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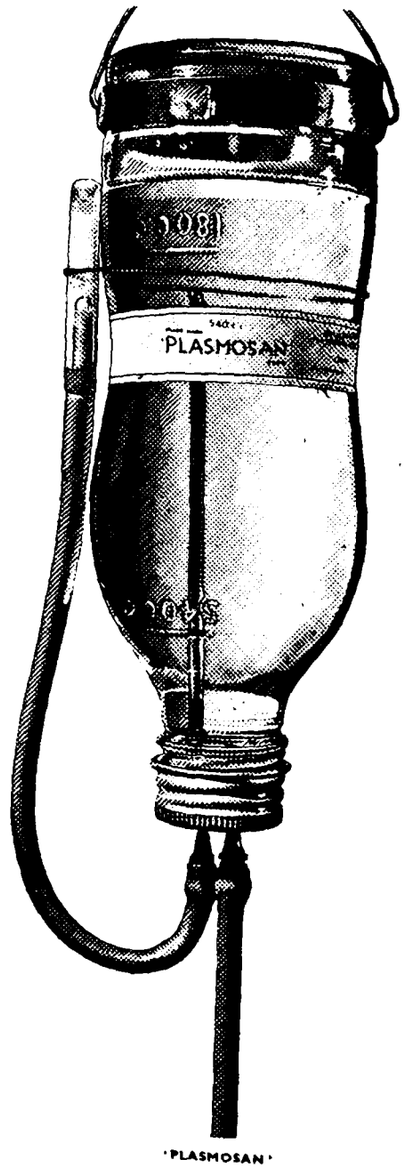

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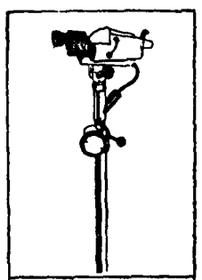

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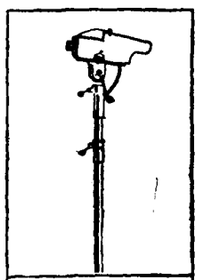

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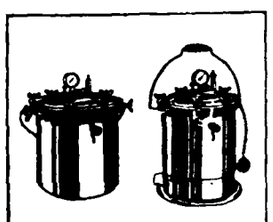

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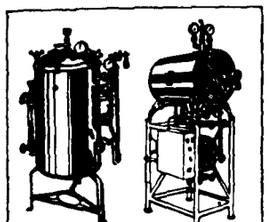

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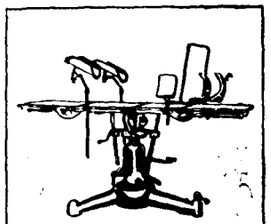

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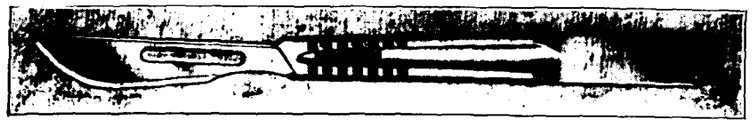

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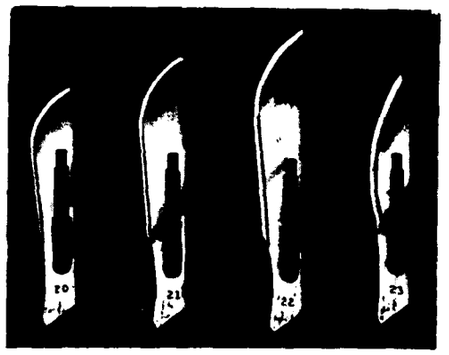

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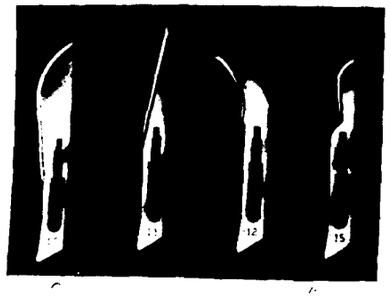

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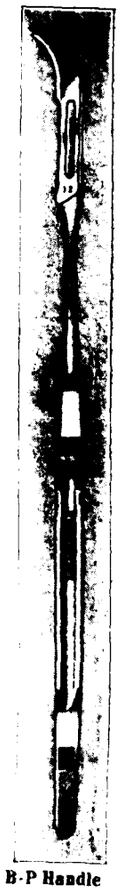

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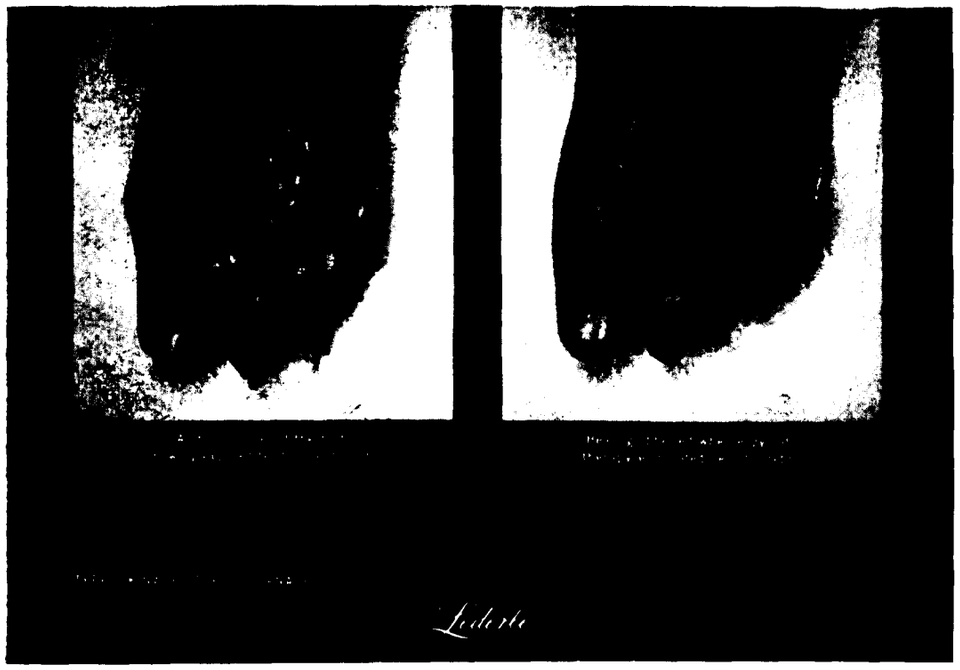

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Vol. XIV SEPTEMBER 1952 No. 3

IN MEMORIUM

In the sudden passing away of Dr. M. G. Kini, the Association of Surgeons of India and the Indian Journal of Surgery have lost one of their staunch supporters. Our readers would remember the large number of articles on Orthopaedic and other subjects from the pen of Dr. Kini in the earlier issues of the Journal. It was particularly at this period when the Journal was starving for want of material that Dr. Kini's articles kept it alive. One of the most remarkable attributes of the late Dr. Kini was the excellent and thorough way in which he maintained records of his cases, and almost on every subject connected with Surgery, he had records of his own material to produce. His contributions to the Journal and at the various annual meetings of the Association of Surgeons of India were marked by the diversity and richness of the material on which his observations were founded.

He was a member of the Governing Body of the Association of Surgeons of India from 1941 to 1946 and its Hony. Treasurer from 1944 to 1946. He was on the Editorial Board of the Indian Journal of Surgery from the beginning and resigned from it in 1949 in order to persuade younger members to serve on the Board. He was the President of the Association in 1947. He was also the President of the Indian Chapter of the International College of Surgeons.

In him we have lost one of the most outstanding figures in Indian Surgery. His many friends will feel his loss much more keenly, as he was a very sincere friend to all of them. He was popular with all his colleagues. He was always cheered whenever he got up to speak at a meeting. We shall miss his genial personality at our meetings and we take this opportunity to convey to his dear wife and children our deep sympathy at this great loss which has come upon them so suddenly.

May his soul rest in peace.

Editor.

Dr. M. Gopal Kini was educated at the Canara High School, & the Government College, Mangalore and later at the Madras Medical College.

He was awarded the M.C. for his services in the Army which he joined in 1919. He joined the Madras Medical Service in 1921. In 1928 he secured the F.R.C.S.

(Edin.) and M.Ch. (Liverpool). On his return to India he was appointed as lecturer in orthopaedics and Surgeon at the Govt. General Hospital, Madras. Between 1932 & 1941, he was at the Andhra Medical College at Vizagapatam as Professor of Operative Surgery and Surgeon, K. E. M. Hospital. From 1941 to 1948, he was Professor of Surgery and Superintendent of Stanley Medical College and Hospital, Madras. He played a great part in reorganising these two institutions.

He was an eminent Orthopaedic Surgeon and had won international reknown in his field. At the time of his death, he was the Medical Director, Society for Rehabilitation of Crippled Children and Children's Orthopaedic Hospital, Bombay, and Hony. President, Indian Medical Students' Association.

He was a regular and active member of the Indian Science Congress and he was invited to deliver orations on Surgical and Orthopaedic subjects at Calcutta, Amritsar, Hyderabad and other places. He was a member of the British Orthopaedic Association and an active member of the Indian Council of Medical Research. He was a Fellow of the American College of Surgeons since 1947 and he had the unique distinction of being elected Fellow of the Royal Society of Edinburgh in 1941.

HYDROCEPHALUS*

(A Study of 80 cases)

by A. E. DeSA', Bombay.

So much surgical endeavour has been concentrated upon the large head of hydrocephalus, that till recently, a study of the earliest beginnings of the condition have been neglected; and yet, the large head with the dilated scalp veins and protuberant eyes over the wasted body, is not so much a surgical problem as a surgical tragedy.

Dandy showed many years ago, that the only cases worth the surgeon's attention were those with a head circumference less than 20 inches, because children with larger heads have already developed irreparable cerebral damage, and survival is only achieved at the expense of permanent mental deficiency.

The antibiotics have proved to be a double edged weapon, as many cases of infective meningitis which would hitherto have been considered hopeless, are being salvaged at the expense of a complicating hydrocephalus. In some of these cases, we have been able to trace the onset and development of ventricular dilatation. Most of the cases that we have had to deal with have lain beyond the pale of effective surgery.

Fig. 1.

Ventriculogram of a representative case, indicating the gross ventricular dilatation.

The average head circumference in our series of 43 cases has been 20 inches, and we have had 26 cases with a circumference exceeding that figure. These have been used by us as subjects for study, but they have not, at any time been considered to be ideal subjects for surgery.

Among the childhood conditions that are associated with enlargement of the head and a tense fontanelle are subdural haematoma and its variant, subdural hydroma. These conditions are the result of birth trauma. Figs. 2 and 3 illustrate the radiological appearances of one such case.

These cases, which may clinically resemble idiopathic hydrocephalus, are diagnosed by a process of exclusion. Pneumo-encephalography reveals ventricles of a normal size, which may or may not be deformed from the size of the haematoma. Final confirmation of the diagnosis is obtained by exploratory aspiration of the subdural space, and withdrawal of bloody or xanthochromic fluid, together with a simultaneous lumbar puncture for purposes of comparison.

Normally, as has been shown by Rogatz and by Ingraham and Matson, the subdural space does not yield more than 1 c.c. of

*Paper presented before the Annual Conference of the Association of Surgeons of India, Calcutta, Dec. 1951.

Fig. 2.

Fig. 3.

Fig. 2. Subdural haematoma — lateral view.
Fig. 3. Subdural haematoma — antero-posterior view.

fluid. Rogatz states that a protein content of more than 35 mg. per 100 c.c. is diagnostic of a subdural fluid collection.

Injection of air into the area so aspirated will outline the cavity of the haematoma which shows the characteristic flat lower margin in sharp contrast to the wavy lower margin of a subarachnoid collection of air. These subdural collections of air are known to move with changing positions of the skull. Recognition of this cause of enlargement of the infant head is important, because some of these cases are cured by simple aspiration of the haematoma or the xanthochromic fluid, though a proportion will come to operative intervention. In our series, there have been two such cases cured by aspiration.

Subdural haematoma is a condition that is easily missed if it is not suspected.

If all cases of cranial enlargement with a bulging fontanelle are not caused by hydrocephalus, the converse also holds, that all cases of ventricular dilatation are not necessarily associated with an increase in the over-all size of the skull.

The classical example of this, is the ventricular dilatation that is associated with cerebral agenesis and atrophy. This variety of ventricular dilatation which is invariably associated with marked dilatation of the subarachnoid lake over the vertex of the brain, has been designated "hydrocephalus ex vacuo" because the ventricles enlarge to occupy the space left over by the shrunken brain. This phenomenon is a validation of the Monro-Kelly doctrine of the constancy of the total volume of the intracranial contents.

We have had to deal with such advanced and hopeless cases that efforts have been made to trace cases of hydrocephalus through the earliest stages of their development. Cases of infective meningitis have been a rich source of material for our study.

The modern treatment of infective meningitis has lowered the mortality rate, but only at the cost of increased morbidity. No form of treatment, however well planned, can be expected in every case, either to sterilise the leptomeninges or to avoid the sequel of residual lesions.

Figs. 4 & 5.
Ventricular dilatation and dilatation of the cerebral lakes associated with cerebral atrophy.

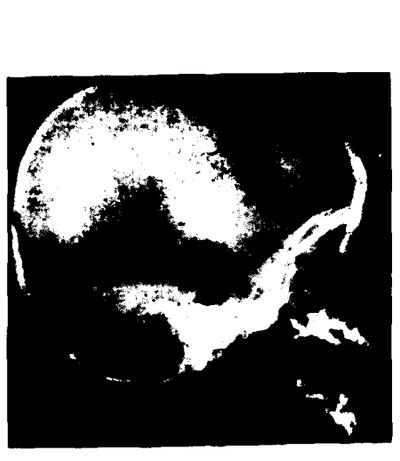

Fig. 6.

Fig. 7.

Fig. 6. Encephalogram showing a tentorial block as evidenced by the presence of air in the basal cisterns and none in the supra-tentorial subarachnoid spaces.
Fig. 7. Encephalogram showing a basal cistern block — absence of air in the basal cisterns as well as the supra-tentorial subarachnoid spaces.

A few cases of tuberculous and pneumococcal meningitis were therefore selected for study, in order to ascertain what changes occur in the size of the ventricles before, during and after treatment.

In two cases of tuberculous meningitis aerographically studied while under treatment, there was unmistakable evidence of ventricular dilatation, in one case from obstruction at the tentorium cerebelli, and

Fig. 8.
Encephalogram with nearly normal ventricles.

Fig. 9.
Encephalogram of a case of pneumococcal meningitis showing a tentorial block.

in the other from obstruction at the basal cisterns. In a third case, in which an encephalogram was done just before treatment was begun, it was difficult to detect any dilatation of the ventricles.

In the solitary case of pneumococcal meningitis which was studied by encephalography while under treatment, there was definite ventricular dilatation from a tentorial block.*

Much controversy has raged with regard to the incidence of hydrocephalus in tuberculous meningitis. Cairns believes that some degree of hydrocephalus is inevitable in the condition. Dorothy Russell on the other hand, in a careful post-mortem study of a series of cases, found only slight degrees of hydrocephalus in some cases and none at all in others.

De showed that intrathecal streptomycin plays no part in the causation of hydrocephalus, but renders it more obvious by prolonging life. He was able to produce a communicating type of hydrocephalus in Wistar rats by the cisternal injection of an emulsion of Mycobacterium tuberculosis.

Several authors have referred to the reversibility of early ventricular dilatation in the hydrocephalus that accompanies cerebral tumours or stenosis of the aqueduct, but so far, the only described case of tuberculous meningitis in which ventricular dilatation has regressed, has been that of Lorber. This finding of dilated ventricles assumes special importance in tuberculous meningitis, because it is known that varying degrees of mental impairment follow this dilatation, though there have been striking exceptions to this rule.

It is unfortunate that so often streptomycin only cures tuberculous meningitis at the expense of mental deterioration. Pneumo-encephalography may be a valuable pointer in these cases, as to when treatment of the condition should be interrupted on humanitarian grounds.

We have obtained a history of neo-natal infection in 14 cases, and a history of fever with convulsions in 7 cases, of a total of 43 cases of "idiopathic" hydrocephalus (1948-1951). The infections that are causally related to hydrocephalus, need not, as Parsons and Spence have shown, cause meningitic symptoms, even though the meninges are involved in the inflammation. They have shown that the pattern of an infective illness in infants is extremely variable, and that diagnostic localisation to the meninges may baffle even the experienced clinician.

*My thanks are due to Dr. S. M. Merchant for having studied these cases and for the encephalograms.

The possibility of intrauterine foetal infection in association with prolonged labour and maternal infection has been raised at various times. Weed showed that compression of the jugular veins for 2 minutes in experimental animals is sufficient to determine the passage of organisms into the leptomeninges. Douglas and Stander obtained positive blood cultures from the heart in a large series of still-born infants, which they were unable to obtain in a larger control series where death was due to some other cause such as the intracranial haemorrhage. It is possible that diagnostic lumbar puncture in the unexplained pyrexial illnesses of infancy, may, by ensuring earlier and more accurate diagnoses of meningitis, prevent the development of at least some cases of hydrocephalus. That the chemotherapeutic agents and antibiotics will not wholly answer the problem, however, is indicated by the work of Bailey, who showed that while the sulphonamides and penicillin restrain meningeal infection, they do not prevent fibroplastic overgrowth and meningeal organisation.

In the three cases (tuberculous meningitis—2, pneumococcal meningitis—1) of meningitis which we have studied it is certain that ventricular dilatation progressed rapidly in spite of clinical improvement. Whether the new fibrinolytic agents, streptokinase and streptodornase will help in preventing organisation of fibrous adhesions into fibrous tissue, and thus lower the incidence of post-meningitic hydrocephalus, only time and increasing experience will show. Our experience in this field is too restricted for any conclusions to be drawn.

Birth Trauma

In our series of cases, there have been only two instances where birth trauma could have occurred, one being a case of prolonged labour with assisted delivery and the other a case of induced labour (5%).

It is possible that we did not obtain reliable histories from all the mothers we questioned, as they were drawn largely from the illiterate classes, but it is certain that those hydrocephalic babies had not suffered any gross obstetrical trauma.

The experimental work of Bagley on animals has shown that the injection of blood into the cisterna magna can produce, after a period of two months, ventricular dilatation from fibrosis and matting of the leptomeninges. It is not the severe haemorrhages that are associated with tentorial tears and rupture of the great vein of Galen that are important in the aetiology of hydrocephalus. These are usually fatal. It is the smaller non-lethal haemorrhages associated with foetal prematurity that pave the way for the development of hydrocephalus.

Though premature infants are known to be specially liable to intracranial injuries, we have not had a single case of a prematurely born child in this series.

Fraser and Dott regarded birth haemorrhage to be an important factor in the aetiology of infantile hydrocephalus. In 33 per cent of their cases, they obtained a history of difficult labour, and operation revealed haemorrhages at the base of the brain, and in some cases, occlusion of the basal foramina.

Congenital Abnormalities

Dandy has shown that the two commonest causes of congenital hydrocephalus are stenosis or narrowing of the aqueduct and obliteration of the basal foramina, the former condition being the commoner of the two. Rarer causes are congenital absence of the arachnoid villi, and absence or maldevelopment of the subarachnoid space as occurs in Lissencephaly.

Dorothy Russell (loc. cit.) has added one more pathological entity to the list of aqueductal lesions — "forking" of the aqueduct, in which the aqueduct is broken up into the fine channels separated by normal neural tissue.

We cannot say with certainly how frequently congenital abnormalities have been responsible for the cases in our series, because we have not been able to perform autopsies on the cases that died.

In 9 cases out of 12 which we have studied aerographically by the lumbar route, the lateral and sometimes the third ventricle have filled easily with air, indicating that the obstructive factor responsible for the hydrocephalus in these cases lay beyond the basal foramina. One would have expected the common congenital lesions to prevent or render difficult the delineation of the ventricles by air injected into the lumbar theca.

Fig. 10.

Block beyond the basal foramina showing air in the supra-tentorial subarachnoid spaces. The ventricles, even the third fill well and easily.

In five consecutive cases of hydrocephalus not aerographically studied, the blue colouration of a 1 per cent solution of methylene blue or indigo carmine, (2 to 10 c.c.) injected into a dilated ventricle was obtained in the fluid aspirated from the opposite ventricle as well as in the fluid obtained by lumbar puncture.

In some of the cases where the ventricles were easily filled with air by the lumbar route, confirmatory evidence of a communication was not obtained by injection of methylene blue. This apparent contradiction can be explained by the small amount of methylene blue we used for the larger sized heads, which led to dilution of the dye and consequent difficulty of recognition of the blue coloration. In our later cases, by using a larger amount of dye, this discrepancy was overcome. The possibility of a valvular obstruction or of a thin septum with a fine perforation in the aqueduct, which permitted upward movement of air but not the downward passage of fluid, cannot entirely be ruled out. Such cases have been described by Dorothy Russell (loc. cit.) and Rowbotham. In 14 out of 17 cases which we studied, there was evidence therefore, of a communication between the two lateral ventricles and the lumbar theca.

An additional bit of evidence that would appear to argue against a congenital origin was the fact that the average age at which enlargement of the head was noticed to begin in these infants was 5 months.

We have obtained relevant data from the Wadia Maternity Hospital, whose neonatal surgical problems we handle. In the six year period (1945—1951) there were nearly 50,000 children born in the Hospital.

In 23 of these new-borns (1 in 2164 births), there was a hydrocephalus large enough to demand emptying of the dilated ventricles by one of the recognised obstetric procedures. The fluid content of the dilated ventricles was over 300 c.c. in every case. It is possible that the minor degrees of hydrocephalus or those that did not present any obstetric problem were missed or ignored.

The incidence of foetal hydrocephalus of a corresponding degree in three large maternity hospitals in Liverpool was 1 in 560 births.

Considering that the total quantity of cerebro-spinal fluid in the brain of a full-term foetus is 5 c.c., the accumulation of such enormous quantities of fluid in the ventricular system might occasion surprise. But if one remembers that the primitive aqueduct is already developed at the fourth week of intrauterine life and the choroid plexus and basal foramina are already functioning by the third month, it becomes clear that a rudimentary circulation of cerebro-spinal fluid exists at a very early stage of foetal life.

The lesser degrees of stenosis or "forking" with fair patency of the aqueduct will allow a balance to be established between production and absorption, because the total fluid content of the ventricles at any one time is so small. But, as the ventricles and their fluid content increase progressively in volume after birth, these narrowed pathways may be unequal to the needs of the cerebro-spinal fluid circulation of early post-natal life.

Among the associated abnormalities in this series of cases of foetal hydrocephalus have been spina bifida, imperforate anus, hare-lip, cleft palate and talipes.

In one case, a breech presentation, the discovery of a spina bifida, gave the obstetrician a clue to the reason for delay in the delivery of the after-coming head. Aspiration of the hydrocephalic head brought about rapid termination of labour.

In another case of twin pregnancy, the first child was born normal and the second was hydrocephalic. As might be deduced from the striking physical difference in these twins, the gestation was binovular. This raised the question of genetic factors in the aetiology of hydrocephalus. Though the demonstration of hereditary factors is naturally difficult in man, Gruneberg has demonstrated three genetically distinct types of hydrocephalus in the mouse. In one of these types, hydrocephalus is caused by cartilaginous growth at the base of the skull, which causes compression of the hind-brain and obstruction to the free flow downwards of the cerebro-spinal fluid. The resemblance of this condition to the hereditary disease achondroplasia, which is often associated with hydrocephalus, is striking. Three points emerge from a study of the material which has been available to us at the Jerbai Wadia and Nowrojee Wadia Maternity Hospitals.

(1) The infrequency with which hydrocephalus presents itself as an obstetric problem, in relation to the incidence of hydrocephalus as a surgical problem.

(2) The enlargement of the head is not noticeable till some time after birth (average age—5 months).

(3) In 14 cases out of 17 studied by air-injection or the dye test, there has been a direct communication between the ventricles and the spinal theca. In the absence of confirmatory autopsies (parental objection was the obstacle) the conclusion would be justified that most of these cases of idiopathic hydrocephalus not associated with spina bifida are of acquired post-natal origin and not secondary to congenital occlusions of the aqueduct, basal foramina or foramina of Monro.

Spina Bifida — Arnold Chiari Malformation — Hydrocephalus

Most of our 37 cases of spina bifida have been situated in the lumbo-sacral region and in every case except one, there has been a clinically evident hydrocephalus.

Lichtenstein has expressed the opinion that hydrocephalus in cases of spina bifida is caused by stenosis of the aqueduct consequent upon traction and elongation of the mid-brain. We attempted unsuccessfully to confirm or disprove the existence of an elongated and narrowed aqueduct by aerographic methods in two cases, but in every one of ten cases in which we have injected methylene blue or indigo carmine, into the ventricles, we have been able to visualise it in, or aspirate it from, the meningocele almost immediately, indicating a free communication between the meningocoele and the ventricle. These findings repudiate the suggestions made by Van Houweninge — Graftdijk that the Arnold Chiari malformation produces a ball-valve effect upon the cerebro-spinal fluid circulation at the foramen magnum, permitting an upward flow of fluid from the spinal theca into the ventricles, but obstructing flow in the opposite and normal direction.

These findings corroborate the view expressed by Dorothy Russell and Donald

Fig. 11.
Encephalogram showing a diverticulum.

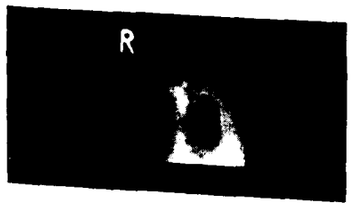

Fig. 12.
Rupture of the septum pellucidum.

that the Arnold Chiari malformation produces a communicating hydrocephalus from displacement of the foramina of the Magendie and Luschka into the spinal canal and "obstruction to the reflux of the cerebrospinal fluid into the cranial cavity due to the plugging of the foramen magnum" by the malformation. All the 30 cases of meningocele that we have operated upon, except one, have been followed at periods varying from two weeks to nine months by aggravation of the pre-existing hydrocephalus.

On the basis of experimental evidence that the wall of the meningocele sac has an aabsorptive function, Penfield and Cone devised their well-known operative procedure in which the wall of the meningocele sac is preserved. Increasing experience with the procedure later led them to abandon the method. It is worth stating, however, that Ingraham and Hamlin reject the suggestion that hydrocephalus is precipitated by operative correction of a meningocele.

We have noticed that operative correction of a meningocele is often followed by progressive retraction of the head. This finding is probably related to the increasing intracranial tension which follows the operation. This clinical observation derives support from the experimental work of Ingraham who showed that dogs in whom hydrocephalus was experimentally induced, carried their heads in extension. In three of the cases in our series, which were palliated by repeated aspirations of the dilated ventricles, there occurred as a terminal event, a great and persistent hollowing of the anterior fontanelle. We have come to look upon this event as one of grave prognostic significance, because death has followed at short intervals of time, in every instance. It probably indicates a terminal failure of the choroid circulation. This phenomenon of exhaustion of secretory activity of the choroid plexus is worth closer scrutiny, because it might furnish a clue to a more positively satisfactory treatment of hydrocephalus. The choroid plexus has a higher capillary pressure than the other intracranial capillaries, and Flexner has shown that the secretory activity of the choroid plexus bears an inverse proportion to the level of the intraventricular pressure. It is a well-known fact that the choroid plexus is more or less atrophied in advanced cases of hydrocephalus.

Though the ventricles usually expand evenly, focal ballooning of the ventricles may occur, and the ependyma may make its way through the deeper sulci of the cerebrum, with wide separation of the convolutions. The ependyma may even make contact with the leptomeninges especially

in the region of the calcarine fissure. The juxtaposition of ependyma and leptomeninges may permit the ventricular fluid to escape into the subarachnoid spaces by simple seepage.

The formation of false diverticula from rupture of the ventricular wall is an occasional consequence of a raised intraventricular pressure, and where a fortuitous communication is established between the dilated ventricle and one of the basal cisterns beyond the level of the block, spontaneous arrest or even cure of the disease might result. Such spontaneous ventriculostomies have been described by Sweet and by Pennybacker and Russell.

The surgeon attempts to imitate these natural short circuits in the operation of third ventriculostomy.

In some advanced cases of hydrocephalus, the septum pellucidum is fenestrated. This natural by-pass between the two lateral ventricles has a surgical parallel in Norman Dott's unusual case of unilateral hydrocephalus due to obliteration of the foramen of Monro, which he was able to cure by cutting out a large opening in the septum pellucidum.

Fig. 13.
Rupture of the leptomeninges with air in the subdural space.

The instances of the occasional successes following these two types of operation indicate how a study of the natural history of a disease can furnish useful pointers to effective treatment.

