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Non-Malignant Obstruction of the Œsophagus

OPENING PAPERS

I

By V. E. NEGUS (London)

THIS subject is best dealt with by considering the different regions of the œsophagus from above downwards. In this paper pure neurological disorders will be omitted—such as lack of relaxation of the cricopharyngeal sphincter and paralytic defects of propulsion of food, as in bulbar palsy and some other diseases. Similarly, obstruction by foreign bodies is not considered. Congenital abnormalities incompatible with life and not amenable to treatment are also excluded.

Webs at the Cricopharyngeal Fold.—Patients may be seen complaining of difficulty in swallowing, referred to the upper opening of the œsophagus, extending over several years, sometimes with no apparent reason to account for the trouble, and in other cases attributable to ulceration from corrosives or inflammatory disease. Direct inspection reveals constriction at the mouth of the œsophagus by webs of different consistency, some thick and firm, and others thin and friable. The lumen of the gullet may be reduced to a minute size, admitting only the smallest bougie.

Treatment is simple and effective, provided the patient will return whenever necessary. The lumen may be enlarged with a series of bougies, followed by the introduction of œsophagoscopes of increasing size until one of 20 mm. by 18 mm. has been passed. Jackson recommends the use of alligator forceps to dilate the web ; they should be passed through the stricture closed and then withdrawn open. The treatment of such cases is easy and the results are excellent.

Chronic Hypopharyngitis.—Long-standing inflammation of the cricopharyngeal fold, usually limited to its upper surface, as

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described by Paterson and Brown Kelly, will eventually lead to obstruction, because of cicatricial contraction of the mucous and submucous layers. Inspection reveals superficial ulceration with the formation of granulations and in places thin webs, which narrow the entrance of the œsophagus.

Local treatment consists of dilatation, repeated after a few weeks and continued for as long as necessary—possibly for years. To avoid injury to the epithelium the use of a dilatable rubber bag is recommended, followed by the passage of an œsophageal speculum or œsophagoscope provided with a beak, to allow of gradual insinuation. Webs may tear and ulceration may be increased temporarily, but such damage is unavoidable and is not dangerous.

After-treatment consists of giving dry powders of bismuth, as recommended by Chevalier Jackson, to cover the denuded and inflamed surfaces. Phenol lozenges also are useful as a local analgesic and antiseptic. If secondary anæmia is present iron may be given, or extract of hog's stomach.

In long-standing cases we have observed the development of malignant changes, a small nodule of firm consistency appearing on the inflamed surface and proving, on microscopical examination, to be carcinomatous. The treatment then called for is excision of a segment of the upper œsophagus, together with the cricopharyngeal fold and a portion of the hypopharynx. In view of the possibility of such carcinomatous change it appears justifiable to recommend this operation in resistant cases of simple hypopharyngitis, even when no actual evidence of malignancy is to be seen (Fig. 1).

A less severe operation, which might be effective, would be division of the cricopharyngeal sphincter, without opening the œsophagus.

Pharyngeal Diverticulum.—Obstruction of the œsophagus is produced in two ways after herniation of the hypopharyngeal wall. The filled pouch presses on the lumen of the gullet and interferes with the passage of food downward, and the anterior lip of the pouch is pulled against the back of the cricoid by the cricopharyngeal sphincter and is also pushed forward by the contents of the pouch.

In slight cases dilatation of the cricopharyngeal sphincter, combined with periodical emptying and washing-out of the pouch, will relieve symptoms. Advanced cases call for excision of the diverticulum, by a one- or two-stage operation. Other measures—such as endoscopic removal of the party-wall between the pouch and the œsophagus, the division of the cricopharyngeal sphincter without opening the pouch, or suspension to the pharyngeal wall—have been recommended, but there are objections to their use.

Stricture following the Swallowing of Corrosives.—Cicatricial contraction is most marked at the cricopharyngeal fold and at the level of the left bronchus. In most cases both regions are affected.

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It is necessary to widen the lumen at the mouth of the œsophagus before attending to strictures lower down.

At the middle of the œsophagus the condition may be difficult to treat because the strictures may be long, multiple, and out of line with one another. They follow the purposive or accidental swallowing of corrosive alkalies or acids, and in our experience are rare. We have records of no more than three such cases in the last twelve years.

The acute stage of obstruction calls for the use of rectal salines with glucose ; later on gastrostomy may be required. No attempt at dilatation of the stricture is made until the acute stage has subsided and cicatricial contraction has occurred. Exposure through an œsophagoscope will, in any but extreme cases, allow a thin bougie of Jackson's type to be passed through the lumen of the stricture ; graduated bougies can then be used, or, preferably, a dilatable bag, to avoid damaging the surface. Such treatment, if repeated persistently—at first weekly, and later at gradually increasing intervals—should relieve all symptoms.

More severe cases may be treated by Plummer's thread-guided method. The main difficulty is to entice a thread to pass through the stricture, but once it is firmly anchored in the small intestine, the passage of graduated bougies, under its guidance, is easy. If obstruction is extreme, gastrostomy is required. This is followed by retrograde bouginage by Tucker's method, a swallowed thread being drawn out of the stomach to form an endless loop.

