circuiting operation is possible. Terplan, Weintraub and Wolf have reported a case in which the patient survived 5 years after ileotransverse colostomy for carcinoid tumour of ileum with hepatic metastases and died due to drowning and necropsy examination showed that the hepatic metastases had shown no further growth.

Only few reports have mentioned the use of radiotherapy in the treatment of

argentaffin carcinoma of small bowel. In Ariel's case a probable metastases in the right iliac fossa was treated with radiation with disappearance of the tumour. Bailey (1934) has suggested that postoperative use of radiation may improve the relative prognosis of this type of intestinal tumour.

CASE REPORT

History:

Z.S., a 50-year old man, was admitted to S. N. Hospital, Agra on 18-8-1956. For previous 6 months he had suffered from repeated bouts of spasmodic colicky abdominal pain, lasting about 24 hours, but were not accompanied by vomiting. At these times he could palpate a swelling in the lower abdomen and could feel it move. The attacks would soon subside after a series of loose motions, which were only 3 or 4 in the beginning but latterly there had been 8 or 9 loose motions a day at the time of admission in the hospital. No blood had been passed per rectum. In between the attacks he had been perfectly well.

On Examination:

The patient was a thin built man. The abdomen was slightly distended and peristalsis could be seen. A firm mass 3" x 2½" in diameter was felt in the left hypochondrium, with diffuse margins, and was found to be dull on percussion, and moved slightly with respiration. The liver and spleen were not palpable and no abnormality was found on rectal examination. The heart and lungs were normal and blood pressure was 128/84 mm. Hg.

Investigations:

(i) Blood — Total R.B.C. 2.7 million/cmm., Total W.B.C. 6300/cmm., Haemoglobin 9 gm./100 cc. (Adams).

(ii) Stool — Brown in colour, acidic reaction, no R.B.C. present.

(iii) Radiological examination: A barium enema visualized the large bowel upto the caecum which filled normally and did not show any filling defect. Rest of the colon also did not show any abnormality.

Operation notes:

As there were signs of chronic obstruction with visible peristalsis, exploratory laparotomy was done. The abdomen was opened by a midline incision and on opening the peritoneum a large amount of straw coloured fluid was aspirated out. On exploration a large hard mass was found in connection with the left lobe of the liver which was being felt on examination in the left hypochondrium. The liver surface was found to be studded with small nard nodules varying from 0.5 c.m. to 1 c.m. in diameter. One of these nodules was taken out for histological examination. On further exploration an annular stricture was found in the ileum, 50 c.m. from the iliocaecal valve. Ileotransverse colostomy was performed. The post operative period was smooth and uneventful, and patient was discharged from the hospital after 19 days of operation though his general condition remained weak because of frequent loose motions.

Histological examination:

Microscopically the nodule removed from liver surface consisted of clumps and masses of large spheroidal cells lying in a fibrous stroma. The cells were round with distinct nuclei but with ill defined cytoplasmic borders. No true glandular formation was found but the central portions of the cell masses exhibited a vacuole which closely simulates the rosettes found in neuroblastomas (Figs. 1 & 2).

DISCUSSION

Argentaffin tumours of the small bowel are still a challenge to modern surgery, as the preoperative diagnosis has rarely been made in such cases. There is a definite curious syndrome of colicky abdominal pain and diarrhoea in cases of argentaffin carcinoma with metastases in the liver. Before resection of the tumour in the bowel, pain and diarrhoea might result from recurrent subacute obstruction or from recurrent incipient intussusception. On the other hand, they might be caused before and after operation by high serum levels of 5 Hydroxy-tryptamine, as Page (1954) has shown that normal individuals injected with 5-HT may complain of abdominal pain and a desire to defaecate. Flushing attacks and cyanosis, and perhaps the stenosis of the pulmonary valve reported by many authors, are also attributed to the circulation of increased amount of 5-HT.

The diagnosis tends to be delayed and even in a case of a stenosing tumour of the small intestine, obstructive symptoms are late because the bowel content is fluid. The estimation of urinary 5-H.I.A.A. or serum 5-HT is not a routine measure, but raised values would confirm the diagnosis.

The slow progress of some of these cases makes it seem reasonable to resect the primary tumour and accessible metastases, to

relieve obstruction, and to reduce the amount of tissue producing 5-HT.

Summary

The literature referring to the malignancy and clinical features of argentaffin carcinomata of small bowel is reviewed. A case of argentaffin carcinoma of ileum with hepatic metastases is described.

ACKNOWLEDGEMENTS

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HERMAPHRODITISM

(Presentation of a case with a brief review of the literature)

by S. D. DEODHAR, C. J. T. PINTO and K. G. MUNSIF, Bombay.

The extreme rarity of true hermaphroditism as a clinical entity prompts the presentation of the following case report.

CASE REPORT

B.V., male, aged about 14 years, was admitted into the K.E.M. Hospital on 11-5-1955 for haematuria of two years duration. He stated that he used to bleed for two to three days every month, the bleeding occurring independently of the act of micturition. His voice had become higher pitched and he had developed enlargements of the breasts about two years prior to admission. On examination, he had full cheeks; the Pomum Adami was not marked; he had no hair on the face; axillary hair were scanty; there was a moderate enlargement of both breasts; the bony pelvis appeared wide, the mons pubis prominent, and the pubic hair displayed a feminine distribution; the left half of the scrotum was well developed and contained a small sized testis; the right half of the scrotum and testis were absent; the penis was three quarters of an inch in length with a normally placed external urinary meatus (Figs. 1 & 2). On digital rectal examination, a nodule (? ovary) was felt on the right side; neither the prostate nor the uterus were palpable.

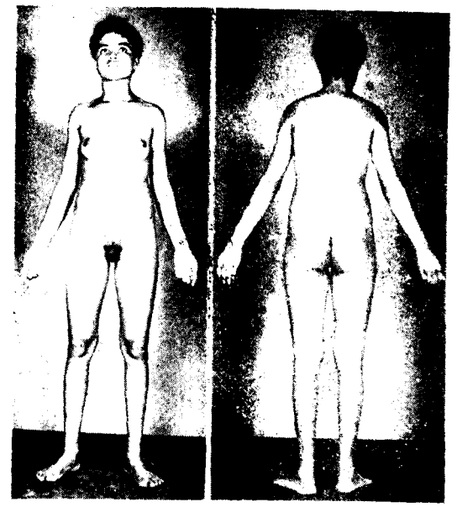
An examination of the blood stained urine did not show any endometrial tissue. An X-ray plate of the bony pelvis was normal. Urinary 17-ketosteroids measured 6.3 mg. 24 hours. The material obtained by digitally massaging the structures in front of the rectum showed the presence of flattened cells with high glycogen content resembling vaginal epithelial cells. A biopsy of the left testis revealed very poor spermatogenesis. Biopsy of the skin and study of the red blood cells showed predominance of female genes.

An exploratory laparotomy performed on 12-8-1955 showed (Fig. 4) a right sided ovary with a pedicle of ovarian vessels, a right Fallopian tube, a right round ligament, a uterus with a small cervix and a very narrow vagina opening into the posterior urethra; there was no evidence of prostatic tissue (Fig. 3).

As the patient had been brought up as a male and as he had a functioning (though poorly) left testis, panhysterectomy was performed. The postoperative recovery of the patient was uneventful. On the following day there was marked reduction in the turgescence of the breasts. There was no more bleeding per urethra, and while he was in the ward the patient had one erection with the passage of about one c.c. of fluid, an examination of which failed to reveal spermatozoa.

Discussion

Somewhere in the no-man's land between endocrinology, morphology and genetics lie the hermaphroditic anomalies. Mythologically the origin of hermaphroditism is



Figs. 1 & 2.

Fig. 3.

* K.E.M. Hospital, Bombay.

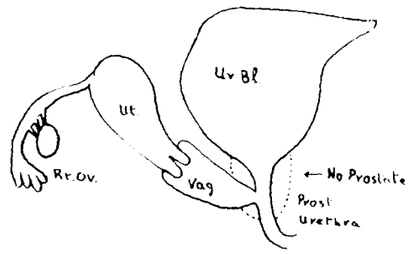


Fig. 4.

traced to a celestial union of Aphrodite and Hermes who brought forth a child endowed with the attributes of both father and mother.

The true hermaphrodite is defined as the patient with both ovarian and testicular tissue, gonads of both sexes. Pseudohermaphroditism, on the other hand, is a different disorder and may be found either in the male or female.

Incidence :

The incidence of hermaphroditism and pseudohermaphroditism is rare. Neugebauer found 50 cases in 52,000 patients. One definitely proved case in 20,523 autopsies was reported from the University of Minnesota (quoted by Daro[2] et al). At the K.E.M. Hospital there have been during the last five years (1952-1956) a total of 1,06,141 indoor admissions; amongst these there were only two cases of true hermaphroditism and one of pseudohermaphroditism.

In a recent account by Schwiebinger and Hodges (1955)[7] it is stated that fifty-six authenticated cases of hermaphroditism have been published, of which sixteen have been of the lateral variety. Our case adds a further one to this series and is the fifty-seventh of true hermaphroditism, and the seventeenth of the lateral or alternating variety.

Aetiology :

It is generally felt that hermaphroditism represents a hormonal disturbance in the developing embryo, most likely at the 13-15 mm. stage, when gonadal differentiation takes place. Cawadias (quoted by Schwiebinger and Hodges[7]), on the other hand, feels that this form of intersexuality as an entity is non-existent. He states that in nearly all cases of true hermaphroditism one or the other of the gonadal structures is rudimentary and that, further, all men show female glandular cells and all women have rudimentary testicular tissue.