In those rare instances in which the dilated ventricles break through the leptomeninges into the subdural space, the communication is of no functional value, because fluid absorption does not take place in the subdural space.

These subdural communications are sometimes produced by repeated punctures of the lateral ventricle through the anterior fontanelle.

Summary and Conclusions

Forty six cases of hydrocephalus have been studied and the causative factors reviewed and discussed. Stress has been laid upon post-natal meningitis rather than on congenital defects as a feature in the causation of hydrocephalus in this series.

The incidence and causation of hydrocephalus following operations for meningocele are discussed from a study of thirty-seen cases.

REFERENCES

1. Bagley, C. Jr.: Quoted by Russell, Dorothy S.[20]
2. Bailey, P.: Chronic Leptomeningeal Thickening Following Treatment of Meningitis with Sulfa Drugs, Ann. Surg. **122**: 917.
3. Cairns, H.: Surgical Aspects of Meningitis, Brit. M. J. **1**: 967, 1949.
4. Dandy, W. E.: Localization on Elimination of Cerebral Tumours by Ventriculography. Surg., Gynec. & Obst. **30**: 329, 1920.
5. De, S. N.: Studies on the Changes of the Brain in Experimental Internal Hydrocephalus. J. Path. & Bact. **62**: 197, 1950.
6. Dott, N. M.: A Case of Hydrocephalus in an Infant Brain, **50**: 548, 1927.
7. Douglas, R. G. and Stander, H. J.: Infantile Mortality and Bacteriological Investigation of the Effect of Prolonged Labour on the Baby. Am. J. Obstet. & Gynec. **46**: 1, 1943.
8. Flexner, L. B.: A Note on the Circulation of Cerebrospinal Fluid. Am. J. Physiol. **106**: 201, 1933.

9. Fraser, J. and Dott, N. M.: Hydrocephalus. Brit. J. Surg. 10: 165, 1922.

10. Gruneberg, H.: Congenital Hydrocephalus in the Mouse, A case of Spurious Pleiotropism. J. Genet. 45: 1, 1936.

11. Ingraham, F. D.: Experimental Hydrocephalus. J. Neurosurg. 4: 164, 1947.

12. Ingraham, F. D. and Hamlin, H.: Spina Bifida and Cranium Bifidum II Surgical Treatment. N. Eng. J. Med. 228: 631, 1943.

13. *Ingraham, F. D. and Matson, D.: Subdual Haematoma in Infancy. J. Pediat. 24: 1,* 1944.

14. Lichtenstein, B. W.: Quoted by Russell.[20]

15. Lorber, J.: Study of Cerebrospinal Fluid Circulation in Tuberculous Meningitis in Children, II Arch. Dis. Child. 2: 28, 1951.

16. Parsons, L. G.: Prevention of Neo-natal Disease and Death. Lancet 1: 267, 1944.

17. Pennybacker, J. S. and Russell, D. S.: Spontaneous Ventricular Rupture in Hydrocephalus with Cyst Formation. J. Neurol. & Psychiat. 6: 38.

18. Rogatz, M. D.: Subdural Haematoma in Infancy. Arch. Pediat. 59: 565, 1942.

19. Rowbotham, G. F.: Small Aneurysm Completely Obstructing Lower End of Aqueduct of Sylvius. Arch., Neurol. & Psychiat. 40: 1241, 1938.

20. Russell, D. S.: Observation of the Pathology of Hydrocephalus. Spec. Rep. Ser. Med. Res.

21. Russell, D. S. and Donald, C.: The Mechanism of Internal Hydrocephalus *in Spina Bifida, Brain 58: 203, 1935.*

22. Spence, J. C.: The Nature of Disease in Infancy. Lancet 1: 777, 1941.

23. Sweet, W. H.: Spontaneous Cerebral Ventriculostium. Arch. Neurol. & Psychiat. 44: 532, 1940.

24. Van Houweninge Graftdijk, C. J.: Quoted by Russell.[20]

25. Weed, L. H. et al.: A Study of Experimental Meningitis. Monogr. Rockfeller Inst. Med. Res. No. 12, 1920.

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NEW OPERATION FOR PEPTIC ULCER (AYLETT)*

(A review of 25 personal cases)

by Lt.-Col. SANGHAM LAL, Madras.

At the outset one must state that this paper is only a report on the experience of 25 operations for peptic ulcer as described by Aylett and not a new operation.

INTRODUCTION

It is generally accepted that the surgical treatment of peptic ulcer is still in a stage which is far from satisfactory.

At present the following procedures are the ones usually practised.

(1) Gastro-jejunostomy
(2) Sub-total gastrectomy
(3) Vagotomy.

Gastro-jejunostomy; although an ideal procedure for duodenal obstruction has practically been given up for cases of active ulceration with high acidity.

Although theoretically it is hoped that the regurgitation of alkaline juices into the stomach through the stoma would keep down the acidity of the stomach contents at a low level — in practice, it is found that this does not happen to any great extent. The persistance of high acidity is mainly responsible for the occurrence of anastomotic ulcers. Thus this operation for the treatment of active peptic ulcer has no physiological basis.

Partial Gastrectomy by removing a large part of the acid producing area of the stomach aims at maintaining the acidity at a low level. Although physiologically sound, this operation, it must be admitted, is a severe and mutilating one. The physiological function of the stomach as such is lost, in that its role as a receptacle where the food is thoroughly mixed up with the gastric juice and macerated by the muscular activity of the stomach, would largely disappear. It is not therefore surprising that in those subjected to this procedure, one often comes across cases of post-operative conditions of intractable type. These sequelae may range from mild dyspepsia, distension after meals, dumping syndrome and even extreme degrees of nutritional deficiencies and hypoproteinaemia and chronic invalidism.

For want of a more physiological or safer procedure this operation, at present, has been accepted as the most suitable one in spite of its being technically difficult with some mortality.

This need for a safer and more physiological operation was responsible for the enthusiasm with which the new procedure of vagotomy was hailed. *Vagal resection* reduces the neurogenic secretion of the acid juice but does not in any way affect the hormonal stimulus which is responsible for the more sustained and continuous secretive activity of the gastric juice. The enthusiasm about this operation appears to be waning and it is being more and more realised that this procedure has a very limited field.

It is generally accepted that high acid is responsible for the maintainance and non-healing of peptic ulcer as well as the production of gastro-jejunal ulcer.

It is very seldom that one meets with peptic ulcer of the 3rd part of the duodenum or jejunum, although exposure of the jejunal mucosa to high concentrations of acid often leads to ulceration as is seen in gastro-jejunal ulcer. Therefore it is safe to assume that the alkaline nature of the pancreatic juice and bile which constantly bathe the mucous membrane of the distal part of the duodenum and jejunum is mainly responsible for the immunity enjoyed by this section from ulceration.

The aim of the new operation as suggested by Aylett is to maintain the acidity of the stomach contents at a low level by introducing the alkaline duodenal contents directly into the stomach.

*Paper presented before the Annual Conference of the Association of Surgeons of India, Calcutta, Dec. 1951.

In this way the objective of both gastrectomy and vagotomy is achieved without the mutilating effects of the former and some of the unfortunate consequences of the latter due to the interference with the muscular activity of the gastro-intestinal tract. The technique, as described by Aylett (1951) is as follows : —

The abdomen is opened by the customary paramedian incision and the greater and lesser omenta divided from the pyloric end of the stomach and the adjacent duodenum for some 4 cm. When the ulcer is in the duodenum and well way from the pylorus, the duodenum is cut across just distal to the pylorus and its end closed and invaginated, as in a gastrectomy. The proximal end of the duodenum remains open and gastric contents are prevented from spilling into the wound by a non-crushing clamp placed across the pyloric end of the stomach.

The first loop of the jejunum is then drawn up into the wound. The mesentery of the jejunum is divided at a point some 7 to 8 cm. from the duodeno-jejunal flexure. The division extends outwards to the bowel and downwards towards the root of the mesentery, but not so far as to jeopardize the blood supply of the proximal loop. In actual practice the division of the mesentery extends for about 3 cm. The jejunum is then divided between non-crushing clamps. A few bleeding points on the edge of the bowel will then require ligation.

The distal cut end of the jejunum is then brought over towards the open end of the duodenum, and to this it is anastomosed. No difficulty is experienced in approximating these two ends, and at the completion of the anastomosis the line of union lies loosely over the transverse colon in the region of the hepatic flexure. On completion of the anastomosis the lumen should admit the tips of two fingers.

The upper part of the stomach is now drawn towards the operator from its subcostal position, so that an area on the anterior surface at the junction of the upper third and lower two-thirds is exposed in the wound. The proximal limb of the jejunum is brought in front of the transverse colon and the open end approximated to this upper portion of the stomach by a continuous layer of seromuscular sutures. These are inserted so that each stitch on the jejunal side takes up a broader bite of tissue than on the stomach side. By so doing a breadth of about 3 cm. of seromuscular jejunal coat is approximated to about 2 cm. of the corresponding coat of the stomach. The object of anastomosing the normal width of the jejunum to a lesser width of stomach wall — a device that is carried out with all the layers of the anastomosis is to produce at this site a final lumen between intestine and stomach capable of admitting the tip of the little finger only. The stomach is then opened through an incision little more than 1 cm. long and a continuous suture is passed through all layers of the adjacent walls of the stomach and jejunum. A Connell inversion stitch is used for the approximation of the anterior layers in order to prevent any mucosal eversion. As already noted, throughout this continuous suture each stitch on the jejunal side includes a broader bite of tissue than its counterpart on the stomach side, so that the final stoma is of the size indicated above. An anterior sero-muscular stitch completes the anastomosis (Figs. 1 to 3).

In cases where one anticipates difficulty in closing the duodenal stump due to the close proximity of scarring ulcer, one may divide the stomach proximal to the pylorus in order to facilitate the closure. The absence of the pyloric sphincter does not materially affect the emptying of the stomach. In case of gastric ulcer the procedure is combined with excision of the ulcer.

When the bowel is returned to the abdomen the newly sited loops of the jejunum lie comfortably and are under no tension one in front of each end of the transverse colon, the intervening V of mesentery covering the middle portion.

The author has performed this operation on 25 cases of duodenal ulcer. No operative difficulty was experienced except the usual difficulty of closing the duodenal stump in the vicinity of scarring ulcer and hence in some cases prepyloric section had to be resorted to. Two minor modifications have been used by the author.

1. The proximal loop of jejunum is kept longer than described above, anything upto 6 or 7", depending on the pattern of the vascular supply. One feels that the longer loop is less likely to be kinked or put on tension in case distension of the stomach occurs.

2. A few interrupted stitches are used to fix the V shaped mesentery of the jejunum to the omentum.

3. A further modification which has been found to be necessary in the light of recent experience is to make the anastomosis between the proximal cut end of duodenum or stomach to the distal end of the jejunum an end-to-side one instead of an end to end one (Fig. 4). The end to end union is likely to get narrowed either as a result of oedema in the immediate post operative period or later, due to cicatrisation. One case ended fatally due to obstruction from this cause.

To begin with this operation was done on cases of duodenal ulcer who were found to be unsuitable for gastrectomy on account of poor state of health. Later on it has been used for most cases of peptic ulcer, specially in the young.

This operation has not been done for gastric ulcer as one should hesitate to rely only on excision of the ulcer specially in the case of older patients.

The youngest patients was 15 and the aldest 50 in the series, with an average age of 45 years. Most of them had to be hospitalised for varying periods from 5 to 35 days before operation. On an average they had to be treated preoperatively for about 16 days.

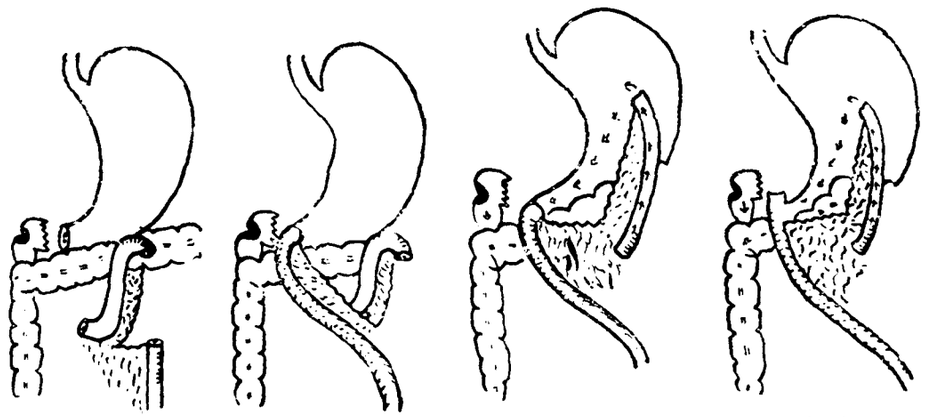

Fig. 1. Fig. 2. Fig. 3. Fig. 4.

Fig. 1 shows the duodenum divided proximal to the ulcer, the distal end closed and the jejunum divided ready for anastomosis to the stomach.

Fig. 2 shows anastomosis of distal end of jejunum to proximal end of duodenum (or stomach) completed.

Fig. 3 shows implantation of proximal end of jejunum high up in the stomach.

Fig. 4 shows the end to side anastomosis instead of end to end as in Fig. 2.

Follow-up has been possible only in 7 cases — four of these replied personally while three replied to queries by post.

All 3 had been free from abdominal pain or discomfort for over 3 months.

Four persons who reported after periods varying from 2—4 months looked fit and had put on weight. They had good appetite and did not experience any abdominal discomfort. They had all returned to their normal work which included heavy manual labour.

The F.T.M. has been done in 6 cases after the operation. Chart (Fig. 5) shows a typical case.

It shows a well-sustained low acidity with presence of bile in all specimens.

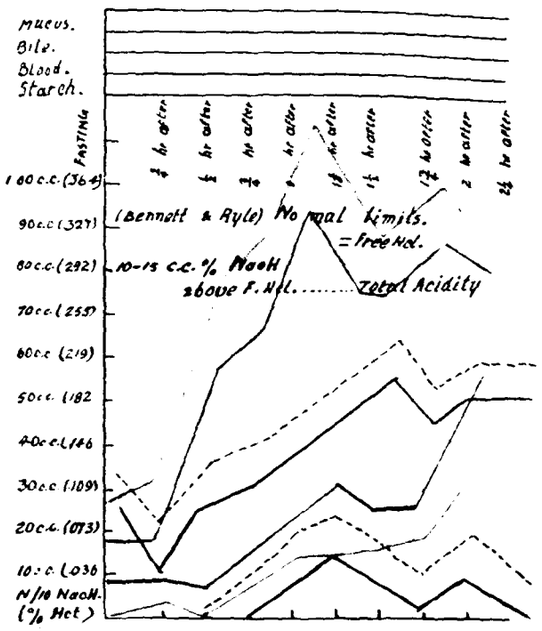

Fig. 5.

F.T.M. readings of a typical case before and after operation.

The questions that come up in respect to this operation are :

1. Does the constant presence of bile in the stomach cause by discomfort ?

   It has been well established that this does not produce any discomfort.

2. What is the effect of the mixing of acid gastric juice and alkaline juices in the stomach on

   (a) Digestive action of pancreatic juice ?

   (b) Normal functions of bile ?

It is not intended to suggest that with this short term follow-up of a few cases any positive conclusion can be drawn but one's impression after a personal experience of over 350 partial gastrectomies is that it may lead the way to find an answer to a difficult problem. It has many advantages as compared to partial gastrectomy.

(a) It is a comparatively easy operation with much less shock to the patient and a much smoother and easier convalescence.

(b) This operation is of special interest to us who have to deal with case material of very poor quality — patients whose blood pictures and blood chemistry are such as would make most gastric surgeons in Western countries hesitate before subjecting them to severe operations like partial gastrectomy.

(c) The few patients who have reported for check up show complete absence of pain and no abdominal discomfort. They had all put on weight and their Hb% was above 70 and the F.T.M. chart showed a sustained low acid level.

3. Barium meal series of one case showed practically normal emptying of the stomach.

REFERENCE

Aylett, O. S.: Brit. M. J. 454, 1951.

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PATHOLOGY OF RIB FRACTURE — ITS TREATMENT BY INTER-COSTAL BLOCK AND RIB SUTURE*

by AMOR SEN, Calcutta.

With the advancement of the knowledge of the physiology of the thorax, traumatic surgery of the thoracic organs has received great attention ; the treatment of fractures in general has also undergone a considerable change. Curiously enough, very little attention has been paid to the question of fractures of ribs, which has cost so many lives and has caused so much distress to those who had sustained it. It has been observed that about 20% of cases of fracture of ribs associated with pleural or lung complication die of their injuries. The rib fracture that is not immediately associated with pneumothorax, haemothorax or other associated injuries of the lung has not received the desired attention and yet it is not always of a benign nature especially if the violence is considerable on the chest wall resulting in multiple fractures of several ribs.

A review of the pathology of this type of injury necessitates the following considerations.

(1) *The splinting action of the chest wall* due to *pain* results in a definite decrease of respiratory activity ; in cases where a fairly large number of ribs are broken, this splinting action involves a greater area and may cause a marked reduction of the ventillary function of the lungs ; if the victim is an aged one, where emphysema has already supervened and been compensated by increased depth of respiration, this added restriction of mobility increases the respiratory difficulty.

In this whole chain of events pain is the predominating causal agent.

(2) *Reflex Bronchospasm and increased secretion.* It has been observed during the last war that both in civil and military chest injuries trauma to the chest wall sets up reflexly two curious phenomena, the exact mechanism of which has not yet been ascertained although there is reason to believe that irritation of the somatic nerves might be one of the factors.

(a) The first of these is the active secretion produced by the bronchial glands which are thrown into overactivity. When this secretion is too much in excess, the conducting and aerating surfaces of the lungs are filled up with fluid instead of air which causes interference with oxygenation. This condition has been described very aptly by the term *traumatic wet lung.*

(b) The second reflex phenomenon that occurs is spasm of the bronchial musculature. This again causes great distress to the patient by interfering with the intake and output of air to and from the alveoli.

(3) *Interference with coughing.* Last among these series of changes that disturb the normal physiology of respiration is the interference with the mechanism of coughing.

In normal condition constant flusning of the whole of the bronchial wall is going on by synergic action of the two processes — the active secretion of the bronchial glands and their evacuation by a complex mechanism of coughing. In coughing an intact chest wall is necessary to produce the expiratory effort ; when that is lost, the coughing mechanism is markedly interfered with. So it stands to reason that if there is excessive secretion, which cannot find its way out by active coughing — stagnation results thus adding to the waterlogged condition ; moreover this predisposes to the occurrence of atelectasis.

(4) *Added Pathology in multiple rib fracture "Stove in chest".* Here the segment of the chest wall formed by the fractured ribs behaves as a separate entity and moves in its own rhythm which is quite contrary to the rest of the chest wall ; this part is depressed during inspiration and forced out during expiration a well known

*Paper presented before the Annual Conference of the Association of Surgeons of India, Calcutta, Dec. 1951.

phenomenon called — paradoxical respiration. This type of respiration interferes with the maintenance of normal negative intrathoracic pressure and may lead to disturbance of venous return to the heart.

Treatment of Rib fracture

If we follow the pathology of rib fracture and try to formulate a rational line of treatment, this must be based on the following principles — no matter what method we employ : —

(a) That pain must be abolished and abolished by as nearly 100% as possible.

(b) That reflex broncho-spasm must be made to relax to a degree sufficient to cause proper conduction of air in and out.

(c) That excessive secretion must be made either to be absorbed or evacuated to diminish the water-logged condition, and for the latter — coughing must be encouraged ; means must be made by which coughing can be made painless and effective.

(d) Lastly that the mobility of the chest wall must not be restricted ; on the other hand this must be restored to as much of its normal range as possible ; this is necessary to restore the normal ventilatory function of the lungs.

If this be our rational line of treatment, let us now consider how far our existing methods fulfill the requisite criteria.

Strapping in the treatment of rib fracture. Till very recently, the only line of treatment, that was advocated in all text books of surgery and is being accepted as the standard teaching, is immobilisation of the chest wall by strapping ; there was a time when Lorenz Bohler's teaching was dominating in the field of treatment of fracture, it was held that the correct treatment of rib fracture was not simply to immobilise the chest of the involved side but that strapping should be of an encircling type, immobilising the other side of the chest too, because it was held that it is not possible to immobilise one side of the chest, as the two sides move in unison with one another.

It will be evident that strapping as a method of treatment cannot satisfy any of the principles that I have enumerated.

Criticism of strapping as a Method. First comes the question of relief of pain. Can we really abolish this pain, which is one of the major issues here, by strapping ? At the first sight it seems that the cause of pain is the movement of the chest wall and that restriction of the mobility of the chest wall will relieve this pain.

But fracture of the rib differs to a great extent from that of other bones ; here we are dealing with a constantly moving object. The question that strikes one is this, can we really immobilise the ribs as we can immobilise a fractured femur ? After all, what sense is there in trying to restrict the mobility of a constantly moving object ? So long as the diaphragm is working, the respiratory centre alive, and the intercostal muscles not paralysed, have we really any means of immobilising the chest ? The movement of the chest will go on rhythmically 16—20 times a minute, no matter what method we adopt. We cannot really conceive of an active immobilisation even if we bind the chest wall with an iron chain not to speak of a "Leucoplast" strapping ; all that might be effected is the restriction of the amplitude of movement which might do more harm than good.

(2) Secondly, strapping by itself cannot relax the reflex bronchospasm neither can it have any inhibitory action on the bronchial glands and consequently interference with conduction as well as oxygenation will remain as they are.

(3) Thirdly, strapping by itself cannot make coughing easier or painless, so that excessive secretion when occurs will not find its exit and thus the water logging condition will not be relieved.

Thus it seems that strapping not only does not fulfil our criteria for logical treatment in case of rib fracture, but on the other hand it is expected to cause definite harm by restricting the mobility of the chest wall. We believe that free

excursion of the chest wall and by that the proper expansion of the lungs is the most important prophylactic measure against the onset of pulmonary complications and it is this guarding against these complications that is the most important principle in the treatment of rib fracture. More and more we are realising the necessity of routine breathing exercises aiming at full range of respiratory excursion in our post operative patients to diminish the risk of pulmonary complication.

Intercostal Block in the Treatment of Rib Fracture.

Now let us consider the type of therapy that has been recently advocated and critically analyse how far this method can satisfy our criteria for logical treatment of rib fracture.

(1) First is the control of pain — and in this respect the intercostal block is the only one that aims at immediate complete relief. This relief of pain is the most striking feature of this therapy. It is most gratifying to see that the patient who had been groaning while sitting in a stiff attitude with apprehension, takes up an entirely different attitude 10 minutes after the block. In one of my cases it was most dramatic to see the patient (with fracture of three ribs) who was sitting in the bed in a curled up attitude, get down from the bed and walk in the ward soon after the block.

(2) Second — so far as reflex bronchospasm and overactivity of the bronchial glands are concerned it is expected that both are likely to be controlled by this interruption of the conducting path and consequently it is expected that the patient will be able to take in and breath out the normal volume of tidal air and there will be no interference with oxygenation.

(3) Third — comes the question of difficulty in producing an effective and painless cough ; so far as this is concerned, the intercostal block by abolishing the pain will certainly give the patient a better chance of having an effective cough, to expectorate any extra secretion that occurs in the bronchial tree but it cannot establish the normal expiratory effort that is necessary to have an effective cough due to loss of integrity of the chest wall.

(4) Last comes in our series of the principles of logical treatment, the restoration of the normal range of movement of the chest wall. So far as this question is considered, it is certain that the intercostal block by abolishing pain allows the patient to have nearly full range of respiratory excursion restored within the shortest period after injection.

Thus it seems from the facts put forward that intercostal block satisfies most of the principles laid down, and hence should be the choice of treatment in all cases of rib fractures.

Suturing of Fractured Ribs

This is a method that has recently been advocated in certain groups of cases. Coleman from the University of Virginia, last year published a paper in which he has put down certain definite advantage of this method over the other two. But he has given definite indications for its use and we shall see that this line of treatment although it may be advantageous will have very limited scope.

Let us analyse this method in the light of the rational line of treatment of rib fracture.

(1) Firstly, so far as relief of pain is concerned it is unlikely that by adopting this method we can control or abolish the pain immediately and we know that in uncomplicated rib fractures abolition of pain is the most important point of treatment.

(2) Secondly, so far as bronchospasm and increased secretion are concerned it is unlikely that suturing of the ribs will have any beneficial influence in this respect because there is nothing to interrupt the reflex arc.

(3) Thirdly, so far as ease of coughing is concerned, it stands to reason that suture must have a definite beneficial influence here, because it aims at restoration of the

integrity of the chest wall which is essential for an effective cough.

(4) Lastly, so far as the restoration of normal excursion of the chest wall is concerned, it is quite conceivable that early restoration is less likely with this method because although the ribs are sutured the pain due to incision of the skin, the division of the muscles, and raising of the periosteum will be there which will hinder the excursion of the chest wall.

Coleman has put down that this method of treatment is indicated in cases of multiple fractures of ribs with paradoxical respiration and here he has obtained very good results in his limited trial of 11 cases.

It is quite true that paradoxical respiration will be controlled by suturing but in my limited experience I have found out that it is not necessary to have recourse to this method to give relief to these patients.

Author's Observations

During the last 6 months I have treated 20 cases of rib fracture. In all of these I have followed one, and only one, method, i.e., the intercostal block; I have discarded the strapping method altogether.

An attempt has been made to study the effect of this therapy with a view to find out how far this method is effective in fulfilling the requirements theoretically discussed before.

Facts observed

(1) Relief of pain is immediate and striking.

(2) Duration of relief varies; after the first injection, in the majority of cases complete abolition of pain lasts for about 2 hours. If the patient feels uncomfortable when the pain recurs, a dose of morphine is injected.

It is curious that although pain recurs after this period the intensity is much less and in many cases even morphine was not required.

The second injection, which is given on the next day, gives complete relief lasting for 6—8 hours after which the patient again feels some sort of dull pain but much less in intensity than before and no morphine is necessary.

(a) In mild cases where one or two ribs are fractured two injections are sufficient.

(b) In more severe cases and in the majority of my series, a third injection is given which gives relief for a very long time and in no case of mine was distressing pain complained of.

In none of my case it was necessary to give more than 3 blocks.

(3) So far as respiratory excursions are concerned, it is dramatic to see the patient getting back their normal range immediately on the first day and when they are asked to take a deep breath, almost all of them could do so without pain — only in one-third of my cases did they complain of pain but much less severe than before the block.

(4) So far as the cough mechanism is concerned my observation shows that coughing still causes pain even after the third injection, but the intensity of pain seems to wear away after the second injection; there is no doubt that although coughing causes pain the patients are in a better position to have an effective cough.

Effect of Intercostal Block in Traumatic Wet Lung.

I had several such cases of traumatic wet lung before I started this regime, but since then I have seen none.

Intercostal Block in Paradoxical Chest Movement in cases of Multiple Rib Fracture.

I had several such cases where I have tried this method. In no case could I find it possible to control the paradoxical movement neither can one expect this from intercostal block. But all the patients were much relieved so far as pain is concerned; they had increased respiratory amplitude and coughing easier, but paradoxical respiration persisted. In these cases I have used a light bandage like an abdominal binder

tied not too tightly. I find that patient feels comfortable when this light bandage is put on.

It is curious that some sort of fixation occurs in the fractured ends and that paradoxical respiration soon ceases; in my cases I have found that paradoxical respiration generally lasts for three days after which normal rhythm sets in. I am yet to find out how this early fixation is brought about.

I do not think suturing of the fractured ends of the ribs, which has been advocated by Coleman, in these types of cases is necessary nor desirable because in many of these cases the patients are too bad to undergo an extensive operation which necessitates exposure of 4 or 5 ribs and suturing them in more than one place.

Conclusion

After what has been discussed and from the facts of my observation, it appears to the scientific mind that strapping as a method of treatment in cases of rib fracture should be discarded altogether. My cases are few, my points of observation perhaps limited but it points clearly to one and one line of treatment of rib fracture and that is by intercostal block; suturing of fractured ends of ribs is not necessary nor desirable even in cases of multiple fracture.

STUDIES ON VESICAL CHANGES IN GENITAL PROLAPSE IN THE FEMALE*

by CHUNILAL MUKHERJEE, Calcutta.

The commonest variety of genital prolapse in the female is a cystocoele. Until recently a gynaecologist's chief concern has been to study the anatomical supports of the bladder base, and the manner in which the vesical descent is brought about. Functional derangements of the bladder have been known to be associated with cystocoele, but the only one, which has received some attention in recent years is stress incontinence (Kennedy[2, 3], Aldridge[1], Millin[4], Shaw[5]). Other aspects of the anatomy and pathology of the bladder in utero-vaginal prolapse still await systematic study. The present communication is based on a preliminary investigation in this direction. Stress incontinence is not included in this study.