Jackson has reported success in establishing a lumen through a complete stricture by perforation carried out by combined peroral and retrograde œsophagoscopy, under fluoroscopic guidance. If the lumen of the œsophagus cannot be restored an external gullet may be constructed, as described by Dr. Kelemen.

Stenosis following Impaction of a Foreign Body.—Although foreign bodies may lodge in the œsophagus for months or even years, with extensive ulceration and the formation of abundant granulations, yet stenosis seldom occurs after their removal.

We have made direct observations on a child, aged 2½ years, who had a halfpenny impacted for three months at the level of the thoracic inlet, with severe obstruction. Direct examination three months, and again one year, later revealed no signs whatever of cicatrization.

Stenosis following Specific Fevers, Syphilis, or Peptic Ulceration.—Occasional causes of œsophageal ulceration are diphtheria, typhoid, and scarlet fever. We have seen cases in which no other reason could be found for stenosis except the effects of one of these fevers. The obstruction is usually at the cricopharyngeal fold or the level of the left bronchus, but we have seen one such stricture midway between the left bronchus and the diaphragm. The appearances

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FIG. 1.

Upper surface of the cricopharyngeal fold in a woman aged 73, showing chronic inflammation, with ulceration, and the formation of granulations. The condition appeared to be undergoing malignant changes, although no definite evidence was found. Because of severe dysphagia, unrelieved by treatment, a segment of the œsophagus and hypopharynx was excised ; the gullet was reconstructed by Trotter's method. The patient made a good recovery, and was able to swallow well.

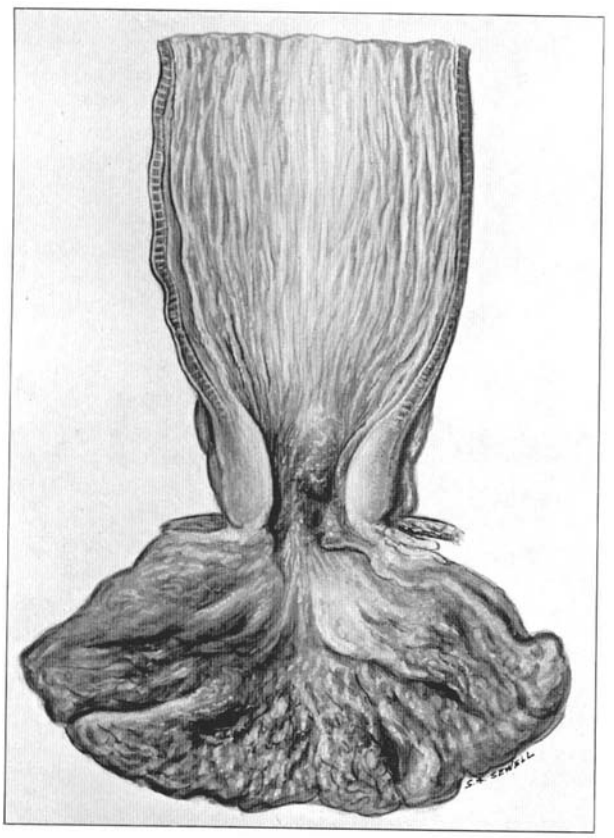


FIG. 2.

Stricture of the œsophagus in a middle-aged man, just above the diaphragm, apparently due to contraction in the site of a peptic ulcer. There was dysphagia, gradually increasing over a period of eighteen months. A diagnosis of carcinoma was first made in error. The patient died of arterio-sclerosis.

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do not differ from those produced by corrosives. Gradual dilatation is required, as already described.

Syphilis is a rare condition in the œsophagus, and we have only one supposed case.

A case of stricture just above the diaphragm, apparently due to peptic ulceration, is illustrated (Fig. 2).

Simple Neoplasms.—This cause of obstruction is extremely rare, but tumours such as papillomata, lipomata, fibromata, and angiomata have been reported. Removal will cause the symptoms to disappear.

Pressure from Without.—We have seen dysphagia caused by the pressure of a chondroma of the cricoid cartilage on the cervical œsophagus. Removal of the growth surgically affords a cure in such a case. Thyroid tumours may cause pressure, but usually only if malignant. Mediastinal tumours, such as lymph-adenoma or sarcoma may give rise to a moderate degree of obstruction; the only practical form of relief is by deep X-ray therapy.

Aneurysms also produce a moderate degree of dysphagia, but treatment of a dilatation large enough to press on the gullet is palliative only. A patient may be relieved by passing a feeding-tube through the œsophagus and leaving it in place; direct guidance may be required, but the operation gives rise to anxiety.

Congenital Shortening.—Since the original papers of Brown Kelly and Leonard Findlay, many cases of this condition have come to light and an explanation is given for the dysphagia of a number of patients.