The aetiology of hermaphroditism in general is not sufficiently well known. Two points, however, do stand out clearly. First, regardless of whether or not hormones participate in normal foetal sex differentiation, it is certain that some types of hermaphroditism are caused by hormonal dysfunction during foetal life. The second well-established fact in aetiology is the genetic basis of many cases of hermaphroditism of all types, as shown by their familial incidence.

Unfortunately, the relative influence of any single factor in a particular case is all too often in doubt, great confusion still exists as to the role of the 'sex' hormones, of the organizers and of the genes. Not only is the nature of the abnormalities not understood but in many cases one is ignorant of the true sex of the child. Two main factors enter into the problem, a genetic and primary factor, and a secondary hormonal influence.

Classification :

Young divided his patients into three groups depending on the status of the gonads : true hermaphrodites, male pseudohermaphrodites and female pseudohermaphrodites. Wilkins suggested a more functional classification into two groups (a) 'hormonal sex reversal' and (b) the 'intersexes'. Creevy grouped his hermaphrodites into bilateral, unilateral and mixed.

The classification of Hmman, however, appears to be very suitable on account of its simplicity. He divides hermaphrodites into —

(a) bilateral : with a testis and ovary on either side, either separate or united (ovotestis).

(b) unilateral : with testis and ovary either separate or united on one side ; with either testis or ovary on the other.

(c) lateral or alternating : with testis on one side and ovary on the other.

Manifestations :

The libido and emotions of the hermaphrodite are conditioned by the manner of upbringing of the individual (Young). In many cases there is an inguinal hernia associated with the genital abnormality. The phallus is always enlarged, and frequently there is some degree of hypospadias. In most cases the breasts enlarge at puberty and tend towards the female type. On the other hand, the voice generally deepens at puberty despite these feminine traits.

Of the internal organs of generation the uterus and vagina are present in all cases but frequently show abnormalities. When these organs are normal in form they are always hypoplastic, as in our case. The onset of menstruation is delayed, but its rhythm and duration are often normal.

Records of the male internal organs do not appear to be so complete. The presence of the prostate is described in a few cases but it is uncommon. The presence of seminal vesicles does not appear to have been recorded. The vasa deferentia are variously developed.

Diagnosis :

The clinical diagnosis of a case of hermaphroditism can only be confirmed by histological evidence of the co-existence of ovarian and testicular tissue.

Laboratory studies of androgen and oestrogen excretion have so far revealed no significant abnormalities (Schwiebinger and Hodges[7]). However, Fischer, Lischer and Byars (1952)[3] attach importance to hormonal studies ; they state that in a true hermaphrodite there is no excessive secretion of urinary steroids or any other sex hormones, no precocious sexual development, but the urine and blood oestrogen, androgen and 17-ketosteroids are always low. In the case presented the urinary 17-ketosteroid output was 6.3 mg. 24 hours, the normal being 6.4-13 mg. 24 hours.

The nature of the sex chromosomes in an individual may be detected by examining the epidermal nuclei in a small biopsy of skin. The skin biopsy of the present case showed predominance of female genes. Although the application of skin biopsy technique to hermaphrodites is in a preliminary stage, it appears that chromosomal sex is as clear in somatic cell nuclei of hermaphrodites as it is in normal individuals [Moore, Graham, and Barr (1953)[5]].

Exact diagnosis in a case of hermaphroditism may be made by (i) examination of both gonads microscopically and (ii) laporotomy to determine the presence or absence of necessary reproductive organs.

SUMMARY

A case of true hermaphroditism is presented along with a discussion of the aetiology, classification, manifestations and diagnosis of hermaphroditism.

ACKNOWLEDGEMENTS

We are thankful to Dr. S. G. Vengsarkar, Dean K.E.M. Hospital for permission to publish this case.

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A CASE OF CHOLEDOCHUS CYST

by SANGHAM LAL and M. S. RAMAKRISHNAN, Madras.

Congenital cystic dilatation of the common bile duct is a rare anomaly. The number of cases so far reported in the literature is in the region of 200 to 250 (Gross 1953). There has been only one recorded case of this anomaly reported in the Indian Journal of Surgery in the year 1944 by Misra and Singh from Agra. We recently came across a child suffering from this anomaly under our care and the patient was treated successfully.

Cases of this type have been periodically reported but the analysis of 175 cases by Shallow et al in 1943 constitutes the single large series studied. A good number of cases (25%) have been reported on by Japanese authors. An index of incidence can be drawn from the fact that in 1926 Judd and Greene reported that they met with one such case in the course of 17381 operations. Swartely et al found a similar cyst in the left hepatic duct which was draining the left lobe of the liver, there being another unaffected duct which was probably draining the right half of the liver.

The incidence of the disease, as reported by Shallow et al, was common in females (77%) and common in children and young adults (below 25 years) 76%. The origin of these cysts has been attributed to many causative factors. They may be detailed as follows:—

(1) Congenital origin due to malformation of the choledochus.

(2) Cyst caused by abnormal course of the common duct or an angular insertion into duodenum. This tends to cause kinking and obstruction which aggravates the dilatation.

(3) Cyst is the result of narrowing of the intraduodenal portion of the duct or due to stenosis caused by infection or sometimes by presence of valves in the intraduodenal portion.

(4) Cyst caused by congenital weakness of the wall of the duct.

(5) Congenital cystic dilatation modified by factors like infection, spasm, valve formation, etc.

(6) Achalasia of the sphincter of Oddi, the result being a megalocholedochus.

(7) Weakness of the duct wall due to rests of pancreatic tissue.

(8) Cyst springing from abortive diverticulum.

(9) Cyst springing from accessory gall bladder formations.

(10) Cyst may follow trauma.

(11) Cyst caused by tuberculous mesenteric lymphadenitis.

(12) Obstruction due to persistence of foetal physiological epithelial occlusion, or

(13) inequality of proliferation of the epithelial cells at the stage when primitive choledochus is still solid (stage of physiologic epithelial occlusion). If there is more energetic proliferation of the upper segment and less proliferation below, when recanalisation occurs, the upper part of the duct will be abnormally wide and lower part relatively narrow.

Aetiologically there are two types of factors which operate. One set of factors is obstructive in nature which is either inflammatory or congenital and the other set postulates a congenital weakness of the duct wall. It is quite probable, as Gross concludes that both factors operate in any given case. It is significant that out of Walton's 5 cases, one was an infant 1 month

old. This suggests the possibility of a congenital cause.

The pathological changes are well known. The dilatation (cyst formation) may extend upto and sometimes include the junction of the cystic duct with the common hepatic duct or sometimes still proximally to involve the common hepatic ducts. In this case the dilatation had not involved the cystic duct. Distally in some cases the opening of the common duct into the duodenum could be probed and usually found patent but unfortunately we could not demonstrate this in our case. The cyst wall itself is usually thick, fibrotic and crisscross striations are seen, but occasionally in places cubical or cylindrical epithelial lining may be present. The gall bladder is usually dilated and seat of chronic inflammation. Liver shows cirrhotic changes, and cholangitis may be present.

The cyst usually contains bile. The quantity of bile contained in the cyst is known to vary between 30 cc. to 5200 cc. In our patient, there was about 2500 cc. of fluid present. Depending upon the completeness of obstruction and the concentrating power of the gall bladder, the fluid is pale and watery or thick and greenish. The fluid is usually sterile but on occasions strepto. staphylo and typhoid and paratyphoid groups of organisms are known to be present. Our patient had a fluid which was sterile for ordinary organisms, but unfortunately no culture for Salmonella group was done.

In Shallow's 175 cases, it has been found that tumour was palpable in 77% of cases. Jaundice in 70% and pain in 59% of cases. These three mark the usual triad of symptoms. But as Gross points out any two of these may be present basically and the third may be completely absent or present intermittently. In our patient, tumour and pain were the predominant features. The occurrence of jaundice which lasted only for a few days made us aware of the possibility of the cyst being choledochal in origin. Pain is usually due to increase of pressure within the biliary system. The other features are vomiting, fever (due to cholangitis or hepatitis). In spite of these well recognised features, the diagnosis is made correctly only in some instances. Very often the lack of awareness of the condition makes one miss the diagnosis.

Various methods of treatment have been suggested and tried. Aspiration, drainage (marsupialisation) and attempts at total excision have all failed because of the prohibitive mortality (90-95%). Preliminary drainage followed by anastamosis of some portion of the biliary system (gall bladder to the gastro-intestinal tract also carries a heavy mortality of about 50%). Primary anastamosis of the cyst to the duodenum has been found to carry the lowest mortality figure. The first successful choledochoduodenostomy was done by Baker in 1906. We carried out this procedure on our patient. This treatment is open to the objection in that ascending cholangitis due to regurgitation of duodenal contents into the cyst may occur and still cause death, months after operation. But this has not been found to be usual and a good number of cases where patients have lived in comfort for years after the operation have been reported on.

To combat the possibility of ascending infection Henry Archambault and others have practised a method of Roux Y anastamosis. The jejunum is usually divided 30-50 cms. distal from the ligament of Trietz and distal portion anastamosed to the cyst and end to side jejuno-jejunostomy done another 30 cms. downwards. They opine that with this procedure regurgitation and ascending cholangitis are uncommon. This method has been originally advocated by Japanese authors - Tsujimara, Kamte and others.