Methods

The present study is based on 186 cases of genital prolapse with cystocoele. Complete investigation for determining the status of the urinary tract was undertaken in all cases. This included cystoscopy, cystometry, intravenous and/or retrograde pyelography, cystography, and estimation of renal function. The study was made on an unselected group of patients admitted in the gynaecological wards of the Nil Ratan Sarkar Hospital for surgical treatment of prolapse. Findings were recorded separately, and compared with the notes obtained during operation only when compilation was being done. This was considered necessary in order to avoid a bias.

Results

Analysis of Clinical Findings. All patients in this series were parous women. The parity varied from 1 to 11, the average being, 4.1 $\pm$ 1.65. The age incidence was as follows:— 20 to 30 years — 73 cases, 31 to 40 years — 54 cases, 41 to 50 years — 37 cases, and above 50 years — 16 cases. Six patients were under 20 years of age.

Vesical prolapse, without uterine descent existed in 23 cases. The associated uterine prolapse in the remaining patients was of the first degree in 41 cases, second degree in 89 cases, and third degree in 33 cases.

The urinary tract symptoms were carefully scrutinised. For obvious reasons overlapping of symptoms was frequent. The frequency of symptoms is presented below.

No symptoms	43 cases.
Dysuria	62 cases.
Stress incontinence	17 cases.
Urge incontinence	59 cases.
Difficulty in the commencement of micturition (Stammering Bladder)	12 cases.
Feeling of incomplete emptying of the bladder	26 cases.
Inability to pass urine unless the bladder base is supported	9 cases.

Bacteriological culture of catheter specimens of the urine was sterile in 97 cases. In 89 patients there was a growth of either a pure culture of E. Coli (81 cases), or a mixed culture of E. Coli, and Staphylococcus (8 cases). Microscopic examination of the organic urinary deposits showed no striking abnormality, except the presence of pus cells in 108 cases, and pus cells and bacteria in 56 cases. The crystalloid deposits showed no unusual features.

The results of the present investigation are presented under two headings.

1. *Anatomical Changes in the Bladder.* Observed through a cystoscope, some anatomical change is invariably observed in every case of cystocele. The simplest change is a descent of the bladder base. When the organ is distended, and is in a static condition three types of sacculation of the bladder base can be observed.

Retro-urethral sacculation. In this condition a small pouching of the trigone occurs just above the internal urinary meatus. In 7 patients in this series (3.1 per cent) this constituted the only change observed by cystoscopy. In all cases the uterus was in normal position, vaginal vault well supported, and the small prolapse was confined to the lower part of the anterior vaginal wall. As the descent of the vagina increases the pouching tends to become shallow, and broad. When complete inversion of the vagina occurs the retrourethral sacculation disappears, and the apical portion of the trigone becomes broadened. The symptoms produced by this type of cystocoele are generally mild. In 2 cases in this group some stress incontinence was present. Both cases showed a widening of the apex of the trigone, and a sagging downwards of the bladder neck. During operation, in retrourethral sacculation, the anterior portion of the pubovesical support is found injured. Stretching, and attenuation of this structure was observed in 4 cases. In 3, it was split in the middle line, and in 2 of these the tear involved the "post-urethral ligament" (Shaw), and the anterior end of the bulbocavernosus. Stress incontinence was present in these 2 cases.

Trigonal sacculation. This condition is associated with a descent of the trigonal portion of the bladder through the anterior vaginal wall. Some degree of trigonal descent is present in most cases of cystocoele of moderate size, with, or without a prolapse of the uterus. Trigonal sacculation alone, in which the portion of the bladder base in front of the interureteric bar shows a depression even in the static state of the organ, was found in 49 cases (26.3 per cent) in this series. The depression is usually shallow, and is as a rule accompanied by an obliteration of the para-trigonal recesses. The ureteric orifices are as a rule displaced, and in a well-marked case can be brought into view only with the cystoscope held at an awkward angle. The inter-ureteric distance is increased, and the tous uretericus is almost horizontal. Frequently, when the detrussor mechanism comes into action, the bladder base behaves in an interesting manner. The following changes were observed.

(i) Thirty-six cases (73.5 per cent in this series). The contraction of the trigonal muscle was slow. The lateral borders stood up as thickened wavy projections, while the central portion became depressed into a furrow. There was an approximation of the base and apex of the trigone. The principal urinary symptom present in these patients was delay in the commencement of micturition, and slow emptying of the bladder. Most patients in this group felt the necessity of pushing the cervix up into the vagina in order to have a normal urinary flow.

(ii) Nine cases (18.3 per cent in this series). The behaviour of the trigone was normal. These patients complained of no urinary symptoms.

(iii) Four cases (8.2 per cent in this series). During detrussor action the contraction of the trigonal muscle was sharp, and attended with a slightly convex elevation of the trigonal area. This was however, of short duration, and gave place to a somewhat relaxed trigone, with a transverse shallowing of mid-trigonal area. The commencement of micturition was quick, and frequently urgent in these cases, but the emptying of the bladder was slow. Straining, and consequent rise of intra-abdominal pressure, was helpful in evacuating the bladder.

The operative findings in trigonal prolapse varied to some extent in the three types of cases mentioned above. The cystocoele, and anterior vaginal wall prolapse were attended with only slight uterine prolapse, which was usually of the first, or early second degree. In the first type of cases the injury consisted of a longitudinal split of the vesical, and pubocervical fascia. The extent of the split varied in different cases, but a fair correlation was observed between the cystoscopic findings, and the severity of the injury to the supporting structures of the base of the bladder. In the second type the lesion consisted of a stretching, and attenuation of the fascial

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supports of the bladder base without any apparent loss of continuity of these structures. In the 4 cases comprising the third type, the findings at operation consisted of a transverse, or oblique rupture of the superficial fibres of the trigonalis muscle, and the fascia covering it. The torn edges of the fascia, and muscle were retracted and rolled in. On dissection of the vaginal wall, this gave rise to the appearance of an elliptical gap, through which the thinned out remnants of the bladder-base musculature was found to protrude. The vesico-cervical ligaments were found intact in these cases.

Retro-trigonal sacculation. In these cases the prolapse principally affects the area of the bladder base behind Mercier's bar. The trigone itself may, or may not show the presence of a sacculation. When trigonal sacculation is absent Bell's muscle shows some amount of hypertrophy, as a result of which the trigonal area is slightly elevated, its lateral margins prominent, and the para-trigonal fossae more distinct. Retro-trigonal sacculation without any descent of the trigone was found in 36 cases (19.3 per cent) in the present series.

Retro-trigonal prolapse is almost invariably associated with a hypertrophy, and congestion of the Mercier's bar. In a well-developed case it may seem to have the appearance of a tight sling dividing the interior of the bladder, as it were, into two compartments. The cause of the hypertrophy of the inter-ureteric bar is not clearly known. The ureteric orifices show some amount of splaying, and the torus uretericus is abnormally prominent. On straining, the trigone tends to descend forward, while the sacculation behind Mercier's bar sags downwards, and backwards. The bladder base seems to acquire a twist and fold up on the inter-ureteric plane. These findings suggest that, the hypertrophy of Mercier's bar is associated with a guy-rope like action of the ureters on the bladder base.

In retro-trigonal sacculation the detrussor mechanism causes a shallowing of the trigonal region with an increase in the posterior, and downward sliding of the retro-trigonal pouch. The para-trigonal fossae become deeper, and Mercier's bar stands out more prominently. During operation the characteristic finding is a disruption of the vesico-cervical ligaments. This causes an obliteration of the anterior vaginal fornix, and an approximation of the lower margin of the bladder to the external os uteri. Frequently the injury to the vesico-uterine ligaments was found to extend laterally, and cause a disruption of the continuity of the pubo-cervical fascia and the McKendrodt's ligaments at this site. This produced a transversely oval opening in the fascial supports of the bladder in this region, through which the organ herniated. A longitudinal, or transverse split of the vesical fascia may be associated with this condition, but this was not present in all cases.

Although these three types of vesical descent have been described separately above, in most cases lesions are combined. In the present series of 186 cases, in 124 (77.5 per cent) such combined lesions were present.

Apart from the descent of the bladder base, there is another change in the bladder wall which is frequently seen on cystoscopic examination. It is trabeculation of the bladder. This is obviously a sign of obstruction in the region of the neck of the bladder. It is not present in all cases, but is present in most cases of long standing prolapse, and in large cystocoeles. All grades of this change was observed in this series of cases. In one of the recent patients the appearance was marked enough to simulate the male bladder with a marked median lobe prostatic obstruction. An almost invariable accompaniment of an advanced case of trabeculation is a clinical feature in which the patient notices that a satisfactory emptying of the bladder is not possible unless the uterus is pushed back, and the bladder base is supported on a finger introduced along the anterior vaginal wall. Forcible straining, without a support on the bladder-base invariably reduces the force of the stream, and sometimes actually stops it. In all of the 81 cases in this series, where trabeculation was pronounced Mercier's bar was also hypertrophied, although in 34 cases in this series hypertrophy of Mercier's bar was not associated with trabeculation of the bladder. In 64 (79.0 per cent), out of the 81 cases mentioned above, a congested muscular elevation was observed on the posterior aspect of the neck of the bladder in the region of the internal sphincter. All patients with trabeculation of the bladder complained of inability to completely empty the bladder, and showed the presence of residual urine. The amount of this varied in different cases, but revealed a fair correlation with the degree of trabeculation of the bladder wall. The capacity of the bladder was also increased in these cases. These changes will be described in detail in the next section.

With the cystoscope in position, if the patient is asked to strain the static changes already described become exaggerated. The bladder base is found to descend. Three types of descent can be observed.

(a) *Troughing of the trigone.* The median portion of the trigone sags down in the form of a longitudinal trough. This appears to cause a drawing up of the lateral edges. In advanced cases, the troughing is so marked that the lateral borders stand out as prominent ridges causing a deepening of the para-trigonal recesses. During operation, these cases are found to be associated with a median split of the vesical, and pubo-vesical fascia.

(b) *Retro-trigonal pouching.* Frequently, this, and the above condition are associated. In 6 cases (3.2 per cent), where retro-trigonal pouching alone was observed, the operative finding consisted of a transverse rent in the utero-vesical fascia near its uterine end, through which the bladder had herniated. Repair of this injury alone restored the normal anatomical conditions.

(c) *Sliding descent.* In this condition the whole bladder base slides down en masse as the intra-abdominal pressure increases. In this condition operation reveals a total disruption of the vesico-vervical ligaments, and a complete loss of continuity of the utero-vesical layer of the pelvic fascia. The pubo-cervical fascia is found detached at its cervical origin, and the continuity between this structure, and the McKendrodt's ligaments is lost.

2. *Functional Changes.* The holding capacity of the bladder was found to be increased in all cases where cystocoele gave rise to symptoms. In gynaecological out-patients' department young parous women are often seen with a somewhat relaxed pelvic floor, but no cystocoele. In 38 such patients, where the bladder capacity was measured, this did not deviate from normal. The normal bladder capacity in women, observed in 258 cases, was found to vary between 275 and 380 ml., with an average of 326.2 $\pm$ 34.5 ml. In the present series of cases of cystocoele, the variability of this value was greater, but the minimum in this group was considerably higher than the maximum in the normal controls. The values obtained were from 488 to 1,465 ml., the average being 638.4 $\pm$ 104.2 ml. The difference between the two is significant. It should be mentioned that in the presence of trigonitis the holding capacity of the bladder is reduced, and this is not an infrequent complication of prolapse. The data presented above are based on the values obtained in 95 cases of cystocoele, where cystoscopic examination revealed no evidence of trigonitis. In order to determine to what extent the anatomical changes in the bladder were responsible for the increase in the distensibility of the organ, a follow-up study was indicated. During the immediate post-operative period the capacity of the bladder was invariably reduced to about the half the normal value. This is obviously due to operative trauma, and frequent post-operative cystitis. Seventy-one patients were examined 3 months after the operation, and of these 61 were found to have no evidences of inflammation of the vesical mucous membrane. In these patients, comparing the values obtained prior to the operation with those obtained during the follow-up examination, it was observed that the holding capacity of the bladder may increase by 60 to 104 per cent

(average 79.8 ± 13.1) owing to the presence of cystocoele. The increase in the capacity of the bladder was most marked in those cases where the lesion was a retro-trigonal prolapse with a sliding descent of the bladder base.

Intravesical tension during the act of micturition was measured by connecting a manometer to one of the canulae of a catheterising cystoscope. In the normal cases referred to above the intracystic tention at the commencement of the act of micturition was 27.5 mm. Hg. ± 2.3. It will be seen that this value compares well with that observed in the male. However, in cystocoele the pressure showed a wide range of variation. The cases can be conveniently grouped as follows.

(i) Group 1. This was a homogeneous group consisting of 59 cases where urge incontinence was a prominent feature. The rise of intracystic tension during the stage of distension was gradual, until the pressure reached a level of 18.7 to 22 mm. Hg. (average, 19.6 ± 1.9). Then, inspite of the rate of distension being the same, there was a sudden increase in the intra-cystic tension, accompanied by a rapid and almost massive emptying of the bladder. Just preceding this event the pressure was found to reach a level varying between 39 and 48 mm. Hg. (average, 43.1 ± 2.6). During the phase of empytying the pressure was maintained at a level slightly lower than the maximum until the bladder was nearly empty, and then there was a sudden drop in the pressure to an almost zero level.

(ii) Group 2. This consists of the remaining 127 cases. The rise of intracystic tension during the phase of distension (the rate of distension being the same as in group 1) was slower than normal. The maximum intracystic tension reached immediately preceding the phase of emptying varied between 28.2 and 39.5 mm. Hg., with an average value of 34.4 ± 3.3 mm. Hg. The intracystic tension was directly proportional to the degree of descent of the bladder, and the duration of the cystocoele. In recent cases with small cystocoele the intracystic tension did not show much difference from normal values. With large cystocoeles of long standing the increase in the intracystic tension was marked, and indicated statistical significance.

An attempt was made to study how the intracystic tension altered after operative correction of the cystocoele. Of the 61 cases referred to above, who were followed up to three months after the operation, the intracystic tension was found to have returned to the normal level in 48. In 6 cases the pressure was slightly higher (+5 to +7 mm.). In the remaining 7 patients the original high level persisted. It may be mentioned here that these last 7 were cases of complete inversion of the vagina, and cystocoele of 7 to 12 years' duration.

The behaviour of the intracystic tension during the phase of emptying of the bladder makes an interesting study. The normal cases referred to above showed that the maximum intracystic tension was reached at the end of the phase of distension, and immediately preceded the emptying phase. This pressure was maintained during the first 10 to 15 seconds of the act of micturition. Then there was a gradual decline of the intracystic pressure until the zero level was reached when the bladder was empty. The nature of the pressure curve in urge incontinence has already been described. The characteristic feature of the pressure curve in cystocoele in the absence of trigonitis is the manifestation of a lack of tonicity of the bladder. It has been stated that the maximum pressure at the end of the distension phase is much higher than that in the normal cases. As soon as the phase of emptying commences the pressure instead of being maintained for a short time falls immediately, and even before a full stream is established. The floor level of this depression is below that at which emptying is maintained in normal individuals. At this stage the intra-abdominal pressure comes into force (manual pressure, or straining efforts), causing the intracystic pressure to rise, and aid the emptying of the bladder. This rise and fall of the intracystic pressure continues until the bladder is empty. This behaviour of the bladder was observed in all cases of cystocoele of more than 5 years' duration, with either a partial or complete inversion of the vagina. With smaller cystocoeles this mechanism of emptying was observed in 74 per cent (94 cases). The feature was most marked in retro-trigonal prolapse with a sliding descent of the bladder.

The sphincter tension, i.e., the pressure which is required to open the internal sphincter was measured by an indirect method. This employed a short canula fitted with an obturator. This was introduced at the external urinary meatus, and connected with a water pump system with a manometer introduced in the circuit. The pressure at which the sphincter opened to allow the passage of water into the bladder was recorded. In the normal casse referred to above the pressure required to open the vesical sphincter varied from 24.5 to 30.5 mm., the average being 26.7 ± 2.1 mm. Hg. In prolapse of the bladder the results can be conveniently classified into three groups.

Group 1. Low Sphincter Tension. This was observed in 17 cases, where the principal associated symptom was stress incontinence. The pressure varied from 18.6 to 23.8 mm., with an average of 21.3 ± 1.7 mm. Hg. It may be pointed out here that on vertical cystography, all of these patients showed broadening and descent of the bladder neck.

Group 2. Normal Sphincter Tension. This was observed in 80 cases in this series. Urge incontinence was present in 51 cases in this group. The sphincter tension varied from 23.8 to 31 mm., with an average value of 27.0 ± 2.4 mm. Hg. Cystoscopic examination showed all varieties of anatomical changes described above, except trabeculation of the bladder wall.

Group 3. High Sphincter Tension. This was observed in 89 patients. The range of values varied between 33.5 and 41 mm., with an average of 37.4 ± 2.9 mm. Hg. In 8 patients in this group the principal subsidiary symptom was occasional retention of urine, with urge incontinence during the intervals. Cystoscopic examination in these patients showed the presence of small pin-head ulcerations on the *juxta-sphincteric* region of the trigone, and on the sphincter ring. The remaining 81 cases in this group showed marked trabeculation of the bladder wall, with considerable increase of the holding capacity of the bladder.

TABLE I

The incidence of dilatation of the upper urinary tract in cystocoele with, and without signs of bladder-neck obstruction.

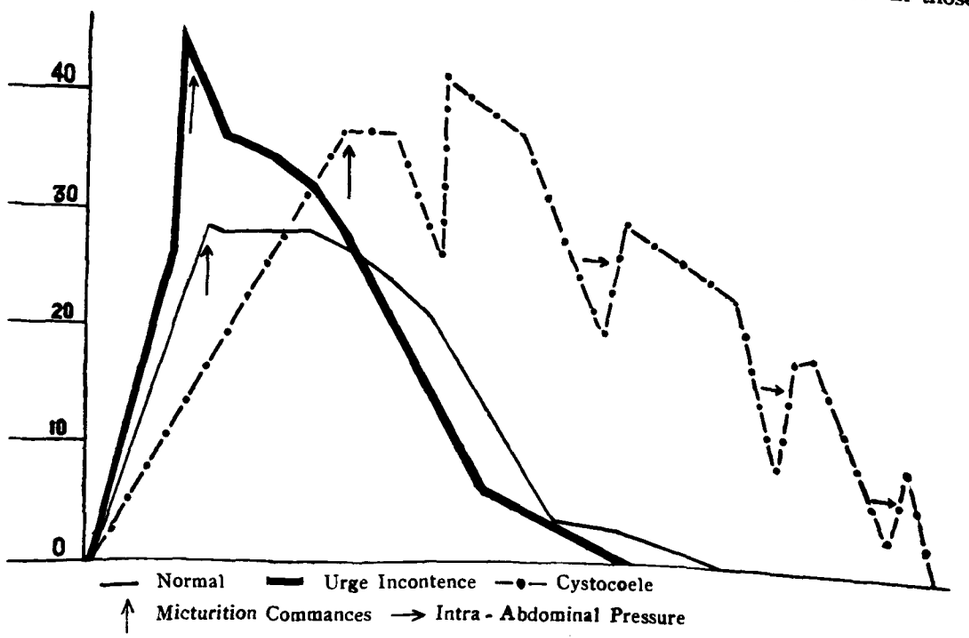
The figures in parenthesis denote the number of cases in each group.

Parity—		1		2		3		4		4+	
Control	...	+ (1)	- (8)	+ (1)	- (15)	+ (4)	- (33)	+ (1)	- (7)	+ (2)	- (9)
81 Cases	...	9		16		37		8		11	
Cystocoele + Bladder-neck Obstruction	...	+ (7)	- (2)	+ (16)	- (0)	+ (35)	- (2)	+ (8)	- (0)	+ (11)	- (0)
81 Cases	...	9		16		37		8		11	
Cystocoele, No Bladder-neck Obstruction	...	+ (1)	- (8)	+ (3)	- (13)	+ (8)	- (29)	+ (3)	- (5)	+ (1)	- (10)
81 Cases	...	9		16		37		8		11	

The arithmatic signs indicate the presence, or absence of dilatation of the upper urinary tract.

Residual Urine. This is not a constant feature in cystocoele. Neither the size of the cystocoele, nor its duration bears any direct relationship to the amount of residual urine. In the present series of cases it was found that as long as the sphincter resistance is normal residual urine is either absent, or negligible (0 to 26 ml.). Where the sphincter resistance is high, the amount of residual urine is big. Between these two factors a significant relationship was constantly observed. Presence of residual urine was associated with two other vesical changes, viz. trabeculation of the bladder, and increase in the holding capacity of the bladder. The direct mutual relationship which exists between these four factors suggests that they are all a part of a symptom complex which points towards the presence of an obstruction in the region of the neck of the bladder. In a previous section it has been pointed out that this symptom complex is associated with the presence of a contractile muscular elevation in the neck of the bladder in very nearly 80 per cent of cases. Work is in progress to determine the role of this structure in causing bladder neck obstruction in the female.

Evidence of bladder-neck obstruction in these patients was further observed in the changes in the upper urinary tract detected by means of pyelography. All patients with appreciable trabeculation of bladder and residual urine showed some amount of dilatation of the upper urinary tract. As prolapse usually occurs in parous women, and as pregnancy normally causes some dilatation of the upper urinary tract, interpretation of these changes require careful control. This was obtained from a pyelographic study of an equal number of women of the same parity without any cystocoele, as well as of those cases of prolapse who showed no evidence of bladder-neck obstruction. Comparison of the results will be possible from the data presented in Table I. A study of these shows a markedly increased frequency of dilatation of the upper urinary tract in those



Superimposed graphs showing the behaviour of vesical tension during the act of micturition in normal cases, and in cystocoele with and without urge incontinence.

cases of cystocoele where signs of bladder-neck obstruction were present.

Urge Incontinence. The functional disturbance in cystocoele which has received very little attention is urge incontinence. In one year the author has come across three cases where plication, and reconstruction of the bladder neck has been done without any relief to the distressing symptom. This symptom constitutes an important feature in some cases of prolapse, and only a careful case-taking can reveal the existence of the condition. This symptom was present in 59 cases (31.7 per cent) in this series. Residual urine *per se* was not found to be related to urge incontinence. It should be noted that while the culture of urine as a rule grows E. Coli, in 8.5 per cent (5 cases) of cases in this series the urine was sterile, and there was no evidence of a tuberculous infection of the urinary tract.

The cystoscopic findings in these cases were characteristic. The trigone showed marked congestion, and vascularity. Frequently flakes of pus, or exudate were found in this area. Telengiectatic dilatation of the capillaries in the region of the neck of the bladder was frequently seen. Occasionally pin-point superficial ulcers were found to affect this area. The sphincter was irritable, and a fibrillary contraction of the muscle ring of the internal sphincter during the introduction of a cystoscope was a common finding. Oedema of the mucous membrane of the bladder with occasional bullous changes was almost constantly observed.

Discussion

Anatomical and functional studies of the urinary tract in the presence of genital prolapse, and cystocoele in the female show that all cases of vesical prolapse are not of the same nature. A correlation between the cystoscopic and operative findings indicates that the nature and extent of the injury to the supporting structures of the bladder vary widely in different cases. This implies that the operative correction of cystocoele must be individualised depending upon the site, and severity of the injury.

The urinary bladder is not merely a passive anatomical structure. It has important functions to perform, — these being, holding, and periodic voluntary evacuation of its contents. The anatomical changes brought about by a descent of the bladder invariably give rise to functional disturbances, which may vary widely in different cases, although overlapping of symptoms is frequent. Functional disturbances apart from stress incontinence have received only scanty attention. Urge incontinence is an important symptom. In the opinion of the author this cannot be always dismissed as a manifestation of an infection of the bladder. Alteration of the anatomy, with passive venous congestion, and oedema plays no less a part in the production of the symptom. Elimination of the vesical infection, when present, does not completely relieve the condition. Proper support of the bladder base is essential for a complete recovery.

The disturbance of the emptying mechanism of the bladder must also be due to a disturbance of anatomical relationship, for this has been found to correct itself when the bladder base is properly supported by operation. The condition which has not been properly recognised is the presence of bladder-neck obstruction in some cases of vesical prolapse in women. The sagging of the bladder-base obviously causes an oedema, and hypertrophy of the structures of the neck of the bladder. This is clearly discernible by cystoscopy. In early cases operative correction of cystocoele causes a retrogression of the condition. But, in advanced cases the changes persist, and the signs of bladder-neck obstruction continue to remain. In these patients residual urine, trabeculation of the bladder, and signs of back pressure in the upper urinary tract may be observed long after the vesical descent has been successfully treated. The author has seen these changes to persist for as long as 5 years after a successful anterior colporrhaphy. The significance of these changes on the ultimate outcome of

the renal functions is obvious. The similarity between this condition, and bladder-neck obstruction in the male is apparent, but the subject demands more elaborate study.

Summary

A study of the anatomical and functional changes in the bladder in 186 cases of female cystocoele is presented. The study was based on cystoscopic and cystometric examination of the bladder, including other investigations relating to the urinary tract. The findings suggest that a proper assessment of the anatomical and functional status of the bladder must be made before an operation for cystocoele is planned.

Acknowledgements

The author takes the opportunity of thanking Principal Dr. A. K. Dutta Gupta of the Nil Ratan Sarkar Hospital, Calcutta for offering every facility for carrying out this investigation. Thanks are also due to Dr. R. Roy Choudhury of the Radiology Department, and to the assistants in the Gynaecology Department of the same hospital without whose co-operation and active help this study would not have been possible.

References

1. Aldridge, A. H.: Am. J. Obstet. & Gynec. **44**: 398, 1342.
2. Kennedy, W. T.: Ibid. **33**: 19, 1937.
3. Idem: Ibid. **41**: 16, 1941.
4. Millin, T.: Proc. Roy. Soc. Med. **40**: 364, 1947.
5. Shaw, W.: Brit. M. J. **1**: 477, 1947.

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DUODENAL DIVERTICULUM

(With a case report of massive haematemesis and malaena)

by K. N. UDUPA, Mandi.

Duodenal diverticulum is a condition which is not very commonly recognised as a clinical entity. Even if it is diagnosed in a patient, one rarely gives much importance to it, since the majority of them do not give rise to any symptoms. However, a few of them can not only produce many digestive disturbances, but also can give rise to some alarming complications such as haemorrhage, perforation etc. which may need some urgent surgical intervention. Therefore, one should always keep these facts in mind whenever one comes across with such a case, or even with a case of haemorrhage or perforation from the gastro-intestinal canal.

Historical aspect (1 & 2)

Chomel is always credited with the first description in 1710 of a diverticulum arising from the duodenum. Thereafter many other observers reported this condition as and when they observed it in the post-mortem room. In 1913, J. T. Case was the first person to publish an instance of Duodenal diverticulum diagnosed during life by means of x-ray and opaque meal. This advance was followed by Forsell and Key in 1915, who diagnosed the duodenal diverticulum correctly by x-ray and then removed the same by operation. Thereafter many other case reports and reviews on this subject have been published of which a few have been quoted in this paper.

Etiology

The incidence of this condition has been described by many authors as a fairly common one and for this, varieties of percentages have been reported depending upon the age of the individuals examined and the care with which a search for them is conducted. Thus the incidence in the dissecting room varied from 3.3% to 16% of the bodies examined to that of x-ray department where an incidence of 0.18% to 5.19% was reported[2]. The difference between the statistics of the dissecting room to that of X-Ray Department can be attributed to the fact that only a minority of the diverticula can be diagnosed radiographically. Certainly the X-Ray examination is the only means of diagnosing this condition with surety in living patients. However, from all the above reports one can safely say that on an average, about 2.5% of persons might be suffering from some type of duodenal diverticulum, out of which only a few are diagnosed in the X-ray department[3]. Most of these diverticula are seen in the latter decades of life, the average age being 55 years in the series of Sprigg's et al[9], although they can also be seen in the young persons occasionally. According to Franks[1] and also in the opinion of Odgers[2] they are more commonly seen in females than males, although Mahorner[3] found it equally in both the sexes.

Pathogenesis & Pathology

There has been in the past much discussion on the classification of this disease. However, the one put forward by Odgers[2] namely primary and secondary, is generally accepted by the majority of people. The primary diverticula are the ones which have no apparent cause for their development. They usually develop on the concave portion of the second or descending part of the duodenum and their wall mainly consists of mucosa and submucosa covered with peritoneum whenever present. They can also occur in the third and fourth portions, but not on the first part. The secondary diverticula are those which have some cause for their appearance such as duodenal ulcers or traction from adhesions of the neighbouring viscera etc. They are usually found in the first part of the duodenum and their wall consists of all the coats.

Because of the presence of congenital weakness in the localised areas of its wall at the places of entrance of blood vessels, the primary diverticula usually develop on the concave side. This localised weakness in combination with increased intra-duodenal pressure due to closed pylorus on one side, may cause rupture of these weak spots and the formation of diverticula. These theories may be further confirred by the fact that they are often multiple, and almost all of them occur on the concave side where the blood vessels enter[6]. Such diverticula may occur in front of the pancreas in which case they are covered by peritoneum. Our only case to be described later belongs to this group. They may also occur behind the pancreas in the retro-peritoneal tissue or may even occur in the substance of the head of the pancreas. Typically they are flask shaped protrusions and they vary in size from a pea to an egg enlarging with advancing age. According to Franks[1], the very large ones are usually found in old people. A large majority of these diverticula are found as empty sacs lying in a bed of areolar tissue in relation to the head of the pancreas; but if they are fairly big and if they lie in front of the pancreas, they may hang down and rest on the transverse mesocolon as was the case in our patient. They rarely become inflamed, because of the sterility of the duodenal contents and the dependant position of their opening into the duodenum. However, those large diverticula whose openings are at a higher level than the fundus, the chances of getting the sac infected from stagnation of their contents are very great with all the accompanying complications such as diverticulitis, peridiverticulitis, ulceration, haemorrhage or even perforation. Sometimes these diverticula may be so big as to enable them to obstruct the passage of food in the duodenum. However, such cases are usually rare.

Clinical Manifestations

There are no definite signs or symptoms which may be called as pathognomonic like a feeling of heaviness or distension after meals, pain in the epigastrum, nausea, vomiting, diarrhoea, etc. Frank[1] has divided these clinical findings into four categories for a better understanding of the problem:—

(1) Symptoms simulating gall bladder disease.
(2) Symptoms simulating peptic ulcer syndrome.
(3) Those of flatulent dyspepsia.
(4) Symptoms simulating colitis.

Here one should also remember that the majority of them are asymptomatic and according to Mahoner[3] only 2% of them are liable to produce some sort of digestive disturbance. Apart from this, there may be some other concomittent disorder of the adjacent organs, like cholecystitis, cholelithiasis, peptic ulcer, appendicitis etc., which are really causing the trouble, the diverticulum of the duodenum being innocent and not giving rise to any symptom. Thus Frank quotes Morten stating "There is always a possibility that the symptoms are due to some other associated pathological lesion, the diverticulum being an incidental discovery." Therefore, before actually blaming the duodenal diverticulum for producing digestive disturbances, one must make sure that there are no other pathological lesions along with it giving rise to such symptoms.

Complications

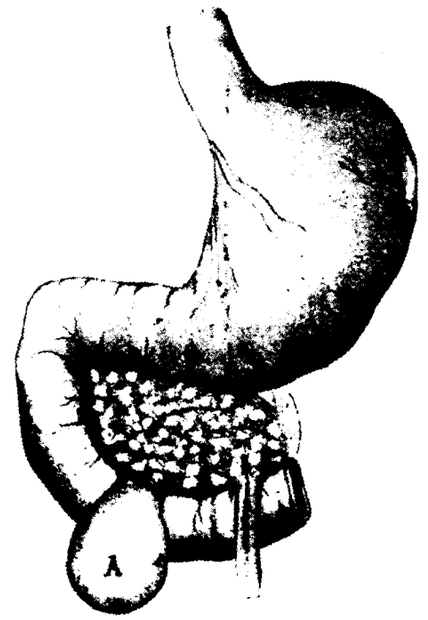
Frank[1] reviewed the following complications of this condition which have been so far reported in the literature:—

(1) Obstructive Jaundice.
(2) Cholangitis.
(3) Acute or Chronic Pancreatitis.
(4) Partial duodenal obstruction.
(5) Diverticulitis or Peridiverticulitis.
(6) Perforation.
(7) Ulcer in the diverticulum.
(8) Malignancy.
(9) Massive haemorrhage.

The occurrence of these complications is comparatively rare, although no one can be sure at the outset as to which one of these patients is liable to get such complications. This means that although these diverticula are harmless in the majority of cases, their presence is a potential danger to one's life. Therefore, we would evaluate the clinical findings of each case and treat accordingly by medical or surgical means as discussed later.

Amongst all these complications, haemorrhage and perforation are the serious ones requiring urgent treatment. Our only patient had massive haemorrhages from the gastrointestinal canal repeatedly. Similarly Spriggs and Marxer[9] reported that 2 of their 18 cases had haematemesis. While Robinav in 1921 recorded a case of a woman aged 39, who, with a history of vague abdominal discomfort for several years, had suddenly a very large haematemesis. On exploration of the abdomen, a pouch was found springing from the 4th part of the duodenum and this was removed. She completely recovered from her illness following this. Mahorner[3] reported that one of his 8 cases, had repeated massive haemorrhage from a duodenal diverticulum. After operation which included both excision of the diverticulum, and partial gastrectomy, the patient completely recovered. Cattle[4] had one such case out of 26, who had severe gastrointestinal haemorrhages and removal of the diverticulum stopped this trouble completely. Thompson[5] also sited a similar case, getting relief completely after excision of the diverticulum. Frank's[1] interesting case with massive haemorrhage, was confirmed only by the clinical and radiological findings.

Here one should also know something about the possible causes of this haemorrhage in cases with duodenal diverticulum. The haemorrhage in such cases, is ordinarily due to inflammation and ulceration of the diverticulum, eroding some of the blood vessels in its wall. Such an inflammation producing diverticulitis or peridiverticulitis can occur more in those cases whose mouths are situated at a less dependant position than the fundus (Fig. 1) so that the contents of the diverticulum are not emptied easily into the duodenum. In such cases, stagnation and putrefaction of its contents may lead to infection and inflammation of its walls. According to Odgers[2] the one situated ventral to the head of the pancreas is more liable to get infected and inflammed than the one situated within the substance of, or posterior to, the pancreas.



A = Diverticulum of the Duodenum.

Fig. 1.

This is a diagramatic sketch of the duodenal diverticulum as was seen in our patient. This flask shaped diverticulum arose from the concave side of the duodenum and then hanged down so as to rest on the transverse mesocolon.

A second cause of haemorrhage in this condition has been described by Cattle[4]. He cited a case who had peptic ulcer due to ectopic gastric mucosa in the duodenal diverticulum. In his case, the peptic ulcer had eroded the blood vessels leading to massive haemorrhage from the gastrointestinal canal quite similar to that of haemorrhage from ulcers of ectopic gastric mucosa in the Meckel's diverticulum. In our case,

the haemorrhage was due to the former cause, namely, inflammation and ulceration produced by stagnation of its contents. Here one should also realise that before reaching a conclusion that this haemorrhage has occured from the diverticulum, one should exclude all the usual possibilities of haemorrhage like peptic ulcer, chronic gastritis, cirrhosis of the liver and other similar common causes, since only a minority of these diverticula give rise to such a haemorrhage.

Diagnosis

Usually the diagnosis is not made by clinical findings alone and only a radiological investigation can show the presence of duodenal diverticulum. It should be remembered that the ordinary method of taking X-Ray picture of the gastro-intestinal canal may sometime fail to reveal the presence of this diverticulum as was the case in our patient and hence the radiologists should keep this condition in mind if the commonly found clinical conditions are excluded by their routine examination. The method of taking X-Ray pictures to detect this condition can be found in any text book on radiography. It consists of making the patient to lie down on the right side after taking the barium meal and to press the upper abdomen by two hands in such a way that the diverticulum is filled with barium if present. After taking the first picture repeated screenings are made and, if necessary, pictures taken, to find out how long the barium is retained in the diverticulum. This latter information is needed in these cases, since it will alter the whole therapeutic approach to the disease.

Treatment

According to Whipple[8] if the diverticulum empties easily as seen in the X-Ray pictures, shows no six hour residue of barium in it and is not tender to direct palpation, then in all probability it is harmless and no therapy is needed. If it retains the barium for more than six hours, is placed dependently as was found in our case, and is tender to pressure, then a standard medical regime meant for peptic ulcers should be given a fair chance to improve the condition. In addition to this, as Spriggs[9] emphasised a postural treatment by which the diverticulum can readily empty should be given every day sometime after meals. Further a lubricant such as liquid paraffin should also be given once atleast to hasten emptying of these sacs, since stagnation may precipitate fermentation, infection and inflammation. Such medicines as will improve the tone of the intestinal musculature e.g. a belladona and allied preparations will also be beneficial to these patients.

If these strict medical regimes fail to give relief to the patients, and if all other possibilities for producing the symptoms are excluded, then the possibility of giving relief by surgical means should be considered. However, when serious complications, such as haemorrhage or perforation occur in these patients then prompt surgical treatment is the only means by which the life of those patients could be saved with certainty. Now, once it is decided that the surgical treatment is needed then the ideal treatment will be to excise the pouch completely and then to carry out an effective closure of the duodenal opening. In some cases in which an ideal closure cannot be obtained, an additional procedure like posterior gastrojejunostomy is also needed to avoid obstruction or fistula formation.

In the actual operation, the main difficulty often encountered is the location of the sac. The sacs situated ventral to the pancreas, can be seen without much difficulty. But those, which are situated in the substance of the pancreas or behind it, are difficult to locate. To overcome these difficulties, there are two procedures which may help. The first procedure is to inflate the sac by injecting air into the duodenum through a needle and this procedure has been advocated and practiced by Mahorner. The second method was suggested by R. Graham[7] who advises to incise the duodenum boldly, to put the finger into the diverticulum and to invaginate it. Whenever such a procedure is carried out in the vicinity of the common bile duct, one should

see that no injury occurs to this important structure during dissection. All these procedures are not needed if the sac is ventral to the pancreas in which case the sac can be indentified easily. After dissecting it from the surrounding structures, the neck is clamped close to the duodenal wall and the diverticulum excised either from inside or from outside. After excision of the diverticulum one should try to close the wall of the duodenum as snugly as possible by two layers of sutures. This suture line is further strengthened by approximating the posterior peritoneum if present or by suturing the surrounding areolar tissue. Thereafter the abdomen is closed without putting any drainage tube.

By following the above technic and precautions, Mahorner[3] treated 8 such cases with no mortality, and with good results in 6 cases. Cattle[4] reported 26 cases, out of which only 18 did well. It has been emphasised by many observers that, in all about 75% of the cases so treated do well while the remaining continue to complain of vague abdominal discomfort, or show some other abdominal trouble. Our only case has been of great interest to us, not only from the diagnostic point of view, but also from the point of view of development of complications in such cases because after the excision of the diverticulum she got complete relief from her longstanding trouble of attacks of haematemesis and malaena for the last three years.

CASE REPORT

Mrs. R. a Hindu female, aged about 35 years was admitted to the Civil Hospital, Mandi with the chief complaint of passing of tarry stools and repeated attacks of vomiting of blood since 3 years. She was keeping perfectly normal health before 3 years, when one day suddenly she vomited a large quantity of blood. This was followed by passing of frequent black tarry stools for a few days. This attack weakened her very much. However, by some medical treatment she regained her lost health to some extent. Since then she used to pass black stools every now and then. About two years back she also noticed a small lump in the right lumbar region, which was freely moveable in the abdomen and which occasionally used to give her severe pain. About two months back she again got an attack of vomiting of blood lasting for about six days. During this period, she vomited about 4 to 6 ounces of blood every day and also passed black stools 6 to 8 times a day. This weakened her considerably and hence she sought medical advice in a hospital. At that time, the Medical Officer, who examined her, found that she was very anaemic and pale with hardly 30% of haemoglobin in her blood. She was also found to be having oedema all over the body. He treated her conservatively by giving large doses of iron and liver extract, since he had no arrangements for blood transfusion. When she regained her health slightly, he referred the patient to us for further investigation and treatment. Even at the time of admission to our Hospital she complained that she passed black stools every day.

There was nothing special in the past or family history. She had seven normal deliveries, out of which 6 children are living and well. She never suffered from any other serious illness. She is the wife of a farmer and is in the habit of doing very strenuous work every day in the fields.

On physical examination, she was found to be very anaemic and pale with puffiness in her face. Her pulse was 80 P.M. and B.P. 105|65 mm. Hg. On examination of her abdomen, a lump, the size and shape of an egg could be palpated in the right lumbar region which was also fairly moveable in the abdominal cavity. The lump was also tender on pressure and was firm in consistancy. It had a smooth and regular surface, and no other lumps or glands could be palpated all over the abdomen. Liver and spleen were normal. All other systems including heart and lungs were found normal, except in the pulmonary area of the heart where a distinct haemic murmer could be heard.

Laboratory examination showed an R.B.C. count of 3.00 millions and haemoglobin percentage of 55%. The stool examination revealed a large number of R.B.Cs and leucocytes. There were no ova or cysts in the stools on repeated examinations. The X-Ray examination of the stomach and duodenum after barium meal did not show any evidence of gastric or duodenal ulcer nor could we find any evidence of tumour in these regions. The X-Ray screening of the colon after barium enema also revealed nothing except that the transverse colon near its hepatic flexure was displaced downwards by the lump.

On the above findings a diagnosis of benign tumour of the small bowel either in the lower part of the duodenum, or in the upper jejunum was made. However, a possibility of a tumour arising from some other organ in the abdomen and eroding the bowel wall was also kept in mind. After preparing her carefully by giving a large amount of vitamins, liver extract and iron, for about 10 days, an exploratory laparotomy was performed by a right paramedian incision. It was found that the lump could be easily reached through an incision on the transverse mesocolon at its right side. Hence the transverse colon was lifted up and an

incision was made on the transverse mesocolon at the area of the lump. The lump was then gradually separated from its surrounding structures. On further exploration it was detected that the lump was arising from the medial border of the descending or 2nd part of the duodenum. The head of the pancreas could be seen just medial to the origin of the lump. After separating it completely from the surrounding structures, it was cut close to the duodenal wall. The defect in the duodenal wall was then closed by two rows of continuous sutures with fine catgut. These sutures were further strengthened by suturing over them the surrounding areolar tissue. At this stage it was noticed that there might be some narrowing of the lumen of the duodenum which may obstruct the passage of food. Hence a posterior gastrojejunostomy was also performed to avoid the development of duodenal obstruction. Then the abdomen was closed layer by layer as usual.

Following this, she had a fairly smooth post-operative course and she recovered completely from her illness on the 10th post-operative day. Thereafter she never vomitted any blood or passed any blood in the stool.

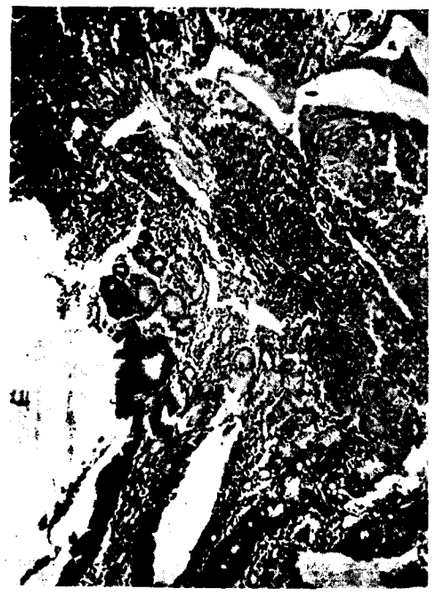


Fig. 2.

This is a photomicrographic picture of the duodenal diverticulum removed by operation. In this one can see the inflammatory changes with ulceration in the mucosa and submucosa with notable thickening of the serous layer. One can also note the absence of muscular layer in the diverticulum which is the characteristic sign of primary duodenal diverticulum.

Pathological examination of the specimen: Grossly the specimen was oval in shape measuring about 1½" x 1" in diameter. Its external surface was fairly smooth. But internally the mucosa was found ulcerated in many places and its lumen was snugly filled with many old and organised clots and also fresh ones. The pathologist's report reads as follows after the histopathological examination of the specimen (Fig. 2). "The tissue on section shows ulceration of the duodenal mucosa and notable thickening of the serosa. Submucosal fibrosis and round cell infiltration of the duodenal wall is a notable feature. There is no evidence of hyperplasia of glandular elements or of malignancy in any of the sections examined."

Therefore it was concluded that the case was one of duodenal diverticulum with inflammation and ulceration of its mucosa giving rise to massive haematemesis and malaena.

Discussion

The interesting feature in this patient was that she had no other digestive disturbance than the haemorrhages, and she used to pass black stools almost everyday. It was also interesting to note that she felt this painful lump in the abdomen recently, when probably diverticulitis and peridiverticulitis developed. Before this, although she bled through this source frequently, it seems, the inflammation and ulceration was limited to the mucosa only. As already stated, the dependant position of the fundus of the diverticulum in our case (Fig. 1) might be primarily responsible for the incomplete evacuation of its contents leading to stagnation, putrefaction and infection of the wall of the diverticulum.

Unfortunately since we never thought of the possibility of this disease preoperatively, we did not carry out the specialised radiological investigations to detect this condition radiographically. Hence we failed to reach to a correct diagnosis before hand. During the operation, because the sac was situated ventral to the pancreas, a complete excision of the sac was easily accomplished. However, due to the presence of diverticulitis and peridiverticulitis, very effective closure of the defect in the duodenum after the excision of the sac could not be obtained. Hence a posterior gastrojejunostomy was also performed in our case. By all these procedures she had an uneventful recovery on the 10th post-operative day. It is now two years since she was operated upon for this condition and she is found leading a completely normal life till now with no trace of blood in the stool and no vomiting.

Summary

(1) A case report of duodenal diverticulum giving rise to massive haematemesis and malaena has been given in detail.

(2) Duodenal diverticulum is not an uncommon disease as such, and in an average about 2.5% of the people might be suffering from this condition. But only a minority of these patients (2%) are liable to get some digestive disturbances and the rest of them are symptomless.

(3) Therefore, active treatment should be given to only those diverticula, which are really the trouble makers, and which fact can be ascertained by various examinations and also by a process of exclusion. Immediate surgical treatment is needed in cases with complications such as haemorrhage or perforation of the diverticulum.

(4) Various surgical procedures have been described by which the excision of the sac can be accomplished without much difficulty.

References

1. Frank, L. L.: Primary Duodenal Diverticula. Rev. Gastroenterol. **11**: 179-189, 1944.
2. Odgers, H. N. B.: Duodenal Diverticulosis. Brit. J. Surg. **17**: 592-618, 1930.
3. Mahorner, H.: Diverticula of the Duodenum. Ann. Surg. **133**: 697-707, 1951.
4. Cattle, R. B.: In the Discussion of the paper of Mahorner (Ref. No. 3).
5. Thompson, M.: In the Discussion of the paper of Mahorner (Ref. No. 3).
6. Ian Aird.: A companion in Surgical Studies. Edinburgh. E. & S. Livingston Ltd. 1949. Pp. 653.
7. Graham, R.: Bancroft & Wade's Surgical treatment of the abdomen. Philadelphia. J. B. Lippincot Co. 1947.
8. Whipple, A. O.: Christopher's Text book of Surgery, Fourth Edition. Philadelphia & London. W. B. Saunder's Company, 1945. Pp. 990.
9. Spriggs, E. J. and Marxer, O. A.: Intestinal Diverticula. Brit. M. J. **1**: 130, 1926 quoted by Frank (Ref. No. 1).

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CONGENITAL MALFORMATIONS

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Congenital malformations exact a high foetal and neonatal mortality. The recorded incidence of congenital malformations upto date account for from 5—20% of foetal and neonatal deaths. Murphy[26] in his exhaustive monograph on congenital malformations recorded 6.8 malformed children per 1,000 amongst 130132 registered births. He observed that congenital anomalies were 5.5 times more frequent in still births than in the live born. From a statistical study undertaken by him, he concluded that a mother who has given birth to a malformed child runs the risk of conceiving another malformed foetus 24 times more than one who gave birth to a normal infant. A 5-year period of apparent sterility in the mother follows the birth of the malformed infant. The mother of a malformed child is often fortunate in giving birth to normal infants before another malformed infant is born. Congenital anomalies are more common in couples of second marriages owing to the advanced age of the parents and it has been observed that some congenital malformations of the central nervous system occur with the increasing age of the mother.

The aetiology of congenital anomalies is obscure. But observations on human beings and experimental study on rats by many have led them to postulate that both environmental and genetic factors influence adversely the fertilized ovum in the first 2 months of gestation. The finding that the malformations are more frequent in the economically low status people has led to suggest insufficient diet and vitamin deficiency as some of the probable causal factors. Murphy[26] recorded that 40% of mothers of malformed infants were on inadequate diets and 61% were anaemic. Warkany[37] and co-workers found, in rats raised on diets deficient in vitamin A, malformations of the limb bones, defects in the diaphragm, eyes and genito-urinary tracts and anomalies of the cardiovascular system. He concluded that deficiency of vitamin A directly affects foetal tissues. Riboflavin lack in rats accounted for defective development of bones. The siblings born to folic acid deficient mother rats were hydrocephalic. Although the experimental study of Warkany and others indicate insufficient diet as a probable cause of malformations, extensive study in the human by Murphy lacks evidence in support of it. 85% of anencephalics are females while a great number of hydrocephalics are males. Sex and seasonal incidence of congenital anomalies are only fortuitous coincidences.

Sedgwick in 1861 cited instances of the role of psychological trauma in the incidence of congenital malformations.

Gillman[10] by injecting trypan blue in the early stages of pregnancy produced evidence in favour of toxic factors as causal agents of congenital anamolies. Gregg[13] in 1941 pointed out that maternal rubella accounted for cataract and anomalies of the heart in the newborn. It is now believed that if rubella is contracted within 8 weeks of gestation, the infant born is invariably malformed. The virus of rubella probably attacks differentiating cells and either inhibits or interferes with cell differentiation.

Although the role of maternal irradiation adversely influencing the foetus is much disputed, Russel[34] and Russel (1952) have asserted that the developing embryo of a great variety of animal forms including mammals is highly susceptible to the induction of malformations by irradiation and that it applies to human embryos. They are of opinion that the 2nd to the 6th week of gestation is the critical period and that doses within the range of diagnostic fluoroscopy may cause subtle developmental alterations in the human. (less than 25r) Adverse effects of irradiation on the embryo may occur at a stage when pregnancy is unsuspected. Murphy[26] in 1947 is credited with having induced microcephaly in an infant by therapeutic doses of pelvic irradiation of the mother.

Hydramnios, oligohydramnios and amniotic adhesions are usually associated with malformed foetuses. Macafee[20] found associated foetal anomalies in 45.9% of his cases of hydramnios. Mengert[23] et al are of opinion that in atresia of oesophagus or duodenum, obsorption of fluid by the intestinal tract may be prevented, accounting for hydramnios. Angevine's[1] observation that the exposed and hyperplastic choroid plexuses in anencephalics secrete fluid which escapes into the amnion may alone account for hydramnios and no other anomaly could account for hydramnios by any probable mechanism. Agenesis of the kidneys may be associated with oligohydramnios, as one source of amniotic fluid is thereby deprived.

In cases the unfortunate mother of a malformed child is an elderly multipara and is a subject of hydramnios, a radiogram is warranted to exclude any possible malformation in the foetus. Malformed foetus is one of the important causes of dystocia. Antenatal recognition of it will avoid the necessity to have recourse to mutilating foetal operations and the mother may be saved from exhaustion of a prolonged labour by an elective caesarian section in some cases at least. Landesman[18] recorded 13 malformed infants in 140 caesarian sections.

80% of the malformed infants die within the first year of birth. Anomalies of the gastrointestinal tract and congenital defects in the diaphragm are amenable to surgical treatment, provided they are recognised and treated soon after birth. Congenital malformations, however, represent goods damaged in manufacture and research is bound to disclose the causal factors and medical science may be in a position to prevent the development of these anomalies

Methods and Materials

Out of 1446 deliveries conducted at the King George Hospital, Visakhapatnam from November 1950 to March 1952, 183 foetal and neonatal deaths were encountered. 14 of these were malformed.

Total No. of deliveries	Malformed foetuses	Percentage of malformations
1446	14	0·98

Table 1

Total and percentage incidence of malformations amongst foetal and neonatal deaths.

Table 1

Nature of death	No.	No. malformed	percentage
Neonatal	73	5	6 9
Still birth	110	9	8·1
Total	183	14	7·6

Of the 183 foetal and neonatal deaths 110 foetal and 52 neonatal deaths were autopsied and this includes 14 malformed infants. Miller recorded only 12 foetal anomalies in 1107 neonatal and foetal deaths.

Table 2

Comparative incidence of congenital anomalies in still births.

Table 2

No. Reviewed	% with the anomaly	Source of data
435	20 9	Philadelphia
614	10 6	Edinburgh
221	10·0	Chicago
530	8·3	Belfast (1940–50)
110	8·1	*Visakhapatnam (1953–52)

TABLE 3

Comparative incidence of congenital anomalies per 1,000 live births and % deaths as a result of anomaly are given.

TABLE 3

No. in group	Incidence of fatal cases per 1000 births	% of total deaths	Source of data
7,599	5·4	20·1	Edinburgh 1943–'45
27,125	2·3	11·3	Chicago 1931–'41
1,356	53·1	9·9	*Visakhapatnam 1950–'52

TABLE 4

Summary of findings of the 14 malformed infants and their mothers.

Autopsy findings of 12 of the malformed infants and obstetric history of respective mothers are recorded below.

ATRESIA OF THE OESOPHAGUS

Atresia of the oesophagus formed 1% of 935 foetal anomalies reviewed by Murphy[26]. He observed 10 cases of oesophageal atresia in 139 anomalies of the gastro-intestinal tract. It is the commonest and most serious congenital abnormality of the alimentary tract. Franklin[9] in 1947 and Grey Turner in 1949 suggested an incidence of 1 in 2500 births. We found

TABLE 4

S. No.	Case No.	MOTHER Age	MOTHER Parity	Sex	Term	NATURE OF DEATH Foetal	NATURE OF DEATH Neonatal	Nature of Anomaly
1	1	22	primi	M	F. T.		survived one day	Atresia œsophagus.
2	149	30	8th	M	premature	still birth		Atresia œsophagus.
3	128	25	5th	M	F. T.		survived 15 minutes	Atresia intestine complicated by meconium peritonitis.
**4	28	24	4th	F	F. T.	still birth		Multiple cysts liver & kidneys associated with foetal hydrops.
5	108	23	4th	F	premature	macerated		Polydactylia.
6	102	25	3rd	?	premature	still birth		Exomphalus.
7	115	22	primi	M	premature	still birth		Diaphragmatic hernia-left & umbulical hernia.
8	138	25	9th	F	F. T.		survived 15 minutes	Diaphragmatic hernia-right sided.
9	37	22	2nd	M	premature	still birth		Multiple congenital arthritic regidities & bilateral club feet.
**10	152			F	premature	still birth		Multiple congenital arthritic deformities, cystic kidneys & bilateral club hands & feet.
**11	12	18	primi	M	F. T.		survived 10 minutes	Bilateral polycystic kidneys, inencephalus & polydactylia.
12	96	20	3rd	F	F. T.	perforated		Hydrocephalus with spina bifida.
13	7	35	6th	M	premature	still birth		Anencephalus.
14	26	3	2nd	M	F. T.		survived 1½ days	Archnoidal cyst brain.

* Authors series. ** Anomalies in more than one system observed.

n 1446 deliveries and this is in agreent with the suggestion of 1 in 800 made Belsey and Donnison in 1950. Oesageal atresia in the live born is recoged by observing persistent cyanotic tinge l dribbling of saliva. Unsuccessful empts to pass a catheter into the oesagus and visualising a blind end on ipoidal" x-ray shadow confirms the cial suspicion. In a review of 24 cases of esia of oesophagus Roswell K. Brown[33] al recorded only 4 survivals. If the conion is recognised soon after birth before ious infection of the lungs and dehydran have set in, prompt surgical intervenn affords permanent relief, inspite of prolonged anaesthesia and long and tedious reparative processes. Height[16] in 1944 reported the first case of successful surgical anastomosis of oesophagial atresia. Franklin[9] in 1947 recorded 2 successful surgically treated cases. Since then there have been several as yet unpublished successes.

Fig. 1.

Fig. 2.

Fig. 1. Case report 1. Atresia Oesophagus. The blind terminal end of the incised oesophagus is well seen. The probe is seen passing through the larynx and out of the incised stomach.

Fig. 2. Case report 2. Atresia Oesophagus shows the blind end of oesophagus and the probe in the larynx emerging out of the stomach.