The complications of a choledochus cyst are many. Untreated, all these patients die of cholangitis and hepatitis. Blocker and others report a case of rupture of a choledochus cyst following a fall in a 14-year old boy. The cyst may be the seat of calculi formation (Kuby 1948). Mewhirter

reports a co-existant destruction of acini and islands of Langerhans in the pancreas as a result of congenital obstruction of pancreatic ducts. Irwin and Morrison report on a case of a choledochus cyst complicated by stones and sessile patches of growth, which on examination proved to be squamous carcinoma. Cyst itself is liable to get infected. Our patient had post-operative pyrexia and 1 in 400 positive Titre for bacillus typhosum, which responded to choloramphenicol therapy. The source of infection remains largely a matter of speculation.

The case report is appended below :

CASE REPORT

Child R. aged 5 years, Hindu, female was admitted on 5-12-1956 with a complaint of distension of abdomen present for the past 2 years which had become worse for the past 2 months. irregular fever on and off and loss of appetite. The child was the first of four children, the other three children being normal. There was no history of jaundice at any time. Bowels and micturition normal.

The patient was fairly nourished, not cyanotic, anaemic with sallow complexion. There was no lymphadenopathy or any other abnormal finding.

On examination of the abdomen, a mass about 8" x 6" was palpable in the right hypochondrium, lumbar, umbilical and iliac regions. It crossed over about 2" to the left of the midline. The mass was well defined, moving with respiration, and not bimanually palpable. The consistency was tensely cystic and was dull on percussion. There was no fluid in the abdomen. There was no other positive finding in the abdomen. The mass was not palpable per rectum.

The patient was running a low and irregular fever.

Investigations :

1. Urine — high coloured — 1020 ; No sugar, no albumin ; no deposits.
2. Hb — 7 gms%.
3. Total — White blood count 9600 /cmm ; D.C. P. 63 ; L. 33 ; M. 4.
4. Casoni's test — negative.
5. Mantoux — negative.
6. Motion examination — well formed — slightly pale — ankylostoma duodenale ova seen — no cysts.
7. Serum proteins — 5.98%.
   Albumin 2.74 gms.%
   Globulin 3.14 gms%.
8. Thymol turbidity — 8.9 units.
9. Alkaline phosphatase — 49.8 units.

X-ray chest — normal. Right dome of diaphragm was seen at a higher level.

X-ray abdomen — soft tissue mass seen pushing the intestinal gas shadows to the opposite side. No calcification — no other abnormalities.

During the course of observation the following findings were noticed : The child had developed a mild icterus tinge which lasted for 3-4 days. Urine examination then revealed presence of bile salts and bile pigments. The vandenberg reaction was biphasic and the icterus index was 10 units. Also the child complained of pain over right hypochondrium lasting for varying periods. Size of tumour seemed to vary on different days during observation.

Intravenous Pyelogram : Both kidneys visualised and secreting. The right kidney was seen at a slightly higher level than the left and also rotated inwards. No evidence of hydronephrosis or distortion of the pelvis.

A provisional diagnosis of Choledochus cyst was made with the other possibilities like retroperitoneal or mesenteric cysts kept in mind as alternate diagnoses.

The patient was prepared for surgery. The general condition was improved by giving blood transfusions, etc.

Under general anaesthesia, right paramedian laparotomy was done. There was a big cyst of the size of unhusked cocoanut occupying the

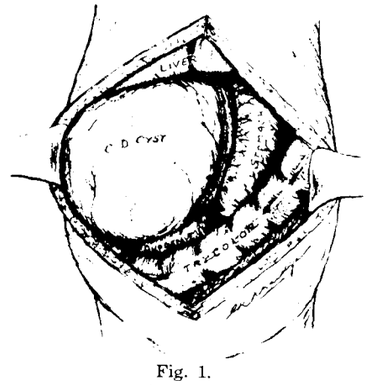

Fig. 1.
Diagram showing the position of the cyst and relationship to neighbouring structures.

Fig. 2.

Photograph taken on the operation table showing the anastamosis between the cyst and duodenum. A loop of tape can be seen above the cyst. This holds the cystic duct joining the common hepatic duct.

Fig. 3.

Photograph at operation showing the anastamosis between the cyst and the duodenum.

right half of the abdomen. The transverse colon was pushed down and the duodenum was stretched over the inferior aspect of the cyst (Fig. 1). The cyst was aspirated and the aspirated material was greenish, resembling bile. About 80 ozs. of this fluid was aspirated. The cyst was opened into. The wall was thick, fibrous and the lining was irregular with criss cross fibres. Further exploration revealed that the G.B. was separate and showed evidence of chronic inflammation. The cystic duct could be traced to its junctions with C.H.D. (Fig. 2) and the common bile duct itself was seen crossing in a curved manner first on the superomedial aspect of the cyst and was anteromedial over the cyst below. The cyst was arising from the wall of the common bile duct. The opening of C.B.D. into the duodenum was not made out. The liver was congested, cirrhotic. Liver biopsy was done. An anastamosis between the cyst and the duodenum was performed with two layers of suture (Fig. 3). The peritoneal cavity was mopped up and the abdomen closed in layers.

Bile from the cyst sent for culture — negative for ordinary organisms.

Biochemical analysis — Bile salts and pigments detected.

The post-operative course was marked by a persistent and irregular pyrexia reaching upto 103° which failed to respond to usual therapy. A complete investigation was done. Blood gave a positive agglutination for B. Typhosum in 1 in 50 dilutions and paratyphosum positive in 1 in 25. Urine and motion negative for culture of B. typhosum. Patient was started on Chloromphenicol therapy and the temperature responded. There was a localised infection in the abdominal wall which responded to ordinary methods of treatment.

The child was discharged and the follow up at the end of 3 months revealed that the child was normal and well.

Summary

1. Literature on the subject of Choledochus cyst is reviewed.

2. A report on a patient suffering from a congenital dilatation of the common bile duct (choledochus cyst) is presented.

3. The patient was treated successfully by primary anastamosis of the cyst to the duodenum.

Acknowledgements

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

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A CASE OF STRANGULATION OF THE AFFERENT LOOP FOLLOWING ANTECOLIC PARTIAL GASTRECTOMY

by N. H. ANTIA, Poona.

Any foramen in the abdomen is a potential source of internal strangulation. It is usually the small bowel, and less frequently the omentum which having entered the hiatus, proceeds to strangulation. Congenital foramina, e.g. Foramen of Winslow and Foramen of Waldeyer are well recognised though rare causes of internal strangulation. Foramina produced inadvertantly by abdominal operation due to the formation of adhesions are also well known causes of this trouble. In certain operations openings are formed through which small gut may enter and strangulate. The opening lateral to an iliac colostomy or an ileostomy are well known causes of this complication. A less known, though probably as frequent a cause, of post operative internal strangulation is the large opening formed during the operation of an antecolic partial gastrectomy as shown in Fig. 1.

The first case of this complication following partial gastrectomy was recorded by Professor Stammers in 1951. Since then he has recorded 15 further cases. In the majority of recorded cases, the efferent loop has been strangulated but afferent loop obstruction is also recorded though it is noted that a long loop had been employed. A further case is recorded here.

CASE REPORT

The patient was a young man aged 26 years with a chronic duodenal ulcer producing pyloric stenosis. Partial gastrectomy was performed with antecolic Polya - Hofmeister type of anastomosis performed with the loop going from right to left side. A short afferent loop was used. The author normally uses an afferent loop of about 9 inches but an even shorter loop of 7 inches was employed in this case. The patient made a very satisfactory recovery following the operation having been up and out of bed the day following operation and taking soup, jellies and fluids. On the third morning following the operation he felt pain

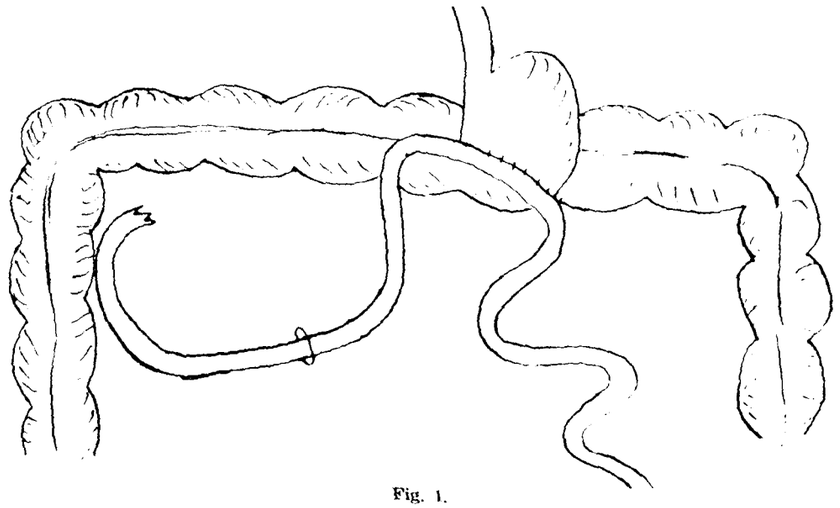

Fig. 1.