Case report 1:

K. B. Primipara, aged 22 on 12-12-50 (the day of hospitalization) had B.P. 120|50 m.m.Hg. and 50% haemoglobin. A.T. forceps was applied to over come delay in the 2nd stage of labour — foetal distress being the indication. A male live born infant was extracted. The infant regurgitated the feeds given. The infant survived 24 hours.

Main Autopsy findings: (P.M. No. 1.)

The infant weighed 5 lb. 4 ozs. The oesophagus was unusually thick walled and was an inch long with a blind terminal end. Probe passed through the larynx was felt in the stomach (Fig. 1). The atresia of the oesophagus observed in this case is similar to that of "Vogt's type b" — tracheo-cesophageal fistula.

Diffuse haemorrhages in the subpleural spaces, liver and kidneys and congestion of meninges and spleen were observed, all of which were in favour of extrinsic anoxia as the immediate cause of death.

Case report 2:

K.M., 8th para, aged 30 on 22-1-52 sought medical aid for bleeding per vagina. All her children are alive. Breech was noticed at the outlet. Foetal heart was not audible. She gave birth to a dead male child.

Main Autopsy findings: (P.M. No. 149.)

The foetus weighed 4 lbs. 12 oz. Oesophagus showed atresia anatomically similar to that reported in case 1 (Fig. 2). Diffuse haemorrhages of subpleural and subpericardial spaces, liver, kidney and soft tissues of the cranium and congestion of meningeal vessels were noticed. These findings are consistent with extrinsic anoxia as cause of death. Foetal distress in breech presentation accounted for the intrauterine death due to anoxia in this case.

ATRESIA OF INTESTINE

Murphy[26] found 7 cases of atresia of small intestine in 139 anomalies of the gastro-intestinal tract. This accounted for less than 1% of 935 foetal anomalies recorded by him. Webb and Wangesteen in 1931 in

their review of 500 cases of intestinal atresia recorded only 9 survivals. Meconium peritonitis and ascites are the chief complications of atresia of intestine. Infants suffering from intra-uterine *meconium* peritonitis are either dead or born alive. In the latter case symptoms of intestinal obstruction, peritonitis and *ascites* are manifested either soon or some hours after birth and progress to a fatal termination unless remedied by surgical measures. In a third of *these cases* atresia is encountered in the duodenum. Recovery rate of intestinal obstruction due to atresia in surgically treated cases is 15%.

Case report 3 :

Ch. S., multipara sought medical aid on 26-10-51 for fever. Uterus was 38 weeks size. B.P. 132|100 m.m.Hg. Haemoglobin 60%. *Both the* patient and her husband were Rh + ve. On 27-10-51 she delivered a live male child. The infant survived only for 15 minutes.

Main Autopsy findings : (P.M. No. 128.)

Ascites was a significant feature. Greenish plastic exudate with white and brownish plaques was masking the intestine from view. The loops of intestines could *not* be separated owing to dense adhesions. Microscopic study of sections of intestine taken at random revealed organising exudate with areas of calcification and pigment laden *histiocytes* over the *serosa* (Figs. 3 & 4). Perihepatitis and massive subdural haemorrhage were noticed. The liver was in contact with the anterior abdominal wall.

The *gross* and microscopic findings in the intestines with the plastic exudate are consistent with the diagnosis of "meconium peritonitis". Meconium peritonitis is often the result of atresia and perforation or infarction of the intestine. Owing to dense matting of the intestine and the lack of technical assistance to provide serial sections of bowel we were unable to locate the exact site of atresia.

Multiple Cysts of Liver

Multicystic disease of the liver is a rare developmental anomaly. Murphy observed anomalies of the bile duct system in less

Fig. 3.

Case report 3. Meconium Peritonitis. Organising exudate is seen over the serosa of the intestinal wall. (H & E x 100).

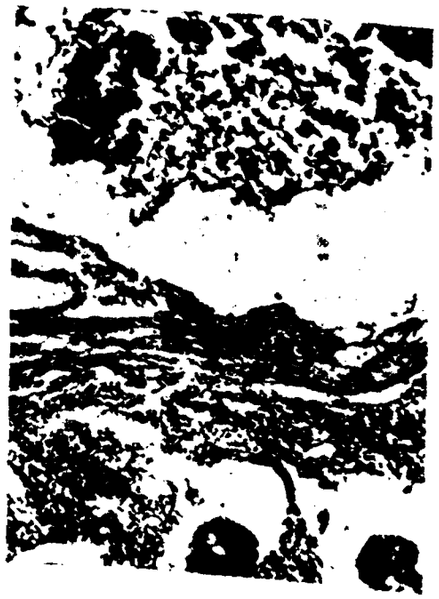

Fig. 4.

Case report 3. Meconium Peritonitis. Areas of calcification (top right corner) and pigment laden histiocytes seen over the serosa of intestinal wall. (H & E x 100).

than ½% of 935 foetal anomalies recorded by him. The pathogenesis of these cysts are imperfectly understood. Malformations of smaller bile ducts and their failure to gain access to larger ducts is presumed to account for the cystic dilatation of the ducts. It is invariably associated with multiple cysts of the kidneys as was observed in the case recorded below.

Case report 4 :

A 4th para aged 24, delivered on 13-3-51 a female still born foetus. First three of her children are alive.

Main Autopsy findings : (P.M. No. 28.)

The foetus weighed 8 lbs. and was pale and waxy looking. Water-logging of the soft tissues and serous cavities enabled us to label the condition "Foetal Hydrops". Sectioned surface of liver presented multiple cysts of varying size with smooth lining and plugged with gelatinous material (*Fig.* 5). *Cystic dilatation and proliferation* of bile ducts with extensive periductal fibrosis was a feature (*Fig.* 6). No ectopic foci of erythropoiesis were observed. Multiple cysts of the kidneys were noticed on *sectioned surface.*

The multiple cysts of the liver and kidneys were certainly not the cause of the foetal hydrops observed in this case.

Exomphalos

The reported incidence of Exomphalos is 1 in 5,000 deliveries. Margulies[21] in 1945 reported a successful surgically treated case of exomphalos. Ladd and Gross in their 22 cases, recorded 75% survivals with a defect less than 8 cms. Surgical repair as soon as possible saves the life of the exomphalic infant. It is a malformation of the supraumbilical part of the abdominal wall and the structural defect usually arises by the 3rd week of embryonal development. It is often formed due to disparity between the size of the abdominal viscera and the abdominal cavity resulting from a *retarded* development of the abdominal parietes.

Case report 5 :

A., 3rd para, aged 25 on admission (14-8-51) had a B.P. of 90|60 m.m.Hg. and 55% haemoglobin. Uterus was of 28 weeks' size. Foetal heart? oblique lie. On 15-8-51 she gave *birth* to a still born foetus. Her first child died on the 10th day of neonatal life and the *second child is alive.*

Main Autopsy findings : (P.M. No. 102.)

No external genitalia could be made out. The *lower limbs* were extended at the hips, legs were

Fig. 5.

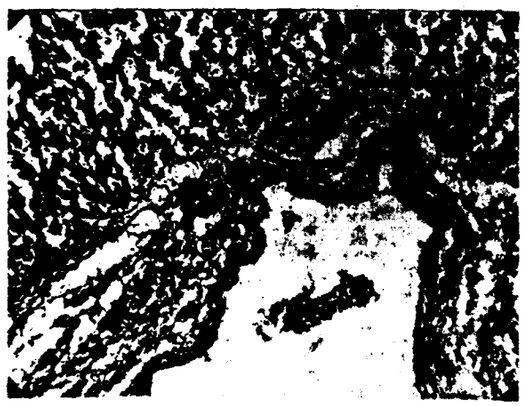

Fig. 6.

Fig. 5. Case report 4. Multiple cysts of Liver. Sections of liver and kidney show multiple cysts of varying size and shape.

Fig. 6. Case report 4. Multiple cysts of Liver. Part of the cyst wall of one of the dilated and distorted bile ducts is seen. (H & E x 100).

directed towards the back and were touching the vertebral column. Just cranial to the navel was seen a gap in the abdominal wall through which a part of the liver and loops of intestines were exposed to the exterior (Fig. 7). The autopsy findings confirmed the clinical diagnosis of exomphalos. This was the only case encountered in 1446 deliveries.

Congenital defects in diaphragm

Vannesson[36] in 1912 reported 34 cases of congenital diaphragmatic hernia in the newborn. In all of them the defect was recognised at autopsy. 2 years later Broca[4] gave accurate autopsy descriptions of the same and indicated 90% mortality. In 1927 Woolsey collected 106 cases from the literature and recorded 71% mortality in 1935. Truessdale[35] operated on 10 cases with a single death. Wyatt[38] in 1941 reported 3 operated cases in the immediate neonatal period with one death.

Landesman[18] observed a case of diaphragmatic hernia in his series of 13 congenital anomalies. Out of 5269 autopsies in still birth and infants upto a year, 38 died of hernia of diaphragm in Minnesota, an autopsy incidence of 1 in 139.

Potter found diaphragmatic hernia in 70 out of 1700 infants, 53 of them were live born and 17 still born. Of these 10 were out of 2100 deliveries from a lying in hospital where 95% of the dead babies are autopsied. Truesdale[35] reported that in 165 out of 303 diaphragmatic hernias of children, the defect was disclosed at autopsy. The high mortality rate makes clinical recognition difficult and 50% die during the first few hours of life permitting insufficient time for clinical observation. 7 of the 9 infants reported by Liebow died within 27 hours of birth and 4 of them survived only 4 hours. 43 of 82 cases recorded by Greenwald[12] and Steiner were either still born or dead within 24 hours of birth.

Weak cry and grunting laboured respiration with cyanosis soon after birth or a few days later, initiated by ingested food or drink should rouse the suspicion of the clinician of diaphragmatic hernia. Gurgling noises in the chest on auscultation and the finding of displacement of the apex beat to the right of median line in defects of the left half of diaphragm and x-ray confirmation of displacement of the organs and visualising pockets of gas in the chest confirm clinical suspicion. It pays well to bear in mind diaphragmatic hernia as a likely cause of respiratory embarassment in the newborn. Diaphragmatic hernia is no longer a medical oddity, and recognised early treatment is imperative as surgery offers a permanent cure. The operation done soon after birth or within the first few days of the neonatal period is bound to make the patient survive.

Congenital defects in the diaphragm are more frequent on the left side. The persistence in patency of the pleuro-peritoneal foramen beyond the 7th and 8th week of intrauterine life is responsible for congenital hernia of the diaphragm.

Case report 6 :

Y.G.H. Primipara, aged 22 was admitted into the hospital on 4-9-51. Said to have suffered from fever during the 2nd and 3rd months of pregnancy. Uterus 32 weeks' size. Foetus alive and head was floating. She delivered a deeply asphyxiated male infant. Artificial respiration supplemented with O_2 was of no use.

Main Autopsy findings : (P.M. No. 115.)

The foetus weighed 3 lbs. 10 ozs. Bilateral club feet and hands was observed. Umbilical hernia was seen (Fig. 8). Abdominal incision revealed the left lobe of liver occupying the left pleural cavity ; the collapsed lung was in close contact with the herniated portion of the liver. The stomach, duodenum and the splenic flexure and part of the descending colon were in the left pleural cavity. The heart was displaced to the right of the median line and the right lung was hidden from view by the heart. The umbilical hernia was made up of loops of small intestine. The left half of the diaphragm was deficient while the right half was well developed.

The male infant presented multiple congenital anomalies — club feet and hands, and umbilical and diaphragmatic herniae associated with dextrocardia and hypoplasia and collapse of lungs.

Case report 7 :

P.K. 9th para, full term sought medical aid for oedema of the legs on 22-11-51. Hydramnios was clinically recognised. She delivered a female infant on 23-11-51. The infant survived for 15 minutes.

Main Autopsy findings : (P.M. No. 138.)

The infant weighed 6 lbs. Abdomen was markedly distended with straw coloured fluid. The liver was deformed and half of its right lobe was found in the deepened and widened right pleural cavity which was filled with clear fluid. The right lobe of the liver showed a "W" shaped deep fissure as it crossed the right pleuroperitoneal membrane was devoid of muscle tissue. The contribution normally made by the septum transversum in the development of the anterior portion of the diaphragm was wanting. The collapsed bell shaped right lung was seen near the median line. The heart was displaced to the extreme left and behind the heart was the stretched out and collapsed left lung hidden from view (Fig. 9). Perihepatitis was observed. Other organs were normal.

Autopsy findings in one case each of congenital diaphragmatic hernia of right and left are described. Two in 1446 deliveries add support to the fact that congenital defects in the diaphragm are not rare.

Stress is laid on the morbid condition being recognised during the neonatal period so that the ectopic viscera in the thorax could be returned to the abdomen and the defect in the diaphragm repaired and thus the life of the infant saved.

Multiple Congenital Arthritic Rigidities

James[17] in 1951 reviewed the literature regarding multiple congenital arthritic rigidities. According to him Otto in 1841 is said to have recorded the autopsy findings of the morbid condition. He observed hypoplasia and/or aplasia of muscles with symmetrical distribution. In 1899 Phocas reported autopsy findings in a single case. Since then several reports in the live born infant have appeared and some of them have lived up to chilhood. The aetiology of this morbid condition is still obscure and

Fig. 7. Fig. 8. Fig. 9.

Fig. 7. Case report 5. Exomphalos. The abdominal viscera are seen exposed owing to deficient abdominal wall.

Fig. 8. Case report 6. Diaphragmatic Hernia (left). The left lobe of the liver is in the left pleural cavity. Umbilical hernia dextrocardia and the hypoplastic lungs are seen.

Fig. 9. Case report 7. Diaphragmatic Hernia (right). The widened and deepened right pleural cavity. The deformed left lobe of the liver was seen occupying this space. The heart is seen pushed to extreme left.

one opinion is as good as another. Oligohydramnios is frequently associated with the anomaly. Stern is of opinion that it is the result of intra-uterine compression and foetal periarthritis. Sheldon (1932) believed that the contracture of the muscles is secondary to hypoplasia or deficient muscle mass. Howard and Middleton are of opinion that it is due to primary degeneration of muscle bundles and that inflammatory cells are conspicuously absent. Price[30] and Brandt without hesitation place the primary lesion in the spinal cord, the muscle involvement being secondary, inspite of the fact that no reaction of degeneration of muscle was observed. Warkany in 1941 expressed the view that it may be due to copper or riboflavin deficiency while Maranon thinks that the Eutrophic centre in the hypothalamus may be adversely affected by trauma, infection or chronic alcoholism.

We encountered 2 cases of multiple congenital arthritic rigidities. The autopsy findings of one of them is recorded below.

Case report 8 :

Obstetric history not available.

Main Autopsy findings : (P.M. No. 152.)

A female infant with club feet was received from the Superintendent, Victoria Gosha Hospital for autopsy examination. The infant weighed 3 lbs. 12 ozs. Marked flexion deformities of the limbs opposite all the joints were found. The neck was short and flexed (typical compact foetal position). The skin over the limbs was thick and could not be picked up between folds. Incision in the proximity of the knee joint laid open abundant subcutaneous tissue and fat. Muscle bundles were far and few and were hidden from view by the dense sleeves of fibro-fatty tissue. Sections of soft tissues around the quadriceps revealed muscle bundles being widely separated by large lines of fatty tissues, replacing islands of muscle mass. Foci of round cell collections intramural and periarterial were observed (Figs. 11 & 12). No spirochaetes were seen in sections stained by Levadatii method. There was interstitial increase in fibrous tissue.

Fig. 10. Fig. 12. Fig. 11.

Fig. 10. Case report 8. Multiple congenital arthritic regidities. Muscle bundles widely separated by layers of fibro-fatty tissue. (x 8).

Fig. 11. Case report 8. Multiple congenital arthritic rigidities. Photomicrograph shows intramural and periarterial collections of round cells. (H & E x 200).

Fig. 12. Case report 8. Multiple congenital arthritic rigidities. Photomicrograph shows fibrous tissue replacing fragmented and degenerative muscle bundles. (H & E x 200).

Ballooning of pulmonary capillaries, intra-alveolar and subpleural haemorrhages, congestion of spleen and liver were seen. Sections of kidneys presented uniform sized, multiple small cysts. Intertubular haemorrhages were observed. The thymus was significantly larger than usual for the infant and interlobular haemorrhages were seen. The autopsy findings were in favour of death due to asphyxia.

Our observations of enlarged thymus and collections of lymphocytes in the affected muscles of the deceased infant are in agreement with the findings of Dorothy Price who is of opinion that the morbid condition is one of infantile myopathy.

Polycystic Disease of the Kidneys

3 cases of congenital cystic kidneys were observed in 162 autopsies. This is significant as the recorded incidence of congenital cystic kidneys varies between 1 in 350 and 1 in 500 cases. One case each of ours was associated with multiple cysts of liver and multiple congenital arthritic rigidities (vide supra). In these the kidneys were of usual size for the age of the infants. In the case recorded below the polycystic kidneys were unusually large. In such cases there is the risk of interference with normal delivery. Polycystic disease of the kidney is unilateral in 10% of cases. Death tends to occur at birth or in early infancy or is delayed until adult life.

Case report 9 :

V.R. Primi, aged 18, was admitted on 22-9-50. B.P. 110|70 m.m.Hg. Haemoglobin 55%. Blood W.R. — ve. Uterus 37 weeks' size. Foetal heart audible. On 26-9-50 she experienced moderate pains and breech presentation was observed. She delivered a live male child with multiple anomalies. The infant survived only 15 minutes.

Main Autopsy findings : (P.M. No. 12.)

The infant weighed 6 lbs. 12 ozs. Abdomen was protuberant. Polydactylia of hands and feet were observed (each with 6 digitis). Through a circular defect, a rupee in size, in the occipital bone, meninges were protruding (inencephaly). Unusually large nodular and cystic kidneys filled the entire abdomen (Fig. 13). The cystic nature of the kidneys was confirmed by microscopic examination of sections. Subdural blood clots were found. Other organs normal.

Malformations of the Central Nervous System

It is universally found that the nervous system is the most frequent site of congenital anomalies and about half of the foetal and neonatal deaths due to malformations are referable to the central nervous system. Murphy reported 60.5% incidence in 935 congenital anomalies and Landesman[18] recorded 8 in 13 anomalies affecting the central nervous system. Craig[7] in 1951 reported 14 congenital anomalies of the C.N.S. in a total of 45 cases. The nature of the lesion recorded by Murphy in 566 anomalies of C.N.S. is shown below :

Spinabifida	..	192
An-encephalus	..	98
Hydrocephalus and spinabifida		93

They are often born prematurely, some are still born and many die soon after birth.

Hydrocephalus with or without Spinabifida

The recorded incidence of hydrocephalus varies between 1 in 500 and 1 in 1000 live births. Crenshaw[8] in 1952 from the Mayo clinic recorded 24 cases of hydrocephalus in 12500 births for the years 1935—1949. Causal factors of hydrocephalus are many. Grant[11] opined that hydrocephalus with spina bifida is the result of infection. Meningitis and aqueductal stenosis are known to produce hydrocephalus. Crenshaw in 24 of the 22 autopsied cases found spina bifida in 9, stenosis of the aqueduct of sylvius in 6, meningitis in 4 and hydromyelia of spinal cord in 5 along with other anomalies. He observed in a fifth of his cases hydramnios.

Diagnosis of hydrocephalus is easy when the vertex presents, provided the existence of the morbid condition is borne in mind and roentgenograms are useful confirmatory aids. Hydrocephalus of minimum or moderate degrees is not easily diagnosed and even though suspected is not easily confirmed. Abdomino-vaginal examination is a reliable diagnostic aid. Titus observed that only small and macerated hydro-

cephalics deliver spontaneously. Oconnor and Gorman advised interventricular tap and drainage of C.S.F. by way of the vagina as the simplest and safest step when vertex presents. In breech presentations of hydrocephalics puncture is made through the base of skull — foramen magnum or through the spinal defect when spina bifida is associated. It is the experience of every obstetrician that hydrocephalus is the third commonest cause of rupture uterus with postpartum haemorrhage and so when hydrocephalus is recognised all further procedures should be directed towards the comfort, safety and future health of the mother.

Case report 10 :

J.N. 3rd para, aged 20 years was admitted on 1-8-51. Her two children are alive. Uterus 36 weeks' size. B.P. 110|80 m.m.Hg. Haemoglobin 55%. Examination per vaginam on 2-8-51 revealed fully dilated os. Membranes were bulging and ruptured. An extended breech above the brim was observed. Under chloroform and aether the breech was extracted and as it was not possible to deliver and as the head appeared to be big, hydrocephalus was suspected. It was perforated and a large amount of C.S.F. was drained. The head was extracted.

Main Autopsy findings : (P.M. No. 96.)

The female foetus weighed 8 lbs. The skull bones were widely separated. The forehead was bulging and triangular and the lower half of the face was conspicuously small — typical of hydrocephalus. The lateral ventricles were markedly distended. Detailed study of the brain was not possible as it was damaged by craniotomy. Spina bifida (meningo-cele) in the dorsolumbar region was seen. All the other organs appeared pale.

It is regretted that hydrocephalus was recognised only during labour. Fortunately the mother had an uneventful postpartum period.

Anencephalus

Record[31] and McKeown in 1949 found 59% of 584 still births and 7% of 260 neonatal deaths from anomalies of C.N.S. were accounted by an-encephaly. Hiilesmma

Fig. 13.

Fig. 14.

Fig. 15.

Fig. 13. Case report 9. Polycystic disease of the kidneys. Sectioned surface of the right and intact left polycystic kidneys.

Fig. 14. Case report 11. An-encephalus. Features typical of an-encephalic foetus. The prominence contributed usually by the vault of skull is wanting.

Fig. 15. Case report 12. Archnoidal Cyst of Brain. A thin walled cyst emerging between the two occipital lobes of the brain.

recorded 39 an-encephalics in 28,509 pregnancies. 14 out of the 18 American and German cases reviewed were associated with hydramnios. Nanagas described 5 anatomical variants of an-encephaly. Hydramnios, small uterus and unusually active foetal movements should rouse suspicion of an-encephaly and the suspicion is confirmed by x-ray.

Case report 11 :

P.P. aged 35, 6th para was admitted on 28-12-50. First three children are alive. 4th and 5th expired 24 and 4 months of infant life respectively. Uterus was of 36 weeks' size. Abdominal wall was tense. Hydramnios was recognised. B.P. 130|90 m.m.Hg. Haemoglobin 60%. Foetal heart was rapid. On 29-12-50 she delivered a male an-encephalic foetus.

Main Autopsy findings : (P.M. No. 7.)

The foetus weighed 2 lbs. 3 ozs. Eyeballs were bulging. Vault of skull was deficient and the entire brain was absent (Fig. 14).

Unrespired lungs with inter-alveolar haemorrhages, congestion and dilatation of sinusoids of liver were seen. Each kidney weighed 4400 milligrammes while the individual adrenal weighed 360 milligrammes giving a kidney-adrenal ratio of 12 : 1 instead of the usual 1 : 3. The glomerulosa and fasciculate zones of adrenals were of usual thickness and structure while considerable reduction in thickness of zona reticulosa was observed.

Autopsy diagnosis :

"An-encephalus — apituitary type with hypoplasia of adrenals."

In some cases of an-encephaly the anterior pituitary is buried in the sphenoidal bone and in these cases the adrenals are of normal size and structure.

Archnoidal Cyst of Brain

Case report 12 :

T.S. 2nd para, was admitted on 9-2-51. First child is alive. Uterus was of 36 weeks' in size. B.P. 110|80 m.m.Hg. Haemoglobin 50%. On 3-3-51 she delivered a deeply asphyxiated male infant. Artificial respiration supplemented by oxygen was given. Coramine was injected. The infant survived 1½ days.

Main Autopsy findings : (P.M. No. 26.)

The infant weighed 6 lbs. The finger nails and lips were blue. Emerging out between the two occipital lobes of the brain was a balloon like thin walled cyst of the size of an orange filled with watery clear fluid. The lateral ventricles were hidden from view by it. The cyst wall was continuous with the archnoid. It was seen more to the left of the median line (Fig. 15). Subdural haemorrhage in the posterior cranial fossa was seen.

Interstitial haemorrhages of lungs, congestion and haemorrhages of liver, intertubular haemorrhages of the kidneys and haemorrhages in the medulla of adrenals were found. Diffuse and universal haemorrhages of all the organs are in fabour of death due to asphyxia of cerebral origin.

Summary

1. Literature regarding congenital malformations is briefly reviewed.

2. Autopsy findings in 12 of the 14 malformations encountered are recorded.

3. Apart from the fact that the mothers of the malformed infants belong to low income groups and that they were anaemic, — we were not able to suggest any aetiological factor for the anomalies.

4. In 8 of the cases recorded the anomaly was disclosed only at autopsy (case reports 1, 2, 3, 4, 6, 7, 11 and 14) thus stressing the value of autopsy in determining the cause of death in these cases.

5. Emphasis is laid on the fact the anomalies like atresia of the oesophagus and the intestine and congenital defects in the diaphragm are amenable to surgical measures, provided the conditions are recognised and treated in the early neonatal period.

6. Case reports 4, 10 and 11 illustrate the fact that both the surgeon and pathologist are aware of existence of multiple congenital anomalies affecting more than one system in one and the same infant.

7. We had encountered 2 cases of multiple congenital arthritic rigidities. We suggest that both the obstetrician and pathologist are to be on the lookout for them as detailed clinical and autopsy studies of these cases may disclose the causal factors and pathogenesis of the morbid state.

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case report 11 and to Dr. Marikar, M.D., for providing us the material for case report 10. With pleasure we record the services rendered by the photo artist Mr. Edwin.

REFEERENCES

1. Angevine, D. M.: Archives of Path. 26: 507, 1938.
2. Bell, E. T.: Renal disease. Philadelphia. Lea and Fibiger 1946.
3. Boyd, J. D.: Abnormal development and foetal death. Modern trends in obstetrics and gynaecology. W. Kenneth Bowes 1950. Butterworth & Co. Ltd. Bellyard temple bar, London. W.C. 2.
4. Broca, A.: Les Maladies-des-Enfants. Paris, 1914.
5. Christopher, F.: Congenital atresia of oesophagus, and diaphragmatic hernia. A text book of Surgery by American authors. W. B. Saunders Co., Philadelphia. 1949. 5th Edtn. 917-918, 1211-1217.
6. Clark Fraser, F. and Fanistat, T. D.: Congenital defects, a review. Am. Med. Ass. Am. J. Dis. Child. 82: 593-603, 1951.
7. Craig John.: Congenital abnormalities of the nervous system. Practitioner. 166: 461-467, May 1951.
8. Grandshaw John, L. and Banner Edward, A.: Hydrocephalic births. Am. J. Obst. & Gynaec. 63: 63-71, Jan. 1952.
9. Franklin, R. H.: Congenital atresia of oesophagus. 2 cases successfully treated by anastomosis. Lancet 2: 243-244, 1947.
10. Gillman. J. and Gilbert, C.: Preliminary report on hydrocephalus, spina-bifida and other congenital anamolies in rat produced by trypan blue, significance of these results in interpretation of congenital malformations following maternal rubella. South Afr. J. M. Scl. 13: 47-90, 1948.
11. Grant, J. C. B.: An atlas of anatomy. 2nd Ed. Baltimore. William and Wilkins. 1945.
12. Greenwald Harry, M. and Steiner Morris.: Diaphragmatic Hernia in infancy and childhood. Am. J. Dis. Child. 38: 360-392, 1929.
*13. Gregg, N.: Trans. Ophth. Soci. Anst. 3: 35-1941.
14. Hanger John and Ehrenberg, C. J.: Diaphragmatic Hernia in the new-born infant. Am. J. Obst. & Gynec. 43: 503-507, 1943.
15. Henry W. Edmonds.: Adrenal and Thyroid ing Encyclopia. Arch. Path. 50: 727-735, 1950.
*16. Height, C.: Am. J. Surg. 120: 623, 1944.
17. James Theodore.: Multiple congenital articular rigidities—a review of the literature with reports of 2 cases. Edinburgh. M. J. LVIII: 565-580, 1951.
18. Landesman Robert.: Foetal mortality in caesarian section. Am. J. Obst. & Gynec. 61: 557, 1951.
19. Liebow Averill, A. and Miller C. Herbert.: Congenital defects in the diaphragm. Am. J. Path. XVI: 707, 1940.
20. Macafee, C. H. G.: Hydramnios. J. Obst. & Gynec. Brit. Emp. 57: 171-182, 1950.
21. Margulies Lazar.: Omphalocele. Am. J. Obst. & Gynec. 49: 659-699, 1945.
22. Mckeown, T. and Record, R. G.: Seasonal incidence of congenital malformations of central nervous system. Lancet. CCLX. 6648. 192-196, 1951.
23. Mengert, W. F. and Bourland, J. W.: The circulation of amniotic fluid. Am. J. Obst. & Gynec. 50: 79-87, 1945.
*24. Miller, B. C.: Analysis of foetal and neonatal deaths in 4117 consecutive births. Pediatrics. 184-192, Feb. 1950.
25. Morrison Edgar, J.: Foetal and neonatal pathology. Butterworth & Co. Ltd., London. 1952.
26. Murphy Douglas, P.: Congenital malformations. 2nd Ed. Lippincot Co. Philadelphia.
*27. Nangas, J. S.: Am. J. Anat. 35: 455, 1925.
28. Penrose, L. S.: Heredity and environment in the causation of foetal malformation. Practitioner. 166: 995, 1951.
29. Potts. William, J.: Congenital atresia of oesophagus with tracheo-oesophageal fistula. J. Thoracic Surg. 20: 675-680, 1950.
30. Price, D. S.: A case of amyoplasia congenita with pathological report. Arch. Dis. Childhood: 8: 343-354, 1933.
*31. Record, R. G. and Mckeown, T.: Brit. J. Social. Med. 3: 183, 1943.
32. Rickman, S. P.: Congenital atresia of oesophagus. Brit. M. J. 22: 940, 1950.
33. Roswell K. Brown and Emid Brown.: Congenital oesophageal anomalies. Review of 24 cases and report of three. Surg., Gynec. & Obstet. 91: 545-550, 1950.
34. Russel. Liane. Branch. Russel, Wl.: Radiation Hazards to the ombryo and foetus. Radiology. 58: 369-377, 1952.
35. Truesdale. Philomon, E.: Diaphragmatic hernia in children with a report of 13 operated cases. New Eng. J. Med. 213: 1172, 1935.
*36. Vanneson, A.: Thesis — Paris. 1912.
37. Warkany, J. and Schraffon-Berger, E.: Congenital malformations induced in rats by mater Vitamin A deficiency; defects in eye. Arch. Surg. 35: 150-169, 1946.
38. Wyatt, O. S.: Congenital diaphragmatic hernia. Journal-Lancet 61: 1 , 1941.