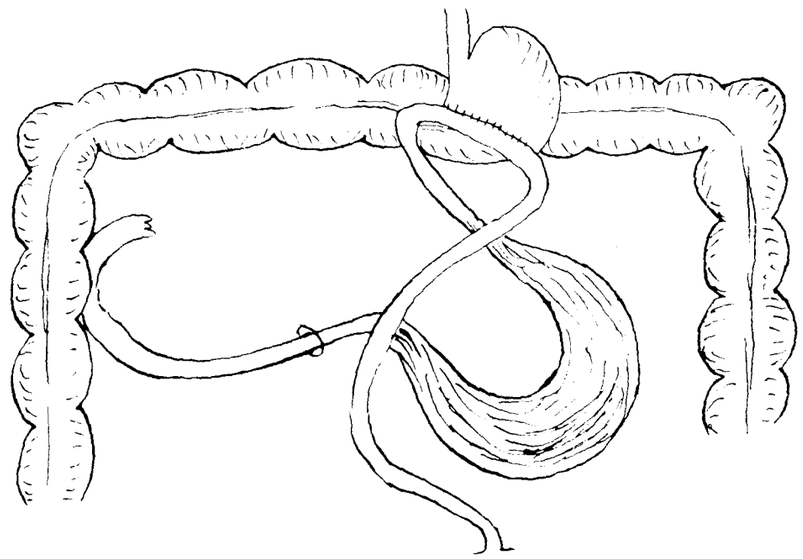

Fig. 2.

in the left hypochondrium sufficient to restrict him to bed. There was tenderness in the left hypochondrium where a round tender lump could be felt. The symptoms were much worse in the evening with severe pain. The lump was also larger. There was no vomiting and aspiration of the stomach revealed it to be empty. Diagnosis of intracapsular rupture of the spleen due to trauma at operation was made. The wound was reopened and abdomen explored revealing a state of affairs shown in Fig. 2. The short afferent loop had passed through the opening from right to left and strangulated. A closed loop obstruction was present affecting the entire afferent loop from the D. J. flexure to the stoma. On undoing the twist, fluid gushed into the stomach and had to be aspirated. As the gut was viable the opening was closed by a few sutures which anchored the afferent loop to the transverse colon and the wound was closed. He made an uninterrupted recovery and was discharged home on the tenth day following the first operation.

A few points emerge on reviewing the case.

(1) Internal strangulation through the opening between afferent loop and stoma must be borne in mind in all cases of acute upper abdominal pain following partial gastrectomy.

(2) If the afferent loop is involved, a closed loop obstruction results with no vomiting.

(3) A tender lump may be palpable in the left hypochondrium which may be mistaken for a rupture of the spleen.

(4) A short afferent loop is no guarantee against this complication.

(5) Early exploration is encumbent with these symptoms, for if the whole afferent loop should become gangerous a very major operation would be required to repair the gap, probably using an isolated segment of jejunum to replace the gangrenous segment.

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ORTHOPAEDIC SECTION

INCIDENCE OF PROLAPSED LUMBAR INTERVERTEBRAL DISC AND ITS SURGICAL TREATMENT

by KARAM SINGH GREWAL and PARAMJIT SINGH GREWAL

We have endeavoured to be critical and have tried to give the present status of surgery in the treatment of prolapse of the intervertebral disc in the lower lumbar spine. We have excluded from the present study the prolapse of the lower cervical disc firstly because the cervical disc is itself a subject and secondly because we have a very limited experience with the surgery of the prolapsed disc in the lower cervical region.

There has been a tremendous storm of enthusiasm over the problem of disc prolapse during the past two decades or so. It is luckily subsiding now and you can see the clear sky. We thought it opportune to review our views about the status of surgery in the treatment of prolapse of the disc. The questions to be answered are :

(1) Are all cases of sciatica due to prolapsed disc ?

(2) If not, what proportion have prolapse ?

(3) What are the other causes of sciatica ?

(4) What type of surgery is indicated in individual circumstances ?

After the monumental paper of Mixter and Barr in 1934 who discussed in detail the etiology, pathology and treatment of sciatica, a wave of enthusiasm overtook the profession and a large number of discs have since been removed under the assumption that a final cure of the disease had been found. The dream, however, remains unfulfilled and quite a good number of cases have obscure etiology and hence are not amenable to surgery, and moreover, even in operated cases the results are not cent per cent satisfactory. This matter of affairs leaves us much to ponder over and stir our consciousness to more research in the diagnosis and treatment of sciatica.

We have had from February 1949 to February 1956 during a period of 7 years 4432 cases complaining of pain in the spine.

TABLE I

Percentage of [illegible] (Feb. 1949 to Feb. 1956)

Complaint	No. of [illegible]	Percentage
Pain in back (all regions)	4432	[illegible]
Pain in low back	1117	25.4

Out of the number 1117 [illegible] complained of low backache [illegible] without sciatica. The following table shows the various conditions producing back pain

TABLE II

Causes of pain in [illegible] (Feb. 1949 to Feb. 1956)

S. No.	Name of Disease	No. of cases	Percentage
1.	Mechanical derangement (P.I.V.D., Prespondylolisthesis, Spondylolisthesis, Sacralisation and L.S. Strain)	211[illegible]	47.7
2.	Tuberculosis	87[illegible]	19.7
3.	Degenerative condition (Osteoarthritis, Senile Osteoporosis)	630	14.2
4.	Traumatic Condition (Fracture and Dislocation)	25[illegible]	[illegible]
5.	Toxic Conditions (Fibrositis, Fibromyositis)	183	4.1
6.	Spondylitis ankylopoetica	154	3.5
7.	Scoliosis Idiopathic 71 Poliotic 2	73	
8.	Other congenital Anomalies (Hemivertebra, Spinabifida, Klippels Feil Disease)	12	
9.	Adolescent Kyphosis	41	
10.	Tumours—Primary [illegible] Secondary 26	3[illegible]	[illegible]
11.	Metabolic Disorder (Osteomalacia, Rickets)	30	
12.	Osteochondrodystrophy	[illegible]	
13.	Other Infection (Brucellosis, Typhoid)	[illegible]	
	Total	4432	100

Further it will be shown from the next table that out of 1117 cases 835 (74.7%) had symptoms of sciatica in addition to the low backache.

TABLE III

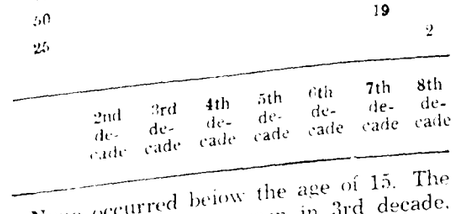
Percentage of cases of low backache with sciatica

Complaint	No. of cases	Percentage
Low backache with sciatica	835	74.7
Low backache without sciatica	282	25.3
Total	1117	100

Out of 835 cases of low backache and sciatica all cases occurred between ages 15—80th year. The comparative incidence is shown in Table IV.

TABLE IV

Age Incidence of low backache with sciatica



None occurred below the age of 15. The highest incidence was seen in 3rd decade, next came 4th decade and then 5th decade. 3rd, 4th and 5th decades showed the maximum incidence of 692 out of 835. That shows that this disease occurs during the age period when the person is most active for earning one's livelihood. 644 cases occurred in males and 191 in females.

TABLE V

Sex incidence of low backache with sciatica

Sex	No. of Cases	Percentage
Male	644	77.2
Female	191	22.8
Total	835	100

Sedentary habit cases predominated.

TABLE VI

Incidence of low backache with sciatica in different occupations

Occupation	No. of cases	Percentage
A. Sedentary		
i. Shopkeepers ii. Clerks iii. House-wives	561	65.9
B. Hard and active		
i. Farmers ii. Labourers iii. Policemen iv. Students	274	34.1
Total	835	100

It is interesting to note that sciatica occasionally was complained of in some very obvious diseases in the lumbo-sacral or sacroiliac region, e.g. Tuberculosis of the spine, Neurofibroma of L_5 nerve root, Osteo-arthritis of lumbar spine, Pregnant uterus, Spondylolisthesis, Spondylitis ankylopoetica, Secondary tumours of the spine, etc. (Grewal, 1950). These cases though few, yet go to prove that the sciatic pain occasionally may be due to causes other than prolapse of a disc in the lower lumbar

spine. In prolapse of a disc the nerve roots generally involved are the L_4, L_5, and S_1. Rarely the L_3 may also be involved in a higher prolapse. But S_2 and S_3 almost always escape except when there is a massive central prolapse when it may press on these nerve roots also. They escape because they are centrally situated and pass out from sacral foramina where there are no mobile joints.

Some cases gave a highly suggestive history of a disc prolapse. 66 out of 835 (7.9%) cases gave a history of sudden onset after a trauma in which the logical deduction is that they were due to some mechanical cause. In such cases the nerve root could be affected either by a haemetoma or by a prolapse of the intervertebral disc. The latter is more probable as the history is so sudden that except for an instantaneous pressure of some semisolid mass the sdmptoms could not be explained. Moreover we have operated on 23 cases with history of sudden onset and found typically prolapsed discs in all. The rest of the cases gave history of slow onset. 54 out of the operated cases also gave no history of sudden trauma but gave history of slow onset. Day to day twists and turns were probably the cause of prolapse in them. Our thesis is that if there is either an inherent weakness of the annulus fibrosus posteriorly or there is an excessive liquefaction of the nucleus pulposus congenitally or due to degeneration, and on the top of all this there are persistent stresses and strains of movements and of body weight, a prolapse can easily occur. The condition may be likened to an inguinal hernia. There is a pre-existent sac and any time during adulthood prolapse may occur into it. Just as hernia is reducible, a disc may also reduce and reprolapse giving rise to repeated attacks of sciatica. These cases therefore can only be explained on mechanical derangements of some nature every time. To our mind a prolapse is the only major possibility. This is further supported by the fact that out of 26 cases of recurrent attacks of sciatica a typical prolapse was found during operation in 24 cases.