*Quoted by Marrison Edgar, J. Ref. No. 25 indicated above.

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THROMBO-ANGIITIS OBLITERANS*

by ASITA LAL SOM, Calcutta.

This paper is a study of the clinical, histopathological and arteriographic pictures, the results of sympathectomy and a short discussion of the aetiology of thrombo-angiitis obliterans. Fifty eight cases of thrombo-angiitis obliterans (T.A.O.) were studied, the diagnosis was chiefly made on clinical basis, but in seven it was confirmed by histopathology. The history and clinical picture of the disease were sufficiently characteristic. Arteriography was done in 20 cases, and biochemical and bacteriological studies were made in a small number of cases. Lumbar sympathectomy was done in thirty patients; eleven cases were followed for four years, nine for three years, seven could not be traced, and three died after operations.

Clinical Observations

Incidence.—One in every 166 surgical admissions in the West Bengal Hospitals was T.A.O., whereas one in 1000 patients in the Mayo Clinic was T.A.O.

Age and Sex.—All the patients were male except one, the diagnosis in the female was not confirmed by histopathology. The maximum incidence was in the third and fourth decades of life. The youngest was eighteen and the oldest was fortyseven.

Occupation and Addiction.—Most of them belonged to low economic status and over fifty percent were cultivators. The majority walked bare-footed. Ninetyeight per cent were addicted to cheap tobacco (Biri), two per cent to ganja or khaini. Each patient smoked 20 to 40 biris a day from 5 to 19 years on the average, before the onset of the disease.

Sequence of clinical events.—The symptoms and signs were due to impairment of blood supply to the tissues and, later, to superadded sepsis.

Pain.—Pain was the outstanding symptom and it was of the following types:—

(a) Intermittent Claudication.—Intermittent claudication was the early symptom and the patients complained of progressive diminution of the distance, they could walk without getting any pain.

(b) Rest Pain.—Pain during rest, localised in the toes, or in the forepart of the foot; it was burning type of pain preceding ulceration and gangrene, occasionally severe in character.

(c) Pain of ulceration and gangrene — continuous pain around ulcers and gangrenous parts.

(d) Pain due to spasm of the blood vessels was noticed in two cases, it was severe excruciating pain, along the course of the blood vessels during angiography under local anaesthesia.

(e) Pain of ischaemic neuritis.—It was shooting and agonising pain not corresponding to the distribution of any nerve.

Two patients reported for claudication only, three patients for rest pain but the rest reported for chronic ulceration or gangrene of the toes and fingers with rest pain. One patient was admitted for rest pain and pain of ischaemic neuritis and gangrene toe. The later attempted to commit suicide on account of the excruciating pain. The posterior tibial nerve of the amputated limb in that case showed evidence of thickening and narrowing of the vasa nervosum..... (Fig. 22).

Swelling of foot.—About one-fourth of the cases reported intermittent swelling and oedema of the foot.

Trophic Disturbances.—Paronychia, deformity of nails, cold feet and blue discolouration of the skin of the toes were often noticed.

Ulcers and gangrene.—The gangrene was dry in nature. The progress upwards was very slow. The lower extremity was involved in all the cases except one. In

*Paper presented before the Annual Conference of the Association of Surgeons of India, Calcutta, Dec. 1951.

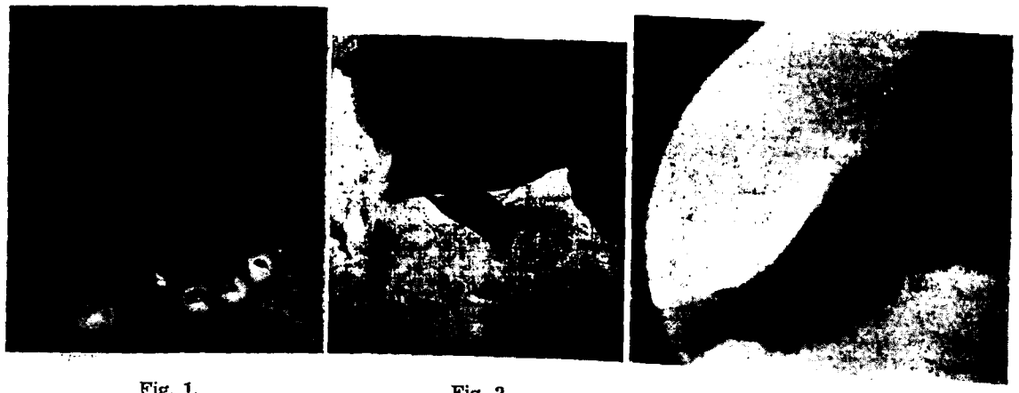

Fig. 1. Fig. 2. Fig. 3.

Fig. 1. Foot of a thrombo-angiitis case — showing gangrene second toe.

Fig. 2. Foot of a thrombo-angiitis case — showing gangrene extending upto middle of the foot.

Fig. 3. X-Ray picture of foot and ankle of a late thrombo-angiitis case — showing marked decalcification of the bones around ankle.

10% of cases, there was evidence of circulatory insufficiency of the fingers as well, leading to ulceration and gangrene. In the lower extremity the great toe and the second toe were the common sites (Fig. 1). In five cases the gangrene extended near about the middle of the foot (Fig. 2). In the upper extremity the gangrene was confined to the fingers. Spontaneous dropping off of the finger were not uncommon but the bare bone would stick out for a long time. Two of such cases were clinically diagnosed as leprosy and they were referred to me by the leprosy department. Gangrene of the four extremities was observed in one and three limbs in three cases only.

Wasting of the limb and deformity.—Wasting of the limb with flexion contracture of the knee was noticed in few advanced cases.

The above sequence of clinical events was not simultaneous in all the limbs. Usually one lower extremity was involved first and the leg period between two limbs was between three to twenty years. Even the disease process in one limb was not a continuous process in the early stages, the attack was intermittent and episodic.

The *general condition* of the patient was not poor to start with but the general condition deteriorated in advanced cases due to pain and sleepless nights. Some were addicted to opiates.

Pulsation of the arteries.—Arterial pulse in the lower limb was diminished or absent in all the cases, either in one or both the limbs. The posterior tibial and dorsalis pedis artery pulse was diminished or absent in all the cases; popliteal was absent in 40%, femoral in 6% and the radical pulse in 19.3%.

Temperate changes.—Cold feet and toes were observed in most of the cases the temperature was determined by palpation only, thermocouple being not available.

Postural colour changes.—Rubor on dependency and pallor on elevation and the Buerger's angle of circulatory efficiency did not appear very helpful to me — probably due to the dark complexion of the patients.

Thrombophlebitis of the superficial veins of the leg was observed in 26.6% of cases. This was the cause of repeated swelling of the foot.

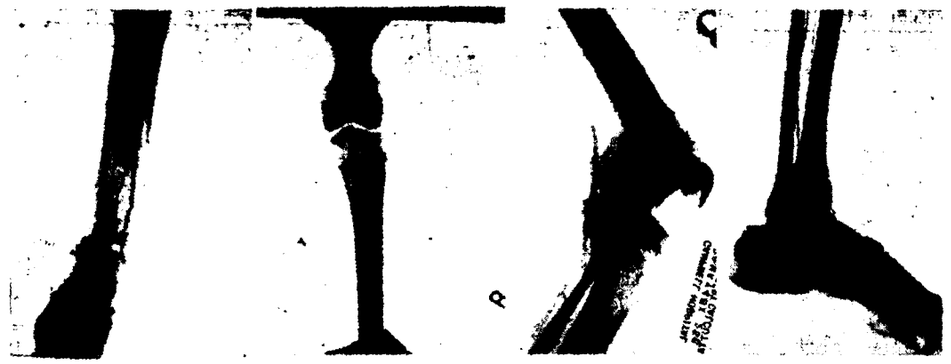

Fig. 4. Fig. 5. Fig. 6. Fig. 7.

Fig. 4. G.P.S. — 39 — gangrene — left great toe — posterior tibial lower fourth narrowed and corkscrew appearance. Anterior tibial occluded at the lower part.

Fig. 5. R.C.N. — 36 — gangrene second toe. Irregular contour and narrowing of the popliteal with leash of collaterals. Blockage of posterior tibial at upper third. Fish tail collaterals.

Fig. 6. B.H. 28 — Gangrene ankle. Partial blockage of femoral at the femoropopliteal junction. Tapering bulbous end at the site of obstruction. Segmental narrowing of upper part posterior tibial with a good proximal collateral.

Fig. 7. Arteriogram of a normal healthy patient of the same age group — showing anterior and posterior tibial planter and dorsalis pedis arteries.

Straight X-Ray of Bones.—Showed marked decalcification of the bones round about the ankle in late cases (Fig. 3).

Epidermophytosis.—In about 60% of the patients, epidermophytosis was present.

Clinically these patients were classified into *two* groups:—

(a) *Young group* — (Age 18—35) five cases — The gangrene extended upto the middle of the foot. The femoral and popliteal pulses were absent and the posterior tibial pulses were diminished. The onset of gangrene was earlier.

(b) *Elderly group* — (Age 36—47) fifty-three cases — The gangrene was of a slow progressive type. It seldom extended beyond the base of the toe. In 60% of cases, the popliteal pulse was diminished, but the posterior tibial and the dorsalis pedis artery (D.P.A.) pulses were absent. Femoral pulse was present.

Diabetes and syphilis were excluded in all except in two cases where W.R. was positive. Blood pressure was normal; sometimes below normal.

Arteriographic Studies

This was the only special investigation done to find out the nature of the obstruction and the amount of collateral circulation.

Lower extremity.—17 cases. The posterior tibial or anterior tibial or both were found narrowed or occluded in all the cases (Fig. 4). The femoral artery was involved in 16.6%. The popliteal was affected in 33.5% cases (Figs. 5 & 6). Please refer Figs. 7 & 8 for comparison — the arteriograms of healthy individuals of the same age group. The dorsalis pedis and plantars were seldom visualised. When visualised it was very narrow, like fine pencil markings. The segmental narrowing of the vascular lumen and the localised changes in the contour of the arteries were the early

Fig. 8. Fig. 9. Fig. 10. Fig. 11.

Fig. 8. Arteriogram of a healthy individual showing the femoral and popliteal — age 40.

Fig. 9. Showing early change — Segmental narrowing at femoro-popliteal junction.

Fig. 10. G.P.S. 39 — showing narrowing of the femoro-popliteal junction. Antero-posterior view.

Fig. 11. R.N.K. 24 — cold finger, burning pain of the second to fifth fingers. Radial pulse absent. The radial artery is not visualised. Part of the deep palmer arch seen, faint marking of the digital arteries.

characteristic features (Figs. 9 & 10). At the site of blockage collaterals were marked in some cases (Fig. 5). There was no filling of veins nor calcification of arteries. The post-sympathectomy arteriograms showed increase of collaterals.

Upper extremity—3 cases. The radial artery was occluded at the upper part in two cases (Fig. 11) and the ulnar at its lower part in one case. There was no blockage of the brachial artery.

Errors and Hazards of Arteriography.— The possibility of error arising from spasm or improper filling or improper timing should also be considered. Two patients developed rapidly spreading gangrene after arteriography. Therefore in advanced cases of T.A.O., arteriography should be avoided.

Histopathological studies

The blood vessels and nerves of the amputated legs were studied. There was difficulty in isolation of the blood vessels due to fibrosis surrounding the neuro-vascular bundle. Post-mortem examination was done in three. Lumbar ganglions removed were also examined in twelve cases.

The disease is mainly a chronic inflammation of the blood vessels, specially of the arteries. Lesions are widely distributed but segmental in character. The early change consists of lymphocytic infiltration of the adventitia with proliferation of intima (cushioning) — Fig. 12. Next stage is marked infiltration of the wall and thrombosis of its lumen (Fig. 13). Giant cells may also be seen in this stage (Fig. 14). Later the thrombus is organised and canalised (Fig. 15). Failing the fibrosis and complete occlusion occurs (Fig. 16). In the visceral blood vessels like coronary artery there may be inflammatory as well as degenerative changes (Fig. 17). The abdominal aorta and the external iliac artery may show evidence of degeneration (Fig. 18).

Fig. 12. Fig. 13.

Fig. 12. Section of an artery showing proliferation of intima. (Early change).

Fig. 13. Section of ant. tibial artery, acute lymphocytic infiltration and unorganised thrombus.

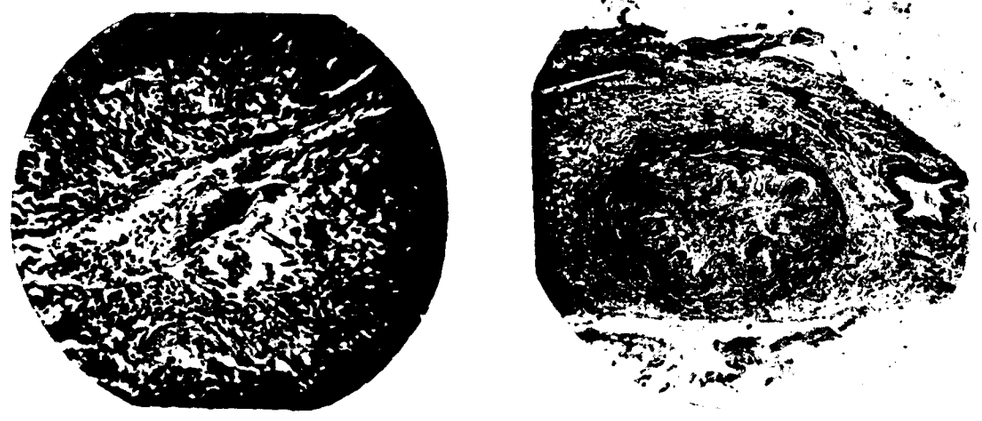

Fig. 14. Fig. 15.

Fig. 14. Ant. tib. artery. High magnification of photo micro. 2 showing acute lymphocytic infiltration and a giant cell.

Fig. 15. Section of post. tib. artery — cushioning of intima, few lymphocytes in the wall, thrombus invasion by round cells, partial organisation and early canalisation.

Fig. 16.

Fig. 17.

Fig. 16. D.P.A. complete organisation of thrombus and fibrosis at places.

Fig. 17. Coronary artery (age 40) — lymphocytic infiltration of its wall and sub-endothelial atheromatous change. No thrombus inside the lumen.

Fig. 18.

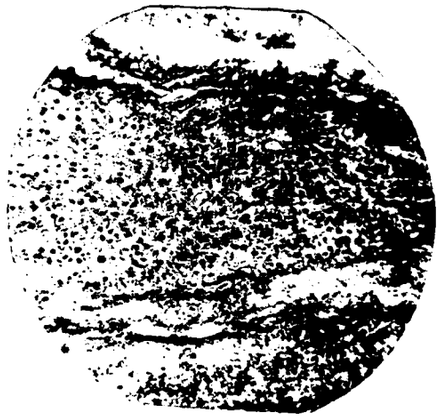

Fig. 19.

Fig. 18. Ext. iliac artery (age 40) showing degenerative changes.

Fig. 19. Section of testis — degeneration of seminiferous tubules with a big area of interstitial cells.

Fig. 20.

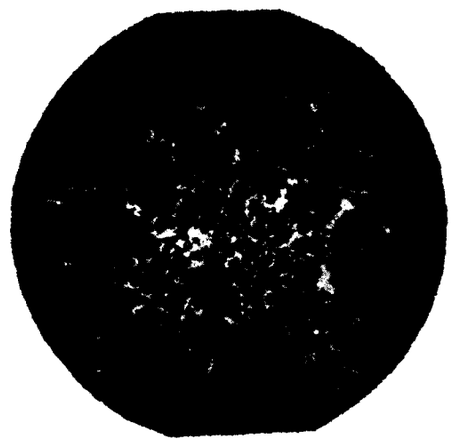

Fig. 21.

Fig. 20. Pituitary of a T.A.O. age 36 — Basophilic proliferation.

Fig. 21. Pituitary of health individual age about 38 years showing no proliferation of basophil cells as compared with 20.

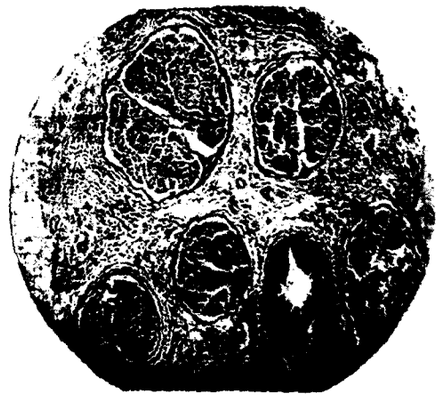

Fig. 22.

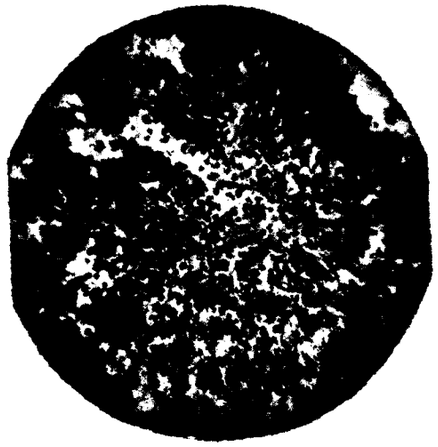

Fig. 23.

Fig. 22. Post. tib. nerve. No degeneration of axis cylinders. Thickening of vasa nervosum.

Fig. 23. Sympathetic ganglion shows no evidence of degeneration of the ganglion cells.

Other extra-vascular lesions.—(a) Testis may show in some cases degeneration of seminiferous tubules with increase of interstitial cells (Fig. 19). In two cases, the pituitary gland shows peculiar increase of basophilic cells (Fig. 20), compared with the pituitary (Fig. 21) from a normal individual of the same age. The accompanying peripheral nerves of the affected blood vessels do not show any evidence of degeneration of the axis cylinders. But the vasa nervosum supplying the nerve shows marked thickening of the intima (Fig. 22). The sympathetic ganglia show no evidence of degeneration of the ganglionic cells (Fig. 23).

Calf Muscles — show evidence of degeneration and thickening of muscular arteries in a patient with absence of femoral and popliteal pulse with severe rest and ischaemic pain (Fig. 24).

Results of Lumbar Sympathectomy

In thirty cases — twenty-two unilateral, eight bilateral. The extraperitoneal antero-lateral, muscle splitting incision was employed. The second, third and fourth ganglions were resected. The site and number of the ganglions were variable, sometimes two ganglions were found. The ganglion situated behind the common iliac vessel should be resected otherwise it is observed that the relief of pain and the rise of skin temperature was not satisfactory. The following observations were made :—

Immediately after operation the skin of the limb became warm — assessed by palpation only. Rest pain improved appreciably but the local pain due to gangrene or ulcer persisted till gangrenous toes separated or ulcers healed up.

Lumbar sympathectomy is not the specific treatment of T.A.O. Satisfactory results were noticed in the distal group of cases with signs of early arterial insufficiency. In follow up cases the rest pain and claudication pain disappeared in early cases. In late cases of the distal group lumbar sympathectomy gave appreciable relief of rest pain, hastened healing of ulcers, stopped further progress of the gangrene with spontaneous separation of the dead toes (Fig. 25). In ten cases, besides sympathectomy conservative low amputation were required :—mid-leg 2, Symes 1, tarso-metatarsal 2, amputation of toes 5. In 50% of cases of this group of late cases, the rest pain relapsed, probably due to further progress of the disease. Involvement of the popliteal and femoral is probably a contra-indication for sympathectomy unless there is sympathetic spasm. In practice, I have performed sympathectomy in cases with absence of popliteal pulsation with improvement of circulation and pain. Three patients died after sympathectomy — one from pulmonary embolism, the second from paralytic ileus and the third from cardiac failure.

Fig. 24.
Section of gastrocnemius muscle — showing degeneration of some muscle fibres and thickening of muscular branches of the *posterior tibial* artery.

Fig. 25.
Photo of foot of T.A.O. case — after lumbar sympathectomy — showing spontaneous separation of the dead toes and healing of ulcers.

Pathological Physiology

Twenty-one specimens of blood from thromboangiitis obliterans cases were studied for blood chemistry and twenty-two specimens of blood of control cases of the same age group were examined for noting any appreciable difference in the blood proteins, blood cholesterol, blood sugar, vitamin 'A' and carotene content of the blood.

Blood Proteins in Thromboangiitis Obliterans.—Total Blood protein in T.A.O. = 5.58 gram ; Albumin Globulin = 3 2.36 gram.

Blood Proteins in Control.—Total Blood proteins in Control = 6.5 gram. Albumin Globulin = 4.2 2.36 gram.

There was slight hypoproteinaemia in T.A.O. as compared with its control. It is the albumin factor which was lower.

Average Lecithin P = 13.32 mg% — Average Cholesterol = 192 mg%.

Control Lecithin P = 12.42 mg% — Control Cholesterol = 172.8 mg%.

The average blood cholesterol and Lecithin P in the thrombo-angiitis obliterans cases were higher.

Blood Sugar (Fasting) Estimation in thromboangiitis obliterans cases and control. The average blood sugar of the thromboangiitis obliterans cases was 88 mg%. This was on the lower side of the normal average which was 105 mg%.

Vitamin 'A' and Carotene Content in T.A.O.—Average Carotene content = .15 microgram per c.c. of serum : Average Vitamin 'A' content = 1.3 Int. unit per c.c.

Control.—Average Carotene Content = 0.2 microgram per c.c. Average Vitamin 'A' Content = 1.16 Int. unit per c.c.

Vitamin A estimation was carried out as in vitamin A deficiency there is atrophy of the skin epithelium followed by proliferation of the basal cell lays or later keratinisation. This vitamin 'A' deficiency might be the cause of flattening of the intima and endothelial proliferation of the blood vessels in T.A.O.

We notice vitamin 'A' & carotene content in T.A.O. was slightly on the lower side.

Blood for Weil Felix reaction was studied in five cases — to exclude past typhus infection, the reaction was negative in all the cases — with O.X.K., O.X.19 and O.X.2, strains of Bacillus proteus. In one patient O.X.2 was positive upto 1 in 50 titre only.

Blood Culture was done in fifteen cases. Blood was collected from the lower parts of the long saphenous veins of the affected limbs. The specimens of blood were cultured in blood agar and glucose broth. In all the cases cultures were negative.

Short Discussion regarding the Etiology of T.A.O.

Since 1879 — Von Winiwater and later Leo Buerger (1908—1929) and subsequently many others worked on this disease to find out its etiology. The following agents are held responsible for this disease :—

(a) *Tobacco*—

Buerger, Silbert and others realised that tobacco must be a factor towards its etiology. From my clinical studies only, it is observed, that 98% of the cases were smokers. The other 2% were addicted to khaini or ganja.

How does tobacco act ? — Is it by the vaso constrictor action of nicotine or by its vascular allergy ? It has been shown both experimentally and in the human subject that there is an average drop of skin

temperature of 5.3°F after smoking one or two cigarettes. Previous workers also observed that vasoconstriction of the peripheral blood vessels is proportionate to the amount smoked. From my studies I have observed that the more the number of *biris* smoked the earlier was the onset of the disease. In those who smoked 40 to 60 *biris* a day the onset of the disease was within 2 to 8 years, whereas smokers of 20 to 40 *biris* a day were affected within 5 to 15 years. Mild smokers took a long time about 18 to 23 years before the onset of the disease.

Silbert & Laskay suggested that tobacco must have a direct etiological role as they produced experimental gangrene in the toes of *male* rats by injection of denicotinised tobacco.

The case for the direct action of tobacco is weak — as there are many heavy smokers in this world but the incidence of the disease is very small — and females are not affected. Silbert & Laskay could not produce experimental gangrene in female rats.

Therefore tobacco appears to be an aggravating factor and not the exciting cause. I call it as an *extrinsic factor.*

(b) *Infection—*

The inflammatory appearance of the blood vessels in T.A.O. gives a strong suspicion that the disease is due to some infection — bacterial, coccal, viral, fungal. Buerger failed to discover micro-organism but he attempted experimental production of acute lesions with success in some cases.

Rabinowitz (1923) isolated gram negative organisms in the blood of T.A.O. patients. This was also the experience of Horton and Dorsey who cultured gram positive pleomorphic streptococcus from acutely inflamed veins.

The Mayo Clinic workers, and Telford, and I have failed to isolate any organism.

The idea of a chronic septic focus put forward by Mahorner and Allen is also not tenable. There are thousands of cases suffering from chronic septic foci but how many are suffering from T.A.O. ?

During my clinical investigation, there were about 25% of cases, who had septic tonsils and pyorrhoea.

Goodman suspected virus infection and a possible relation with typhus. He found large numbers of positive skin reactions in T.A.O. cases. I did not do any skin test — but I did Weil Felix reaction in a very small number of cases. It was negative. But it may be argued that the Weil Felix reaction may become negative in the convalescent period. Almost all virus diseases produce acute manifestation with general reaction — e.g. small pox, anterior poliomyelitis, whereas T.A.O. is a chronic disease. There is no established virus disease, which does not affect females. On perusal of the various clinical reports on typhus fever from this country, it appears that no case of T.A.O. has occurred or followed an attack of typhus. My T.A.O. cases did not give any past history of typhus.

The virus of lympho-granuloma was suggested by Coutts & Devila (1950), as a possible cause of T.A.O., but it is not confirmed by others.

Mayer, Naide and Thomson (1941) suggested fungus infection. He found 80% positive skin tests with fungal extract of dermatophytes. The deformity of nails, the relapsing nature of T.A.O. and the involvement of the lower extremity is in conformity with similar features of dermatophytes. In my investigation — epidermophytes were found positive from the scrapings of the interdigital folds in 60% of cases. According to the work of L. M. Ghosh of the School of Tropical Medicine, Calcutta, 12.6% of the skin diseases of Bengal is trycophyton but he did not see a single case of T.A.O. in those patients (personal communication). Moreover females who walk bare-footed suffer more from tricophyton and they are not affected. In my opinion fungus may be an aggravating factor and not a direct cause.

In conclusion, against infection it may be said in the words of Silbert that there is "No known infection which effects exclusively one sex, and nothing known about the activities of micro-organism or viruses warrants the belief that the female sex enjoys special immunity."

Toxin producing spasm.—Telford and Stopford (1935) suggested spasm of blood vessels leading to thrombosis. He later (1937) suggested some toxic factor. In follow up of cases of sympathectomy the disease progressed in many cases ; if it was purely spastic, sympathectomy would be the ideal and permanent treatment like Raynaud's disease. Of course the question of regeneration of sympathetic nerves may come in. The toxin has not been isolated or confirmed by other workers. There is no doubt that in the early stages of T.A.O. there is considerable vasospasm. This view is also held by me. During pre-operative investigation after spinal anaesthesia or peripheral nerve block, I observed an appreciable rise of skin temperature and loss of sweating in these cases. This spasm may be due to the hypersensitivity of blood vessels due to some endrocrine factor aggravated by tobacco.

Altered Blood Chemistry.—Haemoconcentration, diminished blood volume, increased phospho-lipiods, increased blood proteins, especially fibrinogen, were suggested by Silbert, Rabinowitz, Friedlander towards its etiology. The altered blood chemistry tends to increase the coagulability of blood and thereby may precipitate thrombosis. Mayo clinic observers could not agree with them completely. I from a small number of cases, noticed increased blood cholesterol to up 20 mg. percent and Lecithin P to about 1 mg. percent. My blood protein estimates were on the lower side — especially the albumin factor to 1.2 gram percent, when compared with the control. It is very difficult to draw any conclusion as *complete and elaborate work* was not done by me but it appears to me that altered blood chemistry may hasten thrombosis, where the lumen of the blood vessels is already narrowed by cushioning of the intima and spasm of its wall.

Anatomical peculiarity of the Blood Vessels and Trauma.—Michael Boyd's contention (1949) that the arterial lesions of the proximal group below thirty-five years complaining of intermittent claudication are mostly due to primary popliteal thrombosis. Repeated trauma due to peculiar position and attachment of the femoropopliteal vessels is attributed to be the cause of primary popliteal thrombosis. This view cannot be substantiated from my cases. The lesions, though segmental, were multiple in nature, trauma alone cannot explain them. Besides from my histopathological studies, the cases were inflammatory in nature, not pure thrombosis. Boyd includes in his juvenile obliterative arteritis, the T.A.O. cases. In his opinion the lesions are distally distributed and may spread upward but those cases rarely begin after 35 years. From my observations most of the distal group of cases were in the 3rd and 4th decades and the diseases were generalised in nature. The blood vessels showed both inflammation and degeneration. This group is in accord with Leriche's unclassified group of arterial disease.

Endocrinal Disturbances.—The young age and the male sex remain the constant factors in this disease. I had the opportunity of performing a detailed post-mortem examination in my three cases. It may be interesting to know that in all the cases there was striking basophil cell proliferation of the pars anterior. I compared those sections with the pituitary of normal men of the same age dying of accidents. The testicles in those T.A.O. cases showed proliferation of the interstitial cells (Leydig) with degeneration of the seminiferous tubules. The basophil cells are probably the gonad stimulating hormone (Best & Taylor). Brinbaum et al (1934) also observed basophil cell proliferation in an established case of T.A.O. In the experimental work of Silbert, Laskey and Mcgrath for the production of experimental gangrene in rats by the injection of denicotinised tobacco and ergotamine tartrate, they could not induce gangrene in the female rats.

It may be too premature to conclude from the observation of a limited number of

cases that an endocrinal disturbance of the nature of a pituitary testicular hyperfunction is responsible for the arterial damage.

Author's conclusion of the Etiology of T.A.O.—T.A.O. is a generalised vascular disease probably due to pituitary testicular — hyperfunction aggravated by tobacco.

In other words there are two factors for the causation of this problem disease — (1) *Intrinsic factor* — pituitary testicular hyperfunction—sensitising the blood vessels and (2) *Extrinsic factor* — tobacco.

Summary

(1) The sequence of clinical events of T.A.O. is described on the basis of observation of 58 cases.

(2) Arteriographic studies of twenty cases of T.A.O. are mentioned.

(3) Histopathological studies in this disease are described.

(4) Result of lumbar sympathectomy of thirty cases are described.

(5) The pathological physiology and bacteriological examination of a small number of T.A.O. cases are given.

(6) A discussion of the etiology of T.A.O. is made with a view to arrive at a probable conclusion.

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BIBLIOGRAPHY

1. Allen, Barker and Hines: Peripheral Vascular Diseases. Saunders 1947. P. 413-470.
2. Best and Taylor: The Physiological basis of Medical Practice. P. 875.
3. Brinbaum Prinzmetal and Conor: Arch. Int. Med. 410-412, 1934.
4. Buerger Leo: Am. J. M. Sc. 567, 1908.
5. Buerger Leo: Arch. Path. 210-219, 1915.
6. Boyd, A. M. (et al): J. Bone & Joint Surg. 325-355, 1949.
7. Clifford Jones and Stainer: Brit. J. Surg. 286-295, 1949.
8. Friedlander, Samuel Silbert: Arch. Int. Med. 500-506, 1931.
9. Grey Turner: Modern Operative Surgery. November, 1946. P. 1809.
10. Kinmonth, J. B.: Lancet. 717-719, 1946.
11. Learmonth: Brit. J. Surg. Vol. 25. July, 1937 and April, 1938.
12. Lynn, R. B.: Edinburgh M. J. LVI, 422-430, 1949.
13. Maingot: Techniques of British Surgery. Saunders 1950. P. 647-690.
14. Mayer Naide: Am. J. M. Sc. 822, 1941.
15. McGrath, E. J. K.: Arch. Int. Med. 942-957, 1935.
17. Silbert and Samuel: J.A.M.A. April, 1940. P. 1443.
18. Telford and Lake: Proc. Roy. Soc. Med. 37: 621, 1944.
19. Telford and Stopford: Brit. M. J. 1935.
20. Wright, I. S.: Vascular diseases in clinical practice. The Year Book Publishers, Chicago, 1948. P. 149-165.

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PANCREATIC HETEROTOPIA

by GRACE SWAMIDASAN, Madras.

The occurrence of pancreatic tissue in an anomalous position in the gastro-intestinal tract, though rare, has been recognised. The lesions and symptoms produced by this condition, simulating as it does, various other abdominal catastrophes, often calls for prompt diagnosis and surgical intervention hence, the importance of this condition. Two cases are herewith presented.

CASE REPORTS

CASE I.

A Hindu male aged 40 years was admitted on 24-3-50 for pain in the right hypochondrium of one year's duration.

History.—Typical of peptic ulcer. A barium meal picture revealed evidence of chronic duodenal obstruction with a dilated stomach. A fractional test meal showed high total acidity, both initially and, after 2 hours. Other investigations were of no significance. A pre-operative diagnosis of pyloric obstruction was made and the abdomen opened. No ulcer was located. A small, soft, friable growth was found over the serous coat of the jejunum 6" from the duodeno-jejunal flexure. The growth was removed and sent for biopsy. The pathology report was "The section shows pancreatic tissue. Evidently, it is a case of ectopic pancreas". (Vide Microphotograph No. 1.)

CASE II.

A Hindu female aged 60 years was admitted on 8-6-42 for pain in the abdomen of 4 months' duration.

History.—Pain all over the abdomen since 4 months. Vomiting present. Pain not related to food. Physical examination revealed nothing of significance. Barium meal and F.T.M. findings not recorded.

Operation notes.—A big pyloro-duodenal ulcer was seen. About 8" from the duodeno-jejunal flexure, a small, lipomatous mass of the size of a tamarind seed was found. It was suspected to be a diverticulum and was dissected out entire, without any injury to the mucous coat.

Pathology report.—"Tumour shows pancreatic tissue. The section shows evidence of cystic dilatation of the ducts". (Vide Microphotograph No. 2.)

Definition.—"Pancreatic Heterotopia is defined, as being the presence of pancreatic tissue outside its usual or habitual location and, without anatomic relation either of continuity or of vascularisation with the pancreas proper". (De Castro Barbosa et al.[2]).

Embryology.—The pancreas appears in the latter part of the fourth week of development as two outgrowths from that part of the foregut which becomes the duodenum. One bud springs from the ventral aspect of the duodenum in common with the hepatic diverticulum. The ventral process forms the preduodenal process, the pancreas minor of Winslow and reinforces the dorsal part of the head of the pancreas. The ventral process is the only anlage that tends to encircle the duodenum. The greater part of the pancreas is formed by the dorsal bud, which forms part of the head of the pancreas, the body and the tail. The rotation of the stomach, the migration or displacement of the duodenum towards the right side of the abdomen, with a developmental rotation in the wall of the duodenum, bring about, during the 6th and 7th weeks a displacement of the termination of the common bile-duct and of the ventral pancreas to the inner or mesial side of the duodenum, the ventral pancreas being thus brought in contact with the dorsal pancreatic outgrowth. About the end of the 3rd month, some of the acini become partially or entirely separated from the duct system and form the Islands of Langerhans.

Hypothesis of Origin.—All the concepts agree that heterotopia is of ante-natal origin. Three of these deserve mention. First, that an engrafting of pancreatic tissue occurs on the walls of the mesentery, stomach and intestine, as these lie packed together due to non-inflammatory adhesions of foetal life. Later, during the growth and movements of the gland the attached part is pulled off and may continue to live incorporated as a graft in the gastric, duodenal or intestinal wall or mesentery (Horgan[3]). Second, an accessory pan-

Fig. 1.

Fig. 2.

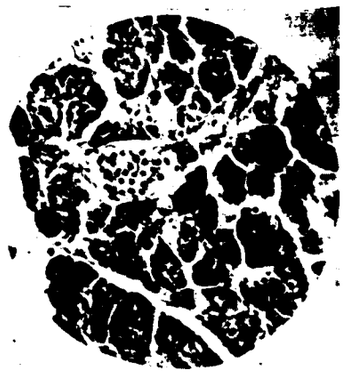

Fig. 3.

Fig. 1. (Case 1). Pancreatic acini showing an Islet of Langerhans in the centre. (H & E x 220)

Fig. 2. (Case 2). Showing groups of pancreatic acini and the dilated ducts. (H & E x 50)

Fig. 3. (Case 3). Pancreatic acini with an Islet of Langherans. (H & E x 220)

creas is due to persistence or, incomplete regression of the left ventral anlage (Lordy[5]). Third, that accessory pancreatic tissue is formed by lateral budding of the rudimentary pancreatic ducts and snaring off of the masses during the growth of the intestine (Warthin[7]). Lastly, if a piece of pancreatic tissue occurs in an anomalous position in a part of the abdomen, unless it had its regular duct system with an outlet into some part of the intestinal canal, it is likely to undergo cystic or other pathological change and prone to produce necrosis in its vicinity due to activity of its secretion. The fact that heterotopic bits of pancreas remain asymptomatic for considerable periods through adult life necessarily implies the existence of a patent and functional duct system in these cases.

The question whether a snared piece of pancreatic tissue torn asunder from the developing mass, could secondarily find its cutlet into the intestinal canal, is very problematic. Hence, it seems probable that any portion of the terminal part of the foregut or the midgut in early embryonic life has the potency of producing aberrant, accessory pancreatic buds. The formation of such an aberrant, accessory pancreatic bud could alone explain the circumstances occurring in many of these cases (Iyer[4]).

Literature.—The total number of cases of Heterotopic pancreas in the literature collected upto 1951 is 589 (Seibert Pearson[6]). Both the cases recorded here were found at operation.

Review of the cases.—Out of the 1683 abdominal biopsies examined in the Pathology Department, Stanley Medical College, Madras, from 1920 to 1950 only two cases of Pancreatic Heterotopia have been recorded.

Incidence.—The incidence according to Busard and Walters[1] is 0.55 to 5.6% in routine necropsy material and 1 in 160 to 600 abdominal operations. This corresponds closely to the figures given by Barbosa and his associates. The age incidence is highest in the 4th, 5th and 6th decades of life. Sex incidence is in the ratio of 3 males to 1 female. Both the cases recorded here were over 40 years of age.

Location.—In 70% of the cases recorded in the literature, the heterotopic pancreatic tissue occurred in the duodenum, stomach and jejunum with an incidence for each of 27.7%, 25.5% and 15.9% respectively. The incidence in other locations was Meckel's diverticulum — 5.3%, ileum — 3% and omentum — 1.7%. In the recent literature several cases have been reported in which the gall-bladder was the site of the ectopic tissue.

Morphology.—Heterotopic pancreatic tissue presents itself usually as a firm, single, yellowish or opaque-white, lobulated, round or irregular nodule with a granular surface and of a diameter of about 1—4 cms. They may be of large size. In both our cases the nodules removed were approximately 1 cm. each.

The histological picture is frequently that of the pancreas itself with acini forming lobules with ducts and Islands of Langerhans (Figs. 1 & 3). The development and differentiation of the acini may, however, be arrested at various stages, depending on which, these cases have been classified.

In the majority of cases the histologic location of pancreatic tissue was in the sub-mucosa alone with an incidence of 53.8%. The second commonest type of involvement was infiltration between the longitudinal or circular muscular layers — 23%. The least common location was the serosal surface. In both the cases recorded from biopsies here the ectopic tissue was in the serosal layer.

Pathology.—Heterotopic pancreatic tissue presents the same pathologic changes as the pancreas viz., cysts, pancreatitis, haemorrhage, necrosis and neoplastic changes, both benign and malignant. Pathologic changes sometimes occur in the tissues adjacent to the heterotopic tissue, such as, fat necrosis, inflammation, haemorrhage, ulceration and diverticulum formation, especially ulceration of the mucosa overlying the dystopic pancreatic tissue, which may be the cause of gastro-duodenal ulcers in a small number of cases.

Symptomatology.—Symptoms vary according to the different locations in which pancreatic tissue is found. They are generally similar to those produced by gastro-duodenal lesions viz., symptoms of gastric ulcer, duodenal ulcer, pyloric obstruction, cholecystitis, obstruction of the common-bile-duct, chronic or acute appendicitis or indeterminate digestive symptoms.

In a high percentage of surgical cases of pancreatic heterotopia, the heterotopia is found to be of clinical significance. The pain in the cases presenting ulcer symptoms, may be produced by encroachment of the lumen by the pancreatic tissue and mechanical obstruction with production of spasm, or by production of ulcers by the pancreatic enzymes, or due to benign or malignant tumour formation.

Clinical significance.—61% of Barbosa's series were found to be of clinical significance. Operative interference is indicated in cases of pancreatic heterotopia which present symptoms. Where the heterotopia is an incidental finding during operations for other causes, it should be treated on its own merits. Those situated in the stomach or duodenum should be excised to avoid future complications unless the risk of removal outweighs the advantages. Surgical treatment for pancreatic tissue in other organs like the jejunum varies according to the particular location. Hypoglycaemia and hyperinsulinism are observed in association with heterotophic pancreatic tissue presenting both benign and malignant changes. The surgeon should, therefore, bear in mind the ectopic situations of the pancreas in cases of hypoglycaemia where the normally situated pancreas shows no abnormality. Conversely, adenomas and adenocarcinomas of islet cell type may be present without clinical evidence of hypoglycaemia. Rare adenocarcinomas of the duodenum may have their origin in the ectopic tissue. A mass of heterotopic pancreatic tissue may be mistaken for a malignant growth roentgenologically and at operation, involving unnecessary surgical interference.

SUMMARY

1. Two cases of pancreatic heterotopia are presented.

2. Incidence, morphology, pathology and clinical significance are discussed.

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BIBLIOGRAPHY

1. Busard, T. M. and Walters, W.: Collected papers of the Mayo Clinic & The Mayo Foundation. XL: 54-58, 1948.
2. De Castro Barbosa (et. al.): Surg., Gynec. & Obstet. 82: 527-542, 1946.
3. Horgan, E. J.: Arch. Surg. 2: 521-534, 1921.
4. Iyer, A. A.: Personal communication. 1951.
5. Lordy, C.: Ann. Fac. Med.; Sao Paulo. 5: 91-94, 1930.
6. Seibert Pearson.: Arch. Surg. 63: 168, 1951. 1951.
7. Warthin, A. S.: Phys. Surg. 26: 337-351, 1904.

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EXPERIENCE WITH THE MALIGNANT TUMOURS OF THE UPPER JAW

by V. M. KAIKINI, Bombay.

Malignant tumours of the upper jaw are fairly common, and if treated early, give extremely good results, as they remain locally malignant for a comparatively longer time than the malignant tumours in many of the other parts of the body. They run a slow course and in untreated cases the patient's condition is extremely miserable as the pain in these cases starts fairly early. In the majority of the cases as the pain is referred to the alveolar process, the patient is treated for a long time for dental trouble, and precious time is wasted unnecessarily. In some cases where the tumour starts in the antrum, slight swelling is found in the alveolar process causing looseness of the teeth and the doctor may attribute the symptoms to dental trouble. Medullary and periosteal osteogenic sarcomas and peri-osteal fibrosarcomas are frequently met with in the upper jaw. The endosteal form causes slow comparatively painless expan-sion of the bone, the maxillary sinus being invaded later on, and the nasal and other sinuses are finally involved. X-ray diag-noses sarcoma, from cysts, dental anomalies, and leontiasis ossea.

Carcinoma usually commences in the epi-thelium of the gums or palate, and invades the jaw secondarily. In this case it is squamous celled. In some cases it grows from the mucous membrane of the antrum and then it is columnar celled. Papillary leucoplakia of the mucous membrane of the upper jaw is potentially malignant. Adeno-carcinoma of the mixed tumour type, usu-ally occurs posteriorly in the upper jaw and palate and as a rule presents a non-ulcerat-ed smooth hard surface.

The other tumours are

(1) *Malignant Epulis.* These are of the nature of osteoclastoma or fibro-sarcoma of the periosteum or the periodontal mucous membrane. They are more rapidly grow-ing than the innocent epulis, and do not as a rule spring up between two teeth, and form a hard elastic red sessile swelling.

(2) *Myelomata.* These arise within the alveolar process. The alveolar process becomes swollen and expanded with a dusky colour, giving rise to egg shell crack-ling. The growth may fungate. They behave like malignant tumours.

(3) *Dentigerous Cysts.* These are of two varieties. The commonest one is cystic, only consisting of an outer bony shell of varying thickness and an inner membran-ous one. An undeveloped tooth is found inside the cavity. They commence early in life and a tooth is found missing. In the other varieties occurring in older people solid growths sarcomatous in nature may be found.

CLINICAL SIGNS AND SYMPTOMS

Patient with constant complaint of pain and uneasiness in the upper jaw in the face, whose symptoms have been of short duration and who states that the pain or uneasiness, is made worse by lying down, should be carefully examined to exclude tumour as the cause of the pain. The majority of the cases that come to the surgeon either for diagnosis or treatment come late. A good many of these are treated for tooth or sinus trouble, and when the pain and swelling are found to increase the help of the surgeons is sought.

When the tumour grows from the ante-rior aspect of the maxilla, the cheek is found to be pushed forward in the begin-ning. Later on the mouth and orbit are invaded, and the soft tissues of the cheek become infiltrated. If the tumour starts from the periosteum of the posterior wall of the maxillary antrum, it grows in the spheno-maxillary fossa and invades the orbit from behind. The eye ball is pushed forward and the nose is invaded in later stages. When the tumour commences in the antrum, the first symptom is pain in the fifth nerve, and the walls of the antrum are found to bulge in all directions; the palate is compressed the eyeball is pushed

forward and upward, and the cheek is found to be prominent. Eggshell crackling may be present over the swelling. There will be nasal obstruction with considerable discharge and epiphora due to obstruction of the nasal duct. Puncture of the antrum will bring out blood but no pus.

Innocent tumours of the maxilla, the myelomas, dental cysts, and dentigerous cysts, and empyemas of the antrum, may be mistaken for these tumours. But none of these conditions give rise to pain, steady progress, infiltration of tissues, bleeding and fungation, that are seen in malignant tumours.

In my experience early operation only, gives good results. The majority of cases that came to me had been given radium or deep X-ray treatment from a very early stage—one of them being treated later on in the Curie Institute Paris — but the results were extremely disappointing.

Out of the 16 cases quoted below, all but one were advanced cases. Thirteen of them had malignancy of the maxilla, and three had invasion of the maxilla by malignant tumours from the adjoining naso-pharyngeal area. In all these cases the maxilla was removed. Where the tumour was pharyngeal removal of the maxilla facilitated the removal of the naso-pharyngeal tumour as well.

In all cases except two where general anaesthesia was used, local anaesthesia by nerve blocking with novocaine gave perfect results, and considerably reduced the shock. Bleeding which was usually profuse was controlled by ligation but mainly by packing, and was never a cause of anxiety.

Out of the 13 cases operated on for primary growth of the maxilla, there was one operative death eight hours after the operation. It was a very advanced case the tumour having invaded the adjoining pharyngeal region. Out of the remaining twelve cases, three came with recurrence. One case operated in 1927, was alive four years after the operation. A female patient operated on in 1928, is alive today, living in Bombay, the wife of a government official, in perfect health with an artificial denture replacing the removed maxilla. A third patient also a female operated on in 1948, a case of malignant epulis, — fibro sarcoma — is in good health without any signs of recurrence. Out of the remaining six cases one who reported six months after the operation had no recurrence. The other five cases were never heard of. All of these must have died of recurrence as they were advanced cases. One old man aged 70, with a sarcomatous tumour of the maxilla, had been treated with radium for six months, and when seen there was advanced infiltration of the tissues of the cheek with sinus formation. The patient was suffering from very severe pain and consented to get operated. The maxilla was removed piecemeal. The old man was alive six months after the operation and practically free from pain. But the lesion was already far advanced and he must have died of recurrence. So even in advanced cases although complete cure is out of question, the patient is relieved of his agonizing pain, and his last days are made more comfortable by radical removal of the maxilla.

Out of the three cases operated on for naso-pharyngeal tumour invading the maxilla, one a very advanced case died soon after operation. One got recurrence after about two years, and the third was seen in good condition when seen two months after the operation, but could not be traced after that. He belonged to Panvel a town near Bombay and would have surely come for further treatment if any new trouble had started.

Below are given the histories of the cases operated on by me.

CASE REPORTS

CASE 1.

Male. Age 35 years. Admitted October 1927 for a big round swelling on the anterior aspect of the left maxilla. There was good deal of pain with nasal discharge and epiphora. History was of about one year's duration. Being the first operation of its kind attempted by me, the classical text book methods of excision of the maxilla were employed. The left external carotid artery was tied, a laryngotomy opening was made and a laryngotomy tube was inserted through which chloroform was given. Unfortunately the patient stopped his respiration before the skin flap had been reflected and his condition looked rather bad. So the skin flap was stitched back and the operation was not proceeded with. The patient recovered from the effects of the anaesthesia, and another attempt was made to excise the maxilla about fifteen days later. Chloroform was administered by the open method the laryngotomy tube being dispened with. The usual incision starting from the middle of the upper lip extending along the external margin of the left ala nasia and lower margin of the orbit to the left malar bone was made and the skin reflected. The whole of the maxilla was removed. It came away in three pieces as the tumour had caused a good deal of destruction of the anterior and lateral walls of the bone. The gap was packed with gauze and the flap stitched in its place. Bleeding was profuse and was stopped with gauze pressure and ligation. Convalescence was smooth. The patient complained of double vision for about a month; but the sight became normal after that. The patient was reported to be doing well about four years after the operation. The tumour was sarcomatous in nature.

Fig. 1.

Fig. 1 (Case 2). Sarcomatous tumour right maxilla. Scar visible right side of the face (photo 1952).

CASE 2. (Fig. 1.)

Female. Age 23 years. Admitted in December 1928 with a small swelling half an inch in diameter on the hard palate on the right side, near the alveolar margin. She at first showed it to her family physician, who at first though it to be an ordinary abscess and incised it. This gave rise to profuse bleeding, and he suspecting something serious advised her to see a surgeon. After admission into the hospital a section was taken from the growth and the pathological report was 'A rapidly growing fibroma with haemorrhages-fibrosarcoma.' The operation was done under general anaesthesia —chloroform, without preliminary tying of the external carotid artery, or the use of the laryngotomy tube. The maxilla was removed in the usual way and it came out in one piece. The antrum was found to be occupied by a fairly large growth, much larger in size than the portion projecting from the hard palate. The patient's convalescence was smooth and uneventful. She has had no recurrence and today she is enjoying perfect health. The defect in her face and mouth does not cause her much inconvenience and with the help of an artificial denture she is able to chew her food and the defect in the cheek is not very disfiguring.

CASE 3.

Female. Age 25 years. Admitted on 10th July 1930, with a papillomatous growth on the hard palate extending to the adjoining portion of the cheek. Two years previously the growth had been removed by diathermy, but had recurred. Pathological report of the growth was 'Papilloma probably becoming malignant.' One per cent novocaine with adrenaline was injected deep into the tissues at a point half an inch in front of the margin of the opening of the external auditory meatus, thus blocking the branches of the fifth nerve in the spheno-maxillary fossa. Novocaine was injected subcutaneously along the margin of the maxilla and deeply under the periosteum of the inferior plate of the orbit. The patient developed perfect anaesthesia and the maxilla was removed completely. The papillary growth on the adjoining portion of the cheek was also dissected out. The patient had no shock and bore the operation very well, and bleeding also was very little. She was discharged in good condition. The further history could not be traced. As she belonged to Panvel a town near Bombay I am sure she would have returned if there was any recurrence.

CASE 4.

Male. Age 45 years. Admitted on 18th Nov. with a fairly big hard fungating tumour, sarcomatous in nature on the right side of the hard palate encroaching a little on the left side. Anaesthesia was induced with novocaine injected as above and the maxilla was removed piecemeal with the patient in a semi-reclining position. The bone was completely disorganized by the tumour.

There was profuse bleeding but the patient stood the operation very well, and was discharged with the wound nicely healed. He did not report himself again. But most likely the tumour must have recurred as it was already too far advanced when the operation was done.

CASE 5.

Male. Age 70 years. Admitted on the 24th January 1931 with an advanced sarcomatous growth of the right maxilla. The patient at first noticed a painless swelling of the maxilla which was diagnosed by the physician as malignant and he was advised deep X-ray treatment. He did not take the treatment but went on applying some Hakim's ointment. The skin of the cheek when seen was infiltrated and oedematous. The hard and soft palate on the right side were involved. The maxilla was removed under local anaesthesia. The growth was found to have involved the base of the skull; so complete eradication was out of question. The wound healed completely except for a small sinus in the skin of the cheek. Shock was completely absent and the patient was discharged absolutely free from the severe and continuous pain that he was suffering from before the operation, and was advised radium treatment for the portion of the growth in the base of the skull which could not be removed. He was alive and fairly comfortable six months after the operation. But nothing was heard about him after that. In this case the tumour was very far advanced and practically inoperable. But the operation gave him good deal of relief from pain and the few remaining days of his life were comparatively happy.

CASE 6.

Male. Age 21 years. Admitted on 7th March 1933 with a big tumour of the left maxilla, of six months duration. The tumour was bulging anteriorly and also in the inferior wall of the maxilla where it was irregular and granular in appearance. The whole maxilla was removed by the method given above under local anaesthesia. The severe pain complained of by the patient completely disappeared and he was discharged with the wound nicely healed. The tumour was sarcomatous in nature. Nothing further was heard of the patient.

CASE 7.

Male. Age 38 years. Admitted on 5th December 1934, with a big fungating ulcer on the hard palate about two inches in diameter, dark brown in colour, extending to within half an inch of the pillars of the fauces. About six months previously the patient noticed a small ulcer on the hard palate which was diagnosed as gummatous by his doctor and he was given anti-syphilitic treatment. But the ulcer went on increasing in size and severe pain radiating to the ear started and the upper teeth on that side became loose. At the same time swelling appeared on the cheek. The maxilla was removed under local anaesthesia. The tumour was carcinomatous in nature and had involved the margin of the orbit and base of the skull. The patient was discharged with the wound completely healed and was given deep X-ray treatment. Pain had completely disappeared. He returned ten months later with the left eye swollen, red, and protruding. There was no pain, but the tumour was reappearing at the base of the skull. The died about four months later.

CASE 8.

Male. Age 45 years. Admitted on 3rd November 1936, for a carcinomatous tumour in the right maxilla involving the mucous membrane of the cheek. Being an advanced case the maxilla had to be removed piecemeal. The ulcer in the cheek was removed with a diathermy knife. The wound healed by first intention and the patient was discharged. But he returned after four months with recurrence in the right eye.

CASE 9.

Male. Age 48 years. Admitted with a large sarcomatous tumour involving the right maxilla, and extending to the lateral wall of the pharynx behind the tonsil. The patient gave history of only three months duration. The maxilla was removed under local anaesthesia. But the patient died of shock about eight hours after operation.

CASE 10.