Out of 77 operated cases, 71 had an obvious syndrome which could only be explained in terms of compression of a nerve root. Either the complete syndrome (scoliosis, stiff spine, positive Lasegue test, sluggish or absent ankle and knee jerks and dulling of sensation) was there or the syndrome was partially present. Now even partial syndrome could also be explained by pressure. Therefore we can say that 71 cases at least with neurological syndrome were due to prolapse of I.V. disc in the operated series.

27 of operated cases were having some radiological characteristic of a prolapsed disc. Three positive radiological signs have been thought to be due to prolapse.

(1) Localised narrowing of intervertebral space and localised lipping of the margins of the adjacent vertebral bodies.

(2) Straightening of lumbar lordosis especially in the first attack.

(3) Retrolisthesis of a vertebra over the one below.

27 cases with localised narrowing of disc space were operated and in all of them a prolapse was found. Though retrolisthesis is put forth as a confirmatory sign, yet this is not infallible. When you examine normal skiagrams retrolisthesis can be said to be present in many. Moreover it requires a perfect technique of lateral skiagraphy to interpret this sign correctly. We have investigated skiagrams of 356 cases for the present study and find that 177 cases had no abnormality. In 98 cases there was diminution of disc space with or without localised osteoarthritis, minimal osteoarthritis of lumbar spine in 36, sacralisation of lumbar vertebrae in 31, spondylolisthesis in 10 and retrolisthesis after correct positioning only in 4. This also proves that true retrolisthesis is present in a very few cases.

TABLE VII

Radiological investigation of cases of low backache with sciatica

Total number of cases investigated		356
FINDINGS		
1. No abnormality		177
2. Diminution of disc space with or without localised osteo-arthritis		98
3. Generalised osteo-arthritis (Minimal)		36
4. Congenital anomaly		
Sacralisation of L V vertebra Lumbarisation of D XII vertebra		31
5. Spondylolisthesis Prespondylolisthesis		10
6. Retrolisthesis		4

It still leaves a large number of cases in whom the diagnosis remains obscure. The patient has a vague history of sciatica and low backache. The neurological syndrome is almost absent as was the case in 514 out of our 835 cases in this series. Radiology is negative. The patient suffers from a chronic pain but objectively very little is found. These are the cases in which we have to be very careful in diagnosis and the line of treatment. Neurosis must be excluded. We, however, believe that one should exclude all physical causes before calling a patient psychic. Many theories have been advanced for these cases and many types of discs have been described by Dandy, Begg and Falconer, etc. to explain these less obvious cases of sciatica. Though very little can be said in favour of toxic or infective causes, yet one should be clear that these cases are not all due to prolapsed I.V. discs. Therefore other causes must be sought for in such cases.

In our series of operated cases two had vague signs and symptoms and in them no prolapse could be demonstrated but there were adhesions round the nerve roots. Operative results were unsatisfactory. Both were reoperated and recovered after arthrodesis of their lumbo-sacral spine. More than that is not possible to say at present.

Having gone over the probable causes of sciatica and having reviewed our impressions, let us now discuss as to the indications of surgery in the cases of sciatica with results.

To compare let us take :—

(1) A series of cases treated conservatively ; and

(2) Cases in which discriminatory surgery has been performed.

Discriminatory Surgery.

All cases of suspected intervertebral disc should ordinarily undergo 12 weeks of conservative treatment in the form of comparative rest on a hard bed and a spinal jacket either of plaster of Paris or steel.

But there are certain criteria which may impel one to operate without first trying the conservative treatment. For example :

(i) The patient has suffered long enough and is absolutely fed up. Arbitrarily one year's suffering should necessitate surgical intervention.

(ii) The patient is having recurrent attacks of lumbago and sciatica of ever increasing intensity which incapacitate him for more than four weeks at a time.

(iii) Acute attack of sciatica which does not subside or regress in 15 days time.

(iv) Positive neurological syndrome when complete also is an indication of surgery because it means that there is a constant pressure on the root which is likely to lead to permanent damage of the involved nerve root.

(v) Positive radiological findings coupled with low backache and sciatica should also be considered an indication of surgery as this sign means a permanent effect on the spinal column and is likely to in-

capacitate the patient if timely surgical intervention is not made.

What type of surgery is indicated ?

The one rationale of definite surgery is removal of the prolapsed disc material. This removal, however, takes away the cushioning effect from in between the vertebral bodies and may leave uneven surfaces in contact with each other. It deals effectively with sciatica but may leave behind low backache. Luckily low backache is also cured in quite a good proportion of the cases. In cases of failure arthrodesis of lumbo-sacral spine may be done.

The other equally rational type of surgery would be to remove the prolapsed disc and arthrodese the involved spine at the same time. This combined operation is popular in U.S.A. and in some clinics on the Continent. To evaluate the comparative results of these two types of surgery, a Research Committee of the American Orthopaedic Association was formed and they reported their findings in October 1952 ; their conclusions in a five-year follow-up are : —

(1) The number of cases who got satisfactory results in disc removal alone was 153 out of 256 i.e. 59.8%.

(2) The number of cases who got satisfactory results with combined operation was 82 out of 118 i.e. 69.5%.

Though according to their findings combined operation improves the results in 10% more cases, yet we must know that the combined operation prolongs the operation period unduly, carries a certain amount of risk and prolongs the convalescent period manifold. Therefore it is not economical or even wise to encourage the adoption of combined operation as a routine.

The mortality of comparatively simple disc excision operation is negligible — nil in our series. Barr (1951) reported a mortality rate of 0.6% and all these fatalities occurred in the combined operation. The convalescent period is considerably prolonged with the combined operation. In our spinal arthrodesis cases the average lying in period in a plaster bed has been 12 weeks — 58 days in the Committee's series — compared to 15 days in simple excision operations in both series. Therefore we conclude that the proper thing to do at present is to be content with simple excision operation when indicated and reserve the arthrodesis for cases who do not improve with simple excision alone.

Results of simple excision of the disc :

Before we relate the results of our operated cases, let us consider briefly the operation itself.

As is the custom with most surgeons we also did not do myelography or discography as a routine. Both these procedures are not without risks. Myelography has been done only in four cases in our series just as an experimental measure. It has been of help when positive ; but in clear cut cases it is a waste of drug, energy and if the pantopaque is not removed it is likely to produce arachnoiditis and neuritis.

Discography requires an elaborate technique of inserting the needle in the disc space under flouroscopic control. The needle may initiate a new prolapse which was not already there, and lastly its interpretation is also not easy.

In cases of sciatica we along with so many others, believe that the prolapse occurs only in one of the lower two interspaces. In our series of 77 operated cases only one case had a prolapse between L_3 and L_4 and that too had a different history. She had a sudden attack of paralysis on lifting a bucket of water accompanied by sciatica like pain. X-ray showed localised narrowing between L_3 and L_4 and lipping of adjacent vertebral bodies anteriorly.

In the rest, 31 cases had prolapse between L_4 and L_5 and 10 had prolapse between L_5 and S_1. As the prolapse is situated at either of these last sites we always explore these two disc spaces and the prolapse is found at one place or the other. Five cases in our series had multiple prolapses, however, (L_3L_4 and L_4L_5 in one and L_4L_5 with L_5S_1 in four).

Interlaminar approach is not always possible, is more difficult, through a small hole chances of damaging the nerve root are more, and lastly thorough curettage of the interspace is impossible. We, therefore, do not use this approach.

We explore the disc through a laminectomy. The laminectomy that we perform is about 2 3 of the lamina. The lamina of whole length of L_5 and lower half of L_4 are removed along with the ligamentum flavum. Care is taken not to damage the articular processes. The disc is always explored extradurally. The disc is visualised as a tense, soft yellowish white swelling situated in either of these places ; just in front of the invoived nerve root (Fig. 1) or occasionally in the angle between the nerve root and the dural tube (Fig. 2). In some cases a large piece of disc material may lie free in the canal (Fig. 3) or in some prolapse may lie laterally (Fig. 4). In majority of cases though annulus fibrosis was thinned out, yet it was intact. A crucial incision over the prolapse and curettage of the disc space by means of Boyd scoop is all that is required. The cutting edge of the scoop should however always be kept away from the dura. We have occasionally inadvertently injured the dura but no harm has occurred. No occasion has arisen to sew this small rent.

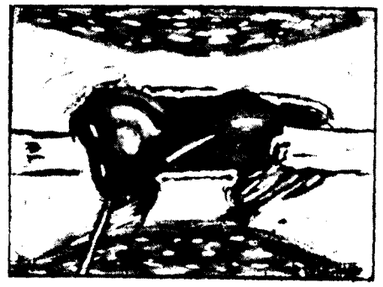


Fig. 1.
The nerve root is passing on the surface of the prolapsed disc.

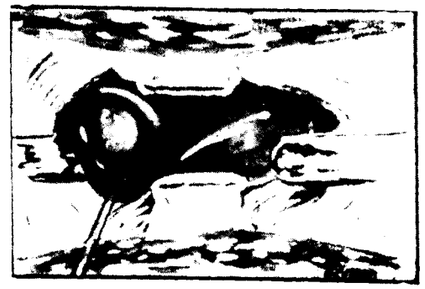


Fig. 2.
The prolapse lies in the angle between the nerve root and dural tube which has been retracted downwards.

Fig. 3.
Small pieces of prolapsed disc are seen lying free in the spinal canal.

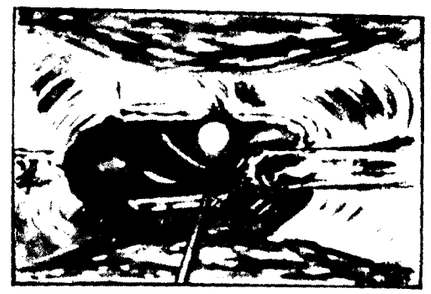


Fig. 4.
The prolapse is seen lateral to the nerve root.

Some points on lessening the bleeding are considered.

There are two stages in which bleeding is excessive: (i) When muscle mass is being separated from the spines and laminae and (ii) When disc is being defined. The operations in our series were mostly done under spinal anaesthesia. Hypotensive technique was applied in some. But the best method of minimising the bleeding from the muscle mass is by infiltrating 50-100 c.c. of normal saline into the sacrospinalis muscle mass. Adrenalin 1 in 600,000 may be added to some advantage. To avoid bleeding inside the vertebral canal the seeker should be kept next to the dura and adjacent to the nerve root. Haphazard movements of the seeker produce rupture of the vertebral veins and cause troublesome haemorrhage. Pressure by means of cotton pledgets helps to stop venous oozing. But the use of sucker is more than useless as it may further increase bleeding.

Various authors have reported results of medical and conservative treatment of sciatica. Yterus reported 256 cases. Naturally they were not all cases of prolapsed disc. 47% of the patients became symptom-free after 12 weeks' conservative treatment. On the whole 71% had satisfactory results on 2-8 years follow up.

Colonna studied rather carefully his cases which were proved cases of prolapsed disc both clinically and on myelography. 29% only of conservatively treated cases became symptom-free. In Colonna's series of operated cases 60% became symptom-free. Dunning had 36% satisfactory results with conservative treatment from a mixed series.

What therefore do we expect from conservative treatment alone? About 30% will get cured. Another 30% will get relief from sciatica and will complain of some low backache but will be able to work 6-8 hours a day. 40% will have unsatisfactory results, out of which 20% or so will have some relief whereas the other 20% will have no relief whatever. Now we think of no other method of dealing with these 40% unsatisfactory result cases than to operate on them. We almost as a routine operate after a failure of 3 months conservative treatment. That means that with a successful operation whatever number we cure means an addition to the total number of cures. From our operative results we find that 65 S% became absolutely symptom-free. Therefore if we take 40 cases out of 100 who have had no relief from conservative treatment, out of these 40 with operative excision of the involved disc 26 (66%) get well. That will add 26 cures to 60 cures of conservative treatment making an overall relief in 86% of cases. That will leave us only with 14 cases out of 100 who will either require a supplementary operation or another exploratory operation.

56 cases have been followed for a period of six months to seven years.

TABLE VIII

Analysis of operated cases

No. of cases followed up for 6 months to seven years	56
No. of cases who did not respond to call for follow up	21
Total	77

RESULTS IN 56 FOLLOWED UP CASES

	No. of cases	Per cent
1. Complete relief of sciatica, backache	39	69.6
2. Complete relief of sciatica but slight persistent low backache	8	14.3
3. Complete relief of sciatica with persistent backache to the extent of 50% or more	2	3.6
4. 50% or more relief from signs and symptoms	4	7.1
5. Less than 50% relief from signs and symptoms	3	5.4
Total	56	100

Out of these, 39 cases i.e. 69.6% are completely free from backache and sciatica.

Slight low backache persisted in 8 cases i.e. 14.3%. In two cases more than 50% of backache persisted but even in these last 10 cases sciatica has been completely cured. In only 3 cases relief is slight and they still complain of the original symptoms.

Three cases of persistent low backache have been operated second time and cured of the backache by an arthrodesis of the spine.

In other words sciatica was cured in 87.5% of the cases. Slight backache persisted in 8 i.e. 14.3%. But the unsatisfactory results were assessed in 7 cases i.e. 12.5% only in whom either more than 50% backache persisted or in whom the overall relief was less than 50%. In other words in properly selected cases not more than ten to fifteen per cent will give unsatisfactory results.

To sum up then:

1. We have come to the conclusion that all cases of sciatica are not due to prolapsed intervertebral disc.

2. At least 40% are not due to prolapsed disc.

3. Other causes of sciatica must be excluded especially in cases in whom signs and symptoms are not definite.

4. Conservative treatment must be tried for 12 weeks in all cases of sciatica especially acute and subacute cases.

5. Surgery is indicated in the cases of failure of conservative treatment and in the presence of some obvious signs and symptoms.

6. Simple excision of the disc is indicated. The arthrodesis of the lumbo-sacral spine should be reserved for cases of failure of simple excision.

7. Arthrodesis of the lumbo-sacral spine may be done in vague symptom cases to stabilise their spines.

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EXPERIMENTAL DIAPHYSECTOMY

(A Preliminary Review)

by B. MUKOPADHAYA and M. T. MEHTA, Patna.

In clinical practice diaphysectomy is sometimes called for where it is desired to remove the whole length of an infected bone. However, the method has not gained acceptance because after the removal of the whole length of the disphysis the mechanical integrity of the limb is jeopardised. Following the removal of the whole or a major part of the length of a long bone, the periosteal tube collapses and new bone often fails to be laid down along the bed of the original shaft. It is this fear of failure of regeneration of bone following diaphysectomy that has prevented a wider use of this method in clinical practice. If only a method could be devised by which the periosteal tube is prevented from collapsing and regeneration of bone leading to the formation of a fresh shaft was possible, then the treatment of a variety of bone conditions could be considerably simplified. This is specially so in cases of severe osteomyelitis where either the whole diaphysis has sequestrated or is so severely infected throughout its course that complete elimination of infection is well nigh impossible. Such patients could be given reasonable certainty of a lasting cure if diaphysectomy became a practical possibility.

With this object in view experiments have been conducted on young growing goats to find a method by which diaphysectomy can be successfully performed without seriously interfering with the mechanical stability of the limb. A sub-periosteal resection of the whole length of the tibia has been performed from one epiphyseal growth plate to the other under

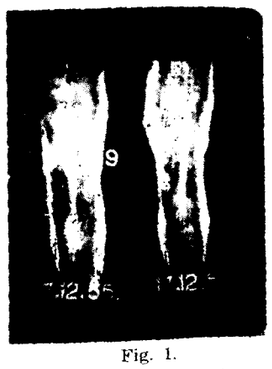

Fig. 1.

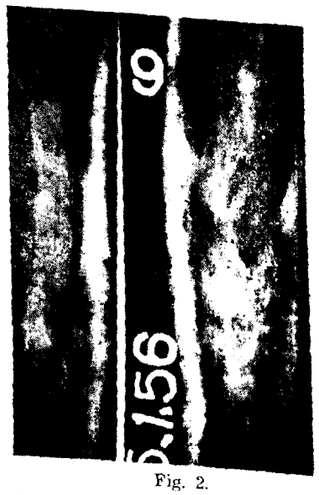

Fig. 2.

Fig. 3.

Fig. 1. Immediate post-operative X-ray showing plaster rod in place. (17-2-55)

Fig. 2. Plaster shadow not visible. New bone shadow evident. (25-1-56)

Fig. 3. No plaster shadow. Good evidence of regeneration of the shaft. (28-2-56)

Note: This work has been carried out under a Fellowship Grant from the Lady Tata Memorial Fund.

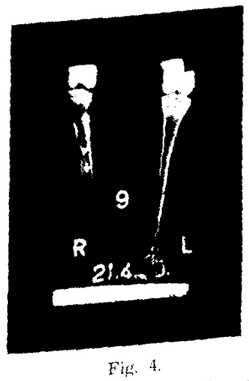

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 4. Comparative view of both limbs without plaster. Whole shaft formed anew. $\frac{3}{4}$" shortening of the operated side. Cortex and medulla not well differentiated (21-4-56)

Fig. 5. Cortex and medulla differentiated. 1" of shortening evident. (30-8-56)

Fig. 6. Immediate post-operative X-ray of other animal, showing plaster rod in place. (19-4-56)

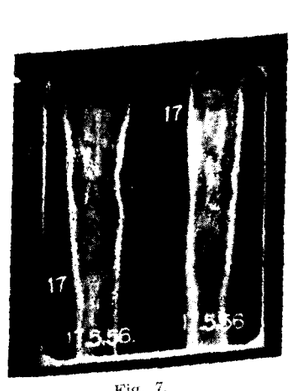

Fig. 7.

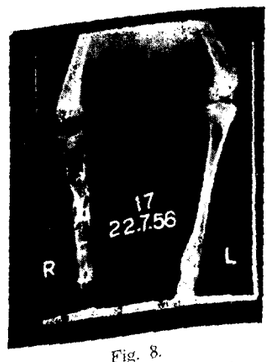

Fig. 8.

Fig. 9.

Fig. 7. Plaster shadow diminished in girth. Evidence of new bone formation throughout. (17-5-56)

Fig. 8. Comparative view of both limbs without plaster. No plaster shadow. Whole shaft reformed. No shortening. (18-6-56)

Fig. 9. Reformed shaft broader than the other side. Cortex and medulla not well differentiated. No shortening. (22-7-56)

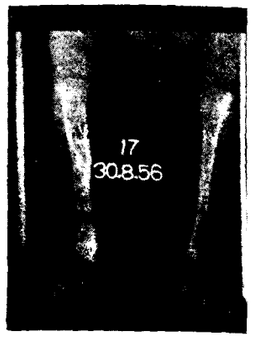

Fig. 10.
New diaphysis approaching normal. Cortex and medulla being differentiated. ¼" shortening apparent. (30-8-56)

strict aseptic precautions. The resected diaphysis has been replaced by a cylinder of plaster of paris prepared in varying sizes to suit the individual animal and sterilized prior to the operation. The length and diameter of the plaster cylinder is made almost exactly of the same measure as the resected diaphysis. The periosteal tube is carefully closed over the plaster of paris cylinder. The wound is closed and the limb completely immobilised in a outer casing of plaster.