Male. Age 60 years. Admitted on 29th March 1938, with a swelling in the left maxilla and inability to swallow. History was of six months duration, and the trouble started with bleeding from the nose. The vision in the left eye was defective. There was a fungating growth on the hard palate on the right side and the alveolar process was also invaded. It was an advanced case. The maxilla was removed under local anaesthesia, and it was found that the tumour had gone beyond the posterior wall of the maxillary antrum. The patient was discharged with the wound completely healed, and was advised deep X-ray treatment. He returned after about four months, and on examination a carcinomatous ulcer was found in the region of the pterygoid fossa. The patient was not seen after that.

CASE 11.

Female. Age 48 years. Admitted on 3rd May 1948 for a big irregularly growing tumour at the base of the right maxilla. Some portion of the tumour was overlapping the margin of the left maxilla as well. A small epulis had been removed from the right alveolar process in June 1944, but it started growing again and was removed locally in January 1947 in Poona. It reappeared again and started growing rapidly. When seen in May 1948, it was found to be a big irregular tumour as described above. The patient was extremely anaemic and was given blood transfusion. The maxilla was removed under local anaesthesia. Shock was practically absent and the bleeding was negligible. The patient was discharged in very good condition. After the operation the patient was able to chew her food and swallow it more easily than she could do before the operation. Pathologically the tumour was found to be an osteosarcoma. The patient has no recurrence, and is enjoying good health to this day.

In the four cases quoted below the maxilla was removed for eradicating tumours in the nasopharyngeal region. The majority of these tumours start from the base of the skull — from the basisphenoid or basiocciput. Less frequently they may start from the pterygoid fossa and the adjacent plates or from around the posterior nares. In all these cases the maxilla was either directly invaded by the growing tumour or pushed forward. All except one were very advanced cases.

CASE 12.

Male. Age 16 years. Admitted on 26th March 1936 for a tumour extending from the nasopharynx on the right to the maxilla and pushing the whole bone forward. Both the hard and soft palates were pushed down as well. A hard nodular mass seen in the right nasal chamber. There was proptosis of the eye ball. The tumour bled easily when touched. Deep X-ray had been tried without any benefit. The condition of the patient was extremely miserable on account of pain and difficulty in deglutition, and he was entreating to have an operation done on him. Under local anaesthesia the right maxilla was removed after tying both the external carotid arteries and the tumour which was very soft and vascular was removed partly with scissors and partly by enucleation. This gave rise to formidable bleeding. The patient died some time after the operation. The tumour was a fibrosarcoma.

CASE 13.

Male. Age 18 years. Admitted on 21st April 1936, for inability to swallow food, tinnitus right ear, and difficulty in breathing. There was a hard tumour occupying the whole of the pharynx from the left to the right lateral wall, and invading the roof as well. The soft palate was pushed forward. There was ptosis of the right upper eyelid. Aural examination report was 'Cochlear division normal, equal both sides. Right membrane hyperaemic without bulging. Tinnitus could be accounted for by hyperaemia.' History was of four months duration. Severe pain was present in the occipital region. The right maxilla was removed under local anaesthesia, which gave good access to the nasopharyngeal region. The tumour was a big one and was attached by a broad base to the posterior and both the lateral walls of the nasopharynx. The mucous membrane covering the tumour was separated as much as possible. It was adherent and very much thickened. The tumour was found to be hard and fibrous in nature. It was removed piecemeal partly with nibbling forceps and partly with the diathermy knife.

There was very little bleeding throughout the operation. The patient was completely relieved of the dyspnoea, dysphagia, and other distressing symptoms, and we discharged on the 18th day after the operation. By that time the ptosis had completely disappeared. After history is not known.

CASE 14.

Male. Age 25 years. Admitted on 14th August 1938 with a big growth filling practically the whole of the nasopharynx, which prevented him from swallowing and breathing freely. The growth was soft and the patient used to pluck out pieces from the tumour which allowed him to breath and swallow a little more freely. This used to give rise to a little bleeding which stopped easily. The patient was in great distress because of the diffi-

Fig. 2.

Fig 2 (Case 14). Naso-pharyngeal tumour. Patient one month after the operation. The scar on the cheek is clearly seen.

culty in swallowing and breathing. Tracheotomy had to be done to relieve dyspnoea. The right maxilla was removed completely under local anaesthesia and the growth was fully exposed. It extended from the roof of the nasopharynx to both the lateral walls and on the right side had extended to the epiglottis. It was very soft and polypoid in nature, and was removed mainly by enucleation with the fingers. There was a fair amount of bleeding which was easily stopped. The wound was packed with acriflavine gauze. The patient was very much relieved and within a couple of hours after the operation helped himself to a large amount of orange juice. He was discharged in good condition, and reported himself in October 1938. He was free from pain, dysphagia and dyspnoea, but a small nodule was found growing on the site of the old tumour, for which he was given deep X-ray treatment. The tumour was fibrosarcoma. I was told that the tumour recurred and the patient succumbed about two years later (Fig. 2).

CASE 15.

Male. Age 20 years. Admitted in January 1929, for difficulty in breathing for the last three years. Caldwell Luck operation had been done out of Bombay for a swelling in the cheek, about one year back. There were fleshy growths on both sides of the nasal cavity the nasal septum being deviated more to the right side. The growth was going from the nasopharynx into the pterygomandibular fossa. The right eyeball was pushed forward. History of severe bleeding. The right maxilla was removed under local anaesthesia, and the tumour which was very extensive — practically inoperable — was removed with the diathermy knife. The patient died a few hours after the operation.

CASE 16.

Here, I would like to mention the history of another case which shows how deep X-ray or radium treatment is disappointing in malignant maxillary tumours. A female patient was brought to me from Ahmedabad about eight years ago, with a fairly advanced malignant tumour of the left maxilla. She had been treated as a dental case for about six months and valuable time wasted. She was taken to a well known surgeon in one of the districts of Gujarat, who advised them to go to Bombay saying "Look here. Get it removed by operation and do not listen to any body who suggests radium treatment or X-ra treatment". I told the doctor in charge that was an advanced case the base of the skull bein invaded and that complete cure with non-recur rence was impossible, although the pain would dis appear and she would be more comfortable b excision of the maxilla. The doctor said "I kno it is an advanced and inoperable case. Howeve her pain should be stopped, and as she has com here crying she should return to Ahmedaba smiling." But she did not turn up for operatio After about four months one afternoon the sam doctor came to me saying, "Doctor, some of he friends advised her to take deep X-ray treatmer by going to.....(some hospital out of Bombay and she took the treatment, but she has n improved. I think you can operate on her now When seen I found the tumour much mor advanced than before, the skin of the face charre to a black colour and the subcutaneous tissues fu of pus. The patient was in an extremely dis tressed condition. Naturally I refused to operat as operation was out of question.

Summary

(1) Early operation and removal of th maxilla for malignancy gives extremel good results.

(2) In all cases done under local anaes thesia shock was practically nil.

(3) Any swelling of the maxilla, witl pain and uneasiness, which grows worse o lying down and in which the alveolar pro cess on the affected side looks inflamed an swollen with looseness of the teeth, mus be looked upon with suspicion.

(4) Even in advanced cases of maxillar malignancy, where the maxilla was excise and the patient died of recurrence, later on life was rendered more happy by the dis appearance or marked alleviation of th pain.

(5) Deep X-ray or radium treatment ha not been found to give any relief to th patient.

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CASES & COMMENTS

A RARE CASE OF PAROTID SALIVARY CYST DUE TO RHINOSPORIDIOSIS

by R. MAHADEVAN, Madras.

The case reported here, a case of cystic swelling of the parotid gland due to Rhinosporidiosis seems unique. As far as can be gathered from available literature and from enquiries of several colleagues no such infection of the parotid gland has so far been recorded.

Introduction

Rhinosporidiosis occurs fairly frequently in several parts of India and cases have been seen in Travancore, Cochin, Madras, Madura, Tanjore, Trichinopoly, Dindigul, Calcutta, Bombay, Rampur State etc. A few cases have been reported from Argentina, U.S.A., West Indies, Cochin-China, East Africa, Persia, Ceylon — almost all of these being tropical countries. A very large number of these cases are seen in the different hospitals of Madras city itself, over a hundred cases being seen in the Govt. General Hospital alone (Cherian and Satyanarayana[1]). According to these authors the majority of them are from Malabar and the age incidence varies from 8 to 60 years.

History

The first case was discovered in 1892 by Prof. Malbran of Buenos Aires in a specimen of nasal polypus but he did not publish his findings. Later in 1894 Seeber, also of Buenos Aires, described the condition again in a specimen of nasal polypus. He made his study of this parasite, a thesis for his M.D. degree. In these and in many other early recorded cases, the infection was in nasal polypi, hence the name Rhinosporidium. However, it has since been observed that the parasite also infects situations other than the nose.

The first case of Rhinosporidiosis observed in India was in 1894 by Lt.-Col. O'Kineali of the Medical College Hospital, Calcutta. The disease is often referred to as Rhinosporidium Kinealyi or Rhinosporidium Seeberi after these early observers.

The credit of first recognising this parasitic polypus of the nose, in this Presidency belongs to T. M. Nair (Tirumurti[5]). Nair reported five cases, all from Cochin (Cherian and Satyanarayana[1]). Until 1909, the parasite was thought to have the mucous membrane of the nose as its special habitat. In February 1909, Major H. Kirkpatrick discovered the sporozoan in a conjunctival polypus, and in April of the same year Capt. A. C. Ingram demonstrated its presence in a papillomatous growth of the penis (Ingram[3]). Since then a large number of cases have been reported by several others. The most important and exhaustive contribution to the subject was made by Prof. Ashworth in 1923, based on the study of a single case. The specimen was a nasal polyp removed by Prof. Logan Turner from a Malayalee Medical student then in Edinburgh.

Sites of Infection

The usual sites of infection are the nose, mouth, epiglottis, tonsils, pillars of the fauces, uvula, nasopharynx, larynx, trachea, lachrymal sac, and conjunctiva.

Conjunctiva: Polypoid growths are seen both in the ocular and palpebral conjunctiva. These could easily be mistaken for phlectenular conjunctivitis, unless a suspicion arises and a biopsy is done. Most of the ocular cases have been reported from Argentina.

Lachrymal Sac: Kirkpatrick in 1909 noted the condition and described a case in which the lachrymal sac was infected. Later R. E. Wright also described a similar case of lachrymal sac infection. These cases look like chronic dachryocystitis and are associated almost invariably with rhinosporidiosis infestation of the conjunctiva or nose.

Fig. 1.

Fig. 3.

Fig. 2.

Fig. 1. Condition of patient at time of admission (2-12-1948).

Fig. 2. Microphotograph of cyst wall clearly demonstrating the mature spores underneath the lining membrane of columnar epithelium.

Fig. 3. Photograph of patient taken in December 1951 (2 years and 10 months after operation). The small swelling seen in the middle of the operation scar, developed after complete cessation of discharge. The last occurrence of discharge was on 3-5-1951.

Uvula: Chinnaswami Pillai of Madras reported a case affecting the uvula (Kurup[4]).

Other Situations: *Penis* — this seems to be a common site of infection occurring fairly frequently in S. India. Willcocks operated on a case in 1909 — the patient was a Mohammedan male, aged 49 (Tirumurti[5]). Dhayagude in 1941 has reported a case involving the *urethra* — the patient was a Mohammedan male, aged 45. There is reason to believe that this affection of the penis or urethra is often missed and is more frequent than the scanty reports in the literature would suggest. Possibly such infections are treated by amputation of the penis under the mistaken diagnosis of carcinoma. The true nature will be revealed only by a routine microscopy in every case. Mistakes of this sort are particularly unfortunate, as in cases of Rhinosporidiosis, mere local excision will suffice to ensure a cure. The wisdom therefore of a routine biopsy before amputation cannot be over emphasised. In Rhinospordiosis the mass bleeds extremely easily on any manipulation and this feature alone, if constantly borne in mind should aid in avoiding, some at least of the mistakes. In one case the *scalp* has been affected (Cherian and Satyanarayana[1]). Another example of a rare situation of the disease is a very interesting case of generalised granulomata occurring all over the body (Dhayagude[2]). The patient was a male of 40 years in whom the subcutaneous swellings — some of them ulcerating as they grew bigger — occurred on the face, thorax, abdomen, back, gluteal region, and both the superior extremities. The ones on the superior extremities were particularly large.

It was once thought that the disease did not occur in the female. But this is erroneous as a few cases of Rhinosporidiosis in the female have been observed and the first cases reported in the female were by Cherian in a woman from Malabar and by Kurup who described its occurrence in the pharynx of a Mohammedan lady (Kurup[4]). Out of 72 cases seen in the first half of 1948 by Cherian and Satyanarayana, 61 were males and 11 were females (Cherian and Satyanarayana[1]).

CASE REPORT

K.K.M., a male, aged 20 years was admitted on 2-12-48 for swelling in the right parotid region and cheek. He first noticed it 6 months earlier. At the time of admission the swelling was about 4" by 3" (Fig. 1). In the earlier stages the swelling was visible only while taking food. There was no pain then, but 3 months prior to admission the swelling suddenly increased in size and became painful, particularly during meals. To quote the patient's words "I used to experience severe pain particularly after dinner but used to get some relief by firmly pressing my face onto a pillow and by this manouvre the swelling also used to contract gradually." But the pain and discomfort were on the increase. Local application and chemotherapy had been tried with no relief. An operation was suggested by the local doctor and this suggestion was accepted. However just before the operation the doctor found that he could make the swelling completely disappear by gentle pressure and massage. The patient was discharged and he then reported for treatment here. Skiagrams showed no evidence of salivary calculi. The cheek, teeth, tongue, pharynx etc. were all found to be normal.

Under the obvious diagnosis of salivary cyst the swelling was excised on 8-12-48. Before excision the fluid contents were aspirated. The fluid was rich in amylase. Section of the cyst wall showed Rhinosporidium infection (Fig. 2). The microphotograph clearly demonstrated the mature spores underneath the lining membrane of columnar epithelium. The operation wound did not heal completely. A salivary fistula resulted and this caused him great discomfort. Dilatation of the parotid duct and cauterisation of the external orifice of the fistula caused no improvement.

Consequently on 23-2-49 the auriculo-temporal nerve was avulsed and the fistulous tract excised, closing the wound in layers. This lessened the quantity of discharge from the fistula but did not heal it up completely. Injections of salts of antimony recommended on an empirical basis. caused no improvement. Ultimately a few exposures of deep X-ray succeeded in closing the fistula.

He was discharged apparently cured on 23-4-49. He wrote on 9-8-49 to say that he was doing quite well and completely free from all symptoms. On further enquiry on Dec. 1951 it was learnt that there was some discharge occasionally and the last discharge had occurred on 3-5-51. After complete cessation of discharge a small swelling was beginning to reform (see photograph taken in Dec. 1951, Fig. 3). There has been no change in the condition since (last heard from the patient on 29-7-52).

DISCUSSION

Nature and Mode of Infection: Rhinosporidiosis is a local inflammatory condition caused by a fungus — a yeast like organism which infests the mucous membrane of the affected area, particularly the nose and the sinuses, producing granulomatous tumours. The mode of infection and transmission is unknown. The occurrence of the sporozoan in the conjunctival and nasal mucous membrane is probably to be explained by direct inoculation through infected clothing, handkerchiefs or the hands. In the series of cases seen by Cherian and Satyanarayana no two cases had occurred in the same family. A transmission through animals or soil is likely, as most of the cases reported on, have been in farmers. In the series of cases compiled and reported by Tirumurti one of the patients who was a student, gave a history of having lived with a fellow student who suffered from a similar complaint. Tirumurti therefore suggests that it is possible that a similar history could be obtained in intelligent patients, if proper enquiries are made. It is also very likely that the mode of conveyance of the disease in many cases is via infected nasal secretion. The occurrence of the parasite in the penis of patients who were otherwise healthy and showed perfectly normal appearances of the conjunctiva and nasal mucous membrane is very suggestive of direct inoculation during the sexual congress. All attempts, by various research workers, at the culture of the causative organism and of reproduction of the disease in the lower animals by experimental inoculation have so far been unsuccessful.

The *naked eye appearances* of the condition are characteristic — small red granules

projecting above the surface of the mucous membrane in the very early stages. With increase in size, the mass becomes polypoidal, has a general reddish appearance with an irregular surface, dotted with spores reddish in colour. The whole appearance is thus like a mulberry or strawberry or in the words of Tirumurti more suggestive of the colour of the Jambulam fruit (botanical name Zyshicicum Jambolinum).

When the tissue after its removal in the fresh state, is floated in water it is seen to flatten itself and spread out and the growth appears to be irregularly papillomatous. In the nose the polypoidal growth may easily be seen hanging outside and in some cases can be drawn back into the nasopharynx or even be seen in the oropharynx. As the growth is soft and friable and easily bleeds the condition may be mistaken for malignancy when it occurs in the aged.

Symptoms of the disease depend on the site of infection; in the nose rhinitis, blood stained discharge and obstruction to breathing; in the larynx obstruction to breathing and hoarseness of voice, and in the trachea irritable cough. The growth bleeds easily and profusely on any manipulation. However, the case reported here is unique in that none of the above characteristic symptoms were present. The main trouble was a painful cystic swelling in the right parotid region and cheek, without any polypoidal growth formation, granulomatous mass or ulceration.

Treatment: This mainly consists in operative removal. The base of the growth should be cauterised. Otherwise the growth will definitely recur. In the case described here the possibility of recurrence cannot altogether be ruled out. Indeed, there is some evidence suggestive of recurrence (Fig. 3). This is probably because the infection has taken deep root and is possibly lurking in the deeper ramifications of the salivary duct apparatus. The repeated operations and deep X-ray therapy have served to give lasting relief but it is rather premature to claim to have effected a cure.

Summary

(1) A case of parotid salivary cystic swelling due to Rhinosporidiosis is described. The case seems to be unique in so far as no such case has been previously recorded.

(2) As the mode of infection remains unknown, one can only postulate that in this particular case infection might have travelled up the Stenson's duct from contaminated food, or infected teeth, gum or oral mucous membrane.

My thanks are due to Dr. B. Tirumal Rao who was kind enough to refer me to articles on the subject, to Dr. S. Sundararaman for some helpful information in the preparation of this paper and to Dr. G. D. Veliath for the Pathology report and microphotograph.

BIBLIOGRAPHY

1. Cherian, P. V. and Satyanarayana, C.: Rhinosporidiosis. Ind. J. of Otolaryngology. Vol. 1, No. 1, pp. 15-19, 1949.
2. Dhayagude, R. G.: Unusual Rhinosporidium infection in Man. Ind. Med. Gaz. Aug.—Sept. 513-514, 1941.
3. Ingram, A. C.: Rhinosporidium Kinealyi in Unusual Situations. Lancet, Vol. 2, p. 726, 1910.
4. Kurup, P. K.: Rhinosporidium Kinealyi Infection. Indian Med. Gaz. Vol. LXXVI, pp. 239-241, 1931.
5. Tirumurti, T. S.: Rhinosporidium Kinealyi Practitioner, July—Dec., 704-719, 1914.

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REVIEWS OF BOOKS

The story of the adaptation syndrome: *by Hans Selye. Pp. 225. Acta., Inc., Medical Publishers, 5465, Degarie Boulevard, Montreal 29, Que. Canada. 1952.*

The Story of the Adaptation Syndrome is a book which could be read profitably by a layman as well as an advanced Research worker. The book deals in a most lucid manner with the birth of the concept of the adaptation syndrome and typifies the problems a research worker has to face before he can effectively pursue the subject he is engaged upon. The evolution of the adaptation syndrome from 1936 to 1952 is so clearly explained that a reader can go through the whole book, from cover to cover, as through a well written detective novel. Another remarkable feature about the book is personality of the Author pervading through its pages so that the reader is made to feel at home with the author at every stage. Not many investigators are gifted with the ability to present complicated problems in such pleasing manner and we have great pleasure in congratulating the author in carrying the Stress concept of disease right into the minds of the general public.

K. P. A.

The first annual report on stress, 1951: *by Hans Selye. Acta., Inc., Medical Publishers, Montreal, Canada.*

This book is a unified presentation of the entire Stress literature from a single point of view. The response of the body to Stress, resulting in General Adaptation Syndrome, and disease of adaptation as postulated by Hans Selye has been the subject of one of the major medical controversies of the century. The book provides an effective answer to the critics of Hans Selye. The earlier chapters deal with the physiology and pathology of Stress in a very convincing manner. The other chapters deal with every aspect of the Stress problem incorporating the works of thousands of investigations in the field. We agree with the author that "this is not a book to be read from cover to cover." Nevertheless this is an excellent reference book for the research worker interested in this revolutionary subject.

K. P. A.

Fluid Balance — *A Clinical Manual: by Carl A. Moyer, M.D. Pp. 191. The Year Book Publishers, Inc. 200 East Illinois Street, Chicago. Price $3.75.*

This manual is a practical guide to the diagnosis and therapy of fluid and electrolyte imbalances. It is a concise and yet clear-cut description of many problems pertaining thereto. Besides laboratory methods helpful to diagnosis, the clinical manifestations of the commonly occurring disturbances of body fluid and electrolytes are clearly described and useful points stressed.

This handy volume is bound to be extremely useful in the day-to-day handling of the surgical patients.

U. M. R.

A Handbook of Operative Surgery of the Chest: *by Julian Jhonson, & Charles K. Kirby. Pp. 387. Illust. 81. The Year Book Publishers, Inc. 200 E., Illinois St., Chicago 11. 1952. Price $9.00.*

A most useful handbook for one who desires to practice chest surgery. It is, as claimed by the authors, a real atlas of thoracic surgical operations. The illustrations are clear and well done and with the aid of the adjoining texts to the illustrations, one gets a good idea of the operative procedures. The pages devoted for the pre and post operative care will be found useful by the readers. The chapter on the Surgery of the Heart and great vessels is well-written considering the scope of a book of this size.

C. S. S.

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THE XIV ANNUAL CONFERENCE

The XIV Annual Conference of the Association of Surgeons of India will be held at Vellore (S. India) on the 30th and 31st of December, 1952 and the 1st of January, 1953. Members from the all States in India are invited to attend. Besides discussions on surgical subjects, an Exhibition of surgical and medical equipment is being arranged. In addition, there will be opportunities of making fresh social contacts and renewing old friendships with distinguished colleagues from all over India.

The following are the subjects for discussion at the XIV Annual Conference :—

1. *Strictures of the Urethra—*

   Opener : Dr. H. Y. Khwaja, Bombay.
   Seconder : Dr. U. Mohan Rau, Madras.

2. *Tuberculosis of Lymph Nodes—*

   Opener : Dr. D. S. Iyer, Madras.
   Seconder : Dr. S. K. Sen, New Delhi.

Besides these, there will be "Short Papers".

* * *

The Hony. Local Secretary in charge of the XIV Annual Conference at Vellore (Dr. R. H. Betts, M.D.) writes :—

"Due to inadequate hotel accommodation, delegates and guests will have to be housed, dormitory style, in the hostels of the Christian Medical College. It will not be possible to provide separate quarters for married couples. Hostel type, board beds will be furnished, but delegates will have to bring mattress, bedding, towels, etc. One or two blankets will be needed although only light daytime clothing will be necessary.

There will be a registration fee of Rs. 10. Room and meals will be charged for at the rate of Rs. 15 per day. For the banquet there will be an extra charge of Rs. 10".

* * *

Subjects for discussion at future meetings

15th Meeting :

1. *Experiences in the Surgery of Portal Hypertension—*

   Opener : Dr. A. K. Basu, Calcutta.
   Seconder : Dr. A. K. Datta Gupta, Calcutta.

2. *Surgery in the treatment of Sequelae of Poliomyelitis—*

   Opener : Dr. K. S. Grewal, Amritsar.
   Seconder : Dr. B. Mukopadhaya, Patna.

3. *Tumours of the Jaw—*

   Opener : Dr. R. Nigam, Nagpur.
   Seconder : Dr. S. P. Srivastava, Agra.

16th Meeting :

1. *Behaviour of the Urinary Bladder in Spinal Paraplegia—*

   Opener : Dr. Pritam Das, Lucknow.
   Seconder : Dr. A. K. Saha, Calcutta.

2. *Tumours of the Salivary Glands—*

   Opener : Dr. J. C. Paymaster, Bombay.
   Seconder : Dr. A. K. Dutta Gupta, Calcutta.

3. *Cleft Palate—*

   Opener : Dr. U. C. Chakravarty, Calcutta.
   Seconder : Dr. R. N. Sinha, Patna.

ASSOCIATION NOTICES

Library of the Association of Surgeons of India

AN APPEAL

In this twentieth century, knowledge is so rapidly expanding that it has become beyond the capacity of scientific workers and professional men to know in their entirety the specialised literature available even in limited fields. An efficient library service has thus become vital to the progress of any branch of Medicine. There can be no useful library service unless there is a good and extensive library attached.

The Library of the Association of Surgeons of India is very small. A complete catalogue of books and journals available in the library will be published very shortly.

The Hony. Librarian makes a fervent appeal to all the members to donate liberally, in cash or in kind, to the library. Books and Medical Periodicals, recent and ancient, are all welcome. Reprints of articles and additional copies of existing books or periodicals will also be accepted with gratitude. Books, now out of print, first or early editions of any book, catalogues and reports of public libraries and private collections, proceedings of special Institutions like Haffkins Institute, Tata Memorial Hospital, Tropical School of Medicine, etc., will also be accepted with grateful thanks.

It is hoped that this appeal will produce substantial results.

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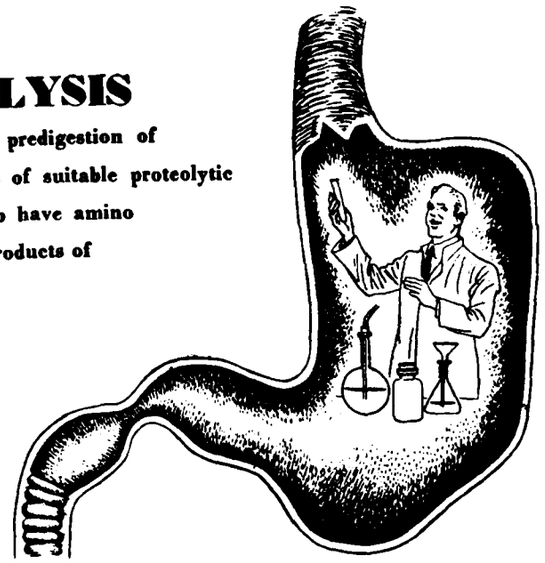

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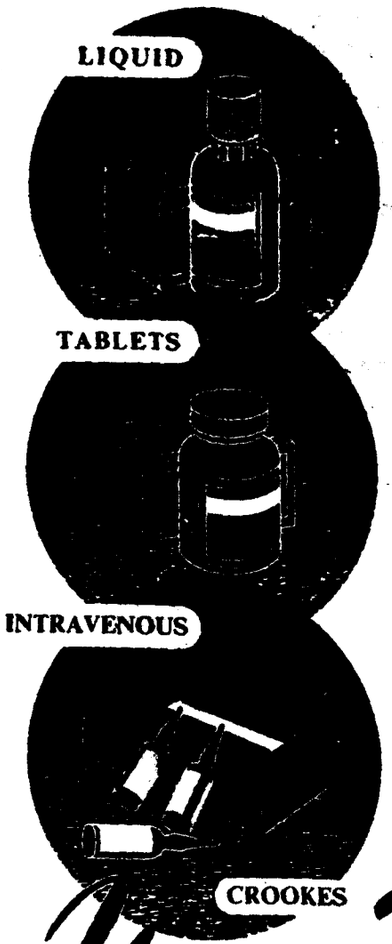

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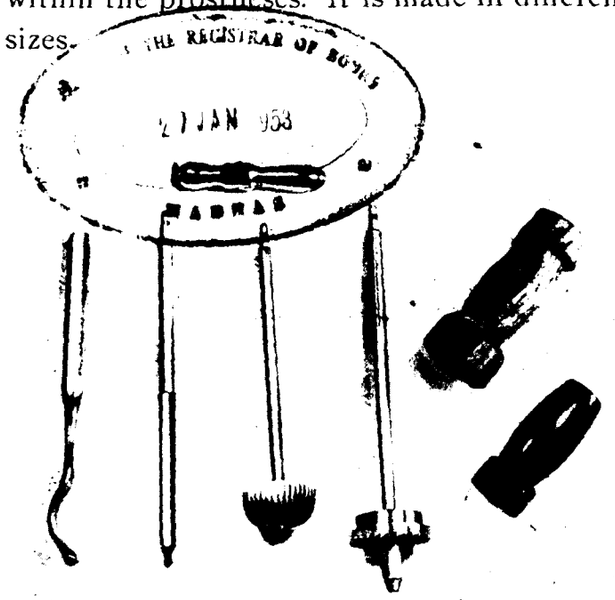

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