The animals are allowed to bear weight on the limb while immobilisation is maintained inside the plaster cast. The plaster cast is maintained till X-ray examination of the limb shows that the plaster cast has been replaced by newly regenerated bone.

The progress of bone regeneration has been studied by taking X-rays of the limb at regular intervals from the time of the operation. A study of these X-rays shows that the plaster of paris cylinder is gradually absorbed and is replaced by new bone growing centripetally. The whole process of replacement of the plaster to newly formed bone takes anywhere upto 3 to 4 months from the time of the operation. The process of remodelling of the newly laid diaphysis goes on for some time after the plaster cylinder is fully replaced. During the period that bone regeneration continues, complete immobilisation of the limb has been found to be essential. Any failure to maintain rigid immobility spells disaster to the smooth process of regeneration. Ultimately, the regenerated diaphysis resembles very closely the original diaphysis. Following the regeneration of the new diaphysis, the animal is able to walk quite normally on that limb and there are no disturbance of function in the limb.

In this series of experiments it has been possible to show that diaphysectomy can be a practical procedure in young growing animals provided the diaphysis is replaced by a cylinder of plaster which is slowly and gradually absorbed while a new diaphysis is laid down. This is shown clearly from the accompanying illustrations.

This is only a preliminary report. Many aspects of the problem of diaphysectomy are being studied and further results will be communicated as the work progresses.

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A CASE OF CHRONIC NON-SPECIFIC OSTEOMYELITIS OF SPINE WITH REVIEW OF LITERATURE

by C. VYAGHRESWARDU and P. RANGACHARY, Visakhapatnam.

After Listerian era and after the discovery of chemotherapeutic drugs and *antibiotics*, bone infection was not as common as it was. But osteomyelitis though not completely eradicated is much under control. Among all the bones of the body *vertebral column* is less vulnerable to non-*specific infection*. Vertebral column is commonly the site of Tuberculous infection. During the last five years 865 cases of Tuberculous Spines have been diagnosed in the Out-Patient Department and not a single case of Chronic Non-Specific Osteomyelitis of the Spine has been noted. During the same period 860 cases of other diseases the Spine have been seen but no case of Chronic Osteomyelitis of the Spine has been noted. *It cannot be said that the* cases have been missed as the Radiographic appearances are so striking and characteristic that if Medical Men are aware of the condition the recognition is very simple.

CASE REPORT

G.N. male, aged 45 years, a well nourished individual was admitted on 26-9-1955 in the Orthopaedic Ward for the treatment of pain in the back of two years' duration. Two years ago he had an abscess in the left scapular region with high fever which was treated with antibiotics and local drainage, which took about two months to heal. During this period he developed pain in the Lumbar Region, radiating to the loin. Sometimes he used to get high rise in temperature during which period the pain used to be very severe. This subsided with usual treatment. He was free for about six months when he was able to attend to his work. On exertion he used to get high fever which subsided after a few days of rest. During the period of fever he used to experience severe pain and tenderness in the back. Pain was also felt on coughing or sneezing.

On examination there is a healed scar on the supero-medial angle of the left Scapula. No kyphosis is present. Slight scoliosis with concavity to the right is present. Lumbar spine is rigid and the 2nd, 3rd and 4th lumbar spinous processes are tender. No abnormality otherwise is noted. There are no palpable masses in the abdomen. There are no other swellings in the body. Central Nervous System is normal. Other systems are normal.

Investigations :

(1) *Urine* :— Acidic, no albumin, no sugar, no Bence-Jones protein.

(2) Blood :— Hb. 65%. R.B.C. 4.2 milli. c.mm. W.B.C. *Total Count* 8,400 *c.mm.* Differential Count — Polymorphs 65% ; Eosinophils 17% ; Lymphocytes 17% ; Monocytes 1%. B.W.R. Negative. Blood Widal (-)ve ; Culture of Typhoid Group of organisms — Negative.

(3) C.S.F. :— *Clear, not under tension.* Cells 3 /c.mm. Proteins 35mg%. Globulin *nil*. Sugar 38mg%. Chlorides 740mg%. C.S.F. W.R. Negative.

(4) *Serum* Calcium :— 9.1mg% (normal 7-11 mg%).

(5) Serum Alk. Phos. : — 7.2 units (normal 3-13 King Armstrong units).

(6) Serum Acid Phos. : — 5 *units* (normal 0-4 King Armstrong units).

(7) X-ray of Spine : — Irregular destruction and sclerosis of 3rd, 4th and 5th lumbar vertebrae. New bone bridging between vertebrae well seen both in antero-posterior and lateral views. *Parrot Beak* appearance is present. Lateral view showed sequestrum in 5th lumbar vertebra. No *narrowing* of the intervertebral space between the affected vertebrae is seen.
X-ray of Chest : — *Nil definite.*

(8) Bone Biopsy : — Under *general* anaesthesia a small para-vertebral incision was made on the left side of the 4th lumbar vertebra (*spine*) and a bit of transverse process with soft tissue was removed for histo-pathological *examination*. Report "shows chronic non-specific inflammatory reaction. No evidence of malignancy".

Treatment :

(1) General treatment : — Rest in bed.

(2) Antibiotic treatment : —

(i) Penicillin 2 lacs B.D. for ten days coupled with *Sulphadiazene* tablets 2 t.d.s.

(ii) Achromycin 1 capsule t.d.s. for eleven days to a total of 8 gms.

(iii) Streptomycin ½ gm. daily with penicillin 2 lacs daily for 30 days. Total Streptomycin 15 gms.

(iv) Aureomycin 1 capsule t.d.s. for 9 days to a total of 4 gms.

(v) Liver extract 2 c.c. twice a week.

Patient showed improvement. Fever and pain abated for the time. The powerful antibiotics used one after the other are to be certain about the control of infection.

Patient was discharged on 3-2-1956. He was advised complete rest in bed for three months and to report for check up after three months.

Patient reported on 2-9-1957. His general condition is good. X-ray was repeated and radiogram showed the absorption of the sequestrum in 5th lumbar vertebra: pain has subsided.

The interesting features in this case are:—

(1) Onset of pain in the Lumbar Spine after Pyaemic abscess.

(2) Absence of Lumbar Kyphosis which is diagnostic of Caries Spine though not an essential requisite.

(3) Absence of any abscess or sinus formation or any neurological signs and meningitis.

(4) Insufficient response to antibiotics though no complication has developed under treatment.

(5) Characteristic radiographic finding with bone destruction and new bone formation extending over three vertebra without any collapse of the vertebral bodies as compared to caries spine of the region.

(6) No narrowing of the intervertebral spaces between the affected vertebra contrary to the description in the literature as the most characteristic diagnostic finding radiologically.

(7) Confirmation of the clinical diagnosis by radiological examination.

Review of Literature:

J. Kulowski (1936) was the first to collect all cases of nonspecific osteomyelitis of the spine and publish an exhaustive treatise on the subject consisting of about 300 cases. Subsequently, from the same hospital J. P. Guri (1946) added some more

Fig. 1.
Has rigid spine with scoliosis concavity pointing to right, in the lumbar region.

Fig. 2.
Arrow indicates the scar of healed abscess primary lesion the spine shows scoliosis in the lumbar region with concavity to right ob

Fig. 3.
Arrow indicates the abscess healed scar. Healed operate wound for biopsy is also seen in the lower lumbar region on the left.

Fig. 4.
Lateral view of lumbar spine shows rarefaction sclerosis, and new bone formation.

Fig. 5.
A.P. view of lumbar spine taken on 24-9-1955. Shows chronic non-specific osteomyelitis of lumbar vertebra.

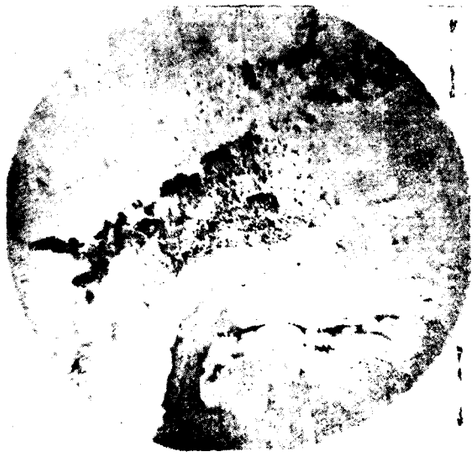

Fig. 6.
Photomicrograph of the biopsy bit taken from the left transverse process of 4th lumbar vertebra, shows chronic non-specific inflammatory reaction.

and classified the subject in an excellent way. Turner (1938) in Britain reported on chronic non-specific osteomyelitis of the spine. Subsequently Peter Martin, Blackburn and Jepsun, Hary Freeman and others have reported a few cases both acute and chronic and some of which ended fatally because of meningitis and Extra-Dural Abscess formation. Total number of cases so far are well above 400 and not a single one has been reported in Indian Literature.

Incidence :

Kulowski has reported that the ratio of caries spine to non-specific osteomyelitis of the spine in his series as 2 : 1. Such high incidence has not been reported by Peter Martin or P. J. Guri. All authors have agreed that males are more frequently affected than females (Kulowski 3 : 1. P. J. Guri 2 : 1). The favourable age of incidence is between the third and fourth decades in the reported series. The patient belongs to fourth decade. Among the sites of the lesion lumbar is the commonest. Next being Dorsal, Sacral and Cervical Regions in the order of occurrence. Usually the body of the vertebra is more commonly affected than other part of the spine. The body of the vertebra is more frequently affected because there is plenty of cellular marrow and the blood flow is sluggish which helps thrombosis leading to embolism in pyogenic infection.

Spread :

This disease is always a metastatic infection leading to primary abscess in the body of vertebra. Spread is by haematogenous route. Primary lesions are usually either an abscess, carbuncle, puerperal sepsis, pneumonia, thrombophlebitis, mastoiditis, etc. In this particular case the primary lesion was an abscess in the back. Sometimes compound fractures of the spine, improperly done Lumbar punctures, and laminectomies may also be responsible for direct infection.

Pathology :

The essential pathology of the condition is that the disease usually affects a number of vertebrae. Collapse of the vertebral bodies does not occur as it occurs in Tuberculosis because along with rapid destruction of the vertebra new bone formation occurs equally rapidly. The primary focus in the spine is usually present in the bone-marrow and in the disc. The disc substance is markedly and rapidly destroyed by the action of the proteolytic enzymes of the pyogenic exudates. The tendency to spread to adjacent discs and vertebral bodies is mainly due to lack of circumferential compact bone layer. The formation of extra-dural abscess producing acute onset of paraplegia and meningitis ending fatally is not so common but always a dreaded complication. Abscess formation both in the back tracking down to sacral region and in the pelvis as psoas abscess is also described sometimes. These may be the presenting symptoms in some cases.

P. J. Guri clinically described four types of syndromes depending on the presenting symptoms. (i) Hip Joint Syndrome. (ii) Abdominal Syndrome. (iii) Meningeal Syndrome and (iv) Back Pain Syndrome. Usually the onset of the disease may be acute, subacute or insidious. The acute cases either due to meningeal or extra-dural abscesses which if not properly diagnosed and treated early and fatally. It is only in the other types there is a fair chance of diagnosis and treatment.

Signs and Symptoms :

The signs and symptoms usually are that of caries spine with the exception of absence of kyphosis and the presence of healed abscesses and typical radiological appearances of this condition. Confirmation is by culture of pus discharging from abscess and open biopsy from the spine.

The condition has got to be differentiated from tuberculous spondylitis mainly as that is the commonest affection of the

	PYOGENIS OSTEOMYELITIS OF SPINE	TUBERCULOSIS OF SPINE
Onset.	Usually sudden.	Gradual.
Pyrexia.	Variable and marked often.	Variable and seldom marked.
Pain.	Usually intensive.	Persistant aching.
Site of Disease.	Body of vertebra usually affected-often other parts of spine.	Body almost invariably.
Primary Focus.	Topical infection wound in 50% of cases.	Other foci not often found.
Leuco-cytosis.	A characteristic finding.	Not a characteristic finding.
Vertebral Collapse.	Not seen because the onset is acute and so early recumbency is attained by the patient. Moreover there is rapid new bone formation.	Vertebral collapse is a common feature.
X-Ray.	Early narrowing of the intervertebral space. New bone formation and sclerosis of the affected vertebrae are common. Paravertebral calcification seen.	Sclerosis seldom seen. No new bone formation is seen except in secondary infection. Disc is not destroyed quickly and extensively.
Cord.	Compression rare. But in acute cases it occurs suddenly due to epidural abscess.	Compression is an usual feature and it is a gradual process.
Course.	Short and leads to bony ankylosis.	Prolonged and leads to fibrous ankylosis.

spine. In this connection Peter Martin (1946) has put various features in a tabular form which is very useful and which is reproduced for ready reference.

Treatment :

The treatment of the condition does not raise any problem as we have got powerful antibiotics. But the only difficulty is about the acute onset of meningitis and epidural abscess which requires early and effective drainage. When this complication sets in the mortality rate is very high.

SUMMARY

(1) A case report of chronic non-specific osteomyelitis of the spine is presented which is proved by biopsy.

(2) Short review of the available literature on the subject is given.

ACKNOWLEDGEMENT

is due to the Staff of Departments of Radiology and Pathology and to the Superintendent of K. G. Hospital.

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THE XIX ANNUAL CONFERENCE

The XIX Annual Conference of the Association of Surgeons of India will be held at the Medical College, Nagpur from the 28th December to 31st December 1957 inclusive. Dr. R. Nigam, M.D., M.S., F.R.C.S., Professor of Surgery, Medical College, Nagpur, is the Local Secretary and is making arrangements for the Conference.

The following subjects will be discussed at the Conference :

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

Besides this, a few 'Short Papers' will also be read at the Conference.

* * *

Subjects for discussion at future meetings

26th Meeting :

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

21st Meeting :

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

NOTICE

All articles bearing on Thoracic Surgery should be sent to Dr. P. K. Sen, M.S., F.A.C.S., Professor of Surgery, K. E. M. Medical Hospital, Parel, Bombay, who is the Sectional Editor of the Thoracic Surgery Section. Dr. Sen will send these articles after scrutiny to the General Editors, of the Indian Journal of Surgery for publication.

A. K. BASU,
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ACTIONMYCOSIS OF THE ILIUM

(A Case Report)

by C. VYAGHRESWARDU and J. VENKATESWARLU. Visakhapatnam.

Introduction

Skeletal actinomycosis usually occurs as a result of an extension from the neighbouring soft tissue foci. The lower jaw is the commonest site of the disease and a number of these cases have been reported. The spinal column is probably next to be affected by this mycotic organism. V. Z. Cope has published in 1951 four cases of vertebral actinomycosis adding to the previous total of 62 cases reported in the literature. Actinomycosis of the other bones also have been reported as Temporal Bone by J. M. Brown in 1942, Metacarpal Bone by H. J. Burrows in 1945, Maxilla by Arnold and Austin, and Mastoid by J. A Haiman and M. A. Adelman in 1948; Humerus by L. J. Mccormack, Dickenson and Reich in 1954. But as far as we could see from the available literature since 1935 no case of actinomycosis of the Ilium has been reported. This case is presented here merely on account of its rarity. Usually a retroperitoneal infiltration or rarely a subcutaneous infiltration provides the source of infection of the iliac bone.

Pathology :

The bone reaction is similar in any other bone. The majority of cases showed irregular osteolytic process with slight new bone formation. Bone destruction is much more evident than new bone formation. Just around the focus of infection there will be rarefaction and beyond that there will be new bone formation which is sometimes of considerable density when gross secondary infection supervenes. Sequestration of bone seems to be very rare.

The clinical picture depends on the region affected and the local tissue reaction. Patient usually complains of multiple swellings with discharging sinuses and irregular fever. Pain is not a prominent feature. There may be secondary anaemia and moderate leucocytosis. Patient may give a history of appendicitis or some vague pain in the right iliac fossa. But in this particular case no such history was elicited.

This condition is to be differentiated from the other chronic granuloma. For diagnosis the possibility of infection is to be borne in mind and the radiological appear-

Fig. 1.
A.P. view of left of ilium showing irregular destruction and sclerosis.

Fig. 2.
Barium enema X-ray shows filling defect of the caecum in A.P. view.

Fig. 3.
Photomicrograph of bone biopsy of left ilium. Pathology report "Actinomycosis of the left ilium (bone)". X-ray fungus with inflammatory cells are found.

ance may be helpful to some extent. The only certain method of diagnosis is the demonstration of the fungus in the affected part.

CASE REPORT

K.M., a Hindu male farmer, aged 45 years was admitted in the Orthopaedic ward on 26-4-1955 with the complaint of painful swelling in the right iliac fossa and gluteal regions with a few healed sinuses over it of one year duration. There was no history of any gastro-intestinal disturbances, evidence of any venereal disease or tuberculosis.

The present illness started one year ago with swelling over the crest of the right ilium and the portion below it. Ten days later he noticed two sinuses over the swelling discharging pus. They healed within six months. He used to get slight fever now and then during this period. The swelling gradually increased to the present size and now occupying the space and between the crest of the ilium and the greater trochanter on the right side.

On examination there was diffuse swelling with two healed sinuses adherent to the deeper structures. The swelling was slightly tender and warm to touch. There was no enlargement of the regional lymph nodes. Movements of the right hip were slightly limited due to pain but hip joint was normal.

Investigations :

Hb. — 65%. R.B.C. — 3.5 millions c.mm. W.B.C. — 9,800/c.mm. B.W.R. — Negative. Urine and Faeces — Nil abnormal. X-ray of the pelvis showed multiple irregular cystic spaces in the right ilium with irregular patches of sclerosed bone and with no sequestation. The Radiologist's report was osteomyelitis of the ilium.

The possibility of actinomycosis was thought of and a biopsy of the growth was done on 5-5-1955 and the section of the tissue showed actinomycotic infection.

Barium meal and Barium enema X-rays were taken. This showed only a distorted caecum.

The infection probably might have spread to the Ilium from the Ileocaecal region through minute perforations.

Treatment :

The patient was put on Penicillin, 6 lacs daily, for one month along with Streptomycin ½ gm. a day for one month. The patient showed marked clinical improvement. He was discharged on clinical improvement. He was discharged at his own request. The size of the swelling has been considerably reduced. He had another course of same injections in his native place.

The interesting features in this case are :—

(1) No history of any gastro-intestinal disturbances though the Barium X-ray showed a distorted caecum.

(2) Bone destruction is much more evident than new bone formation as shown in the skiagrams.

(3) The infection has responded to both Penicillin and Streptomycin.

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