The treatment falls under two headings: (*a*) that of symptoms attributable to dilatation of that part of the stomach lying above the diaphragm, such as pressure on the heart; and (*b*) that of cicatricial stenosis causing dysphagia.

It is with the last group alone that we have to deal. In these cases there is not only a developmental failure to grow in length but also a lack of expansion of the lumen; furthermore the epithelial lining of the narrow segment may be deficient.

The treatment should consist of gradual dilatation with a rubber bag distended with water; the use of this instrument avoids any possibility of injury to the œsophageal walls and cannot cause superficial ulceration. Dilatation is carried out at intervals, in accordance with the symptoms and radiographic findings, and a good result may be expected.

A factor to be considered in these cases is the possibility of regurgitation of acid contents from the thoracic stomach into the lower end of the œsophagus, with peptic ulceration. It is possible that excessive dilatation of a cicatricial stricture may increase the liability to this unfortunate occurrence, as there is no possibility of closure by mechanical or muscular factors while a meal is in

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process of digestion. The means we suggest of avoiding this complication—with its resulting symptoms of discomfort or pain in the œsophagus, in the back, or round the ribs—is to advise the patient to avoid the horizontal posture as far as possible, so that the force of gravity may help to prevent regurgitation, and also to give him small and frequently repeated doses of alkaline powders, taken dry.

Œsophagectasia.—Wide dilatation of the œsophagus, from the level of the diaphragmatic orifice upwards, has as many possible means of treatment as explanations for its cause.

The possibility of primary dilatation by air-swallowing in infancy has been rather neglected, although it is mentioned by Chevalier Jackson and others. If the gullet is distended gradually by air its walls can no longer meet as a result of muscular action; peristalsis is thus eliminated. The prophylaxis and the treatment of early cases must therefore aim at prevention of ærophagy. Once wide dilatation has occurred it is impossible for the damage to be undone. Any reflex cause in the abdomen, such as an inflamed appendix, gastric ulcer, or a gall-bladder filled with stones, must be sought and treated. If no such cause is found, the daily passage of Hurst's mercury-filled bougie may be used, after preliminary wide dilatation of the diaphragmatic hiatus. The rationale of this treatment presupposes lack of relaxation of the cardiac sphincter because of degeneration of Auerbach's plexus. Lavage of the œsophagus, at intervals, may be required to prevent œsophagitis; an ordinary stomach tube is used. To stretch the hiatus we prefer to use a bag introduced through a wide œsophagoscope and dilated under vision, but others employ a bag passed under fluoroscopic guidance. Stretching the œsophagus by fingers introduced through an abdominal incision has also been advocated. Knight has suggested destroying the sympathetic nerve supply of the cardia by stripping the plexus from the cœliac axis artery, so as to prevent excessive muscular contraction. The results of such treatment appear to be disappointing.

In certain cases stagnation of food leads to œsophagitis and cicatricial contraction. A simple fibrous stricture is thus produced at the level of the diaphragm; it is treated by dilatation with a bag, at repeated intervals.

When the œsophageal walls have stretched to an extreme degree they also elongate, and kinking takes place. This provides yet another cause for obstruction to the passage of food.

The wedge-like dilatation of the diaphragmatic orifice by the heavy, dilated œsophagus may cause part to descend into the abdomen. A reasonable form of treatment in cases with kinking consists in opening the abdomen, freeing the œsophagus from the diaphragm, and straightening it by drawing the lower part down

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into the abdomen. One of our cases recently treated in this manner by Harold Edwards has much improved. Some surgeons, in addition to the freeing and straightening, have thought it wise to establish an anastomosis between the stomach and the œsophagus.

II

By G. KELEMEN (Budapest)

Ante-Thoracic Plastic Operations for Impermeable Stricture of the Œsophagus.—The large number of strictures of the œsophagus observed in Hungary is due to the fact that hydroxide of potassium (caustic potash) is popular for cleansing in that country. In spite

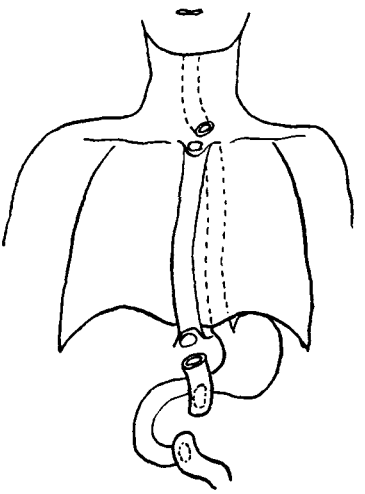


FIG. 1.

of the proscriptions of the authorities, this substance is much used in village households for preparing soap and for other methods of cleaning. It leads to many cases of poisoning, partly as a means of suicide and partly by accidental confusion with drinking water.

When the resulting strictures are found to be impassable during attempts at dilatation, or reach an impassable stage later, owing to neglect of such treatment, a substitute for the œsophagus by plastic operation is indicated. This plastic substitute may be successful even in cases of carcinoma of the œsophagus, as has been shown in a case reported by G. Grey Turner to this Section in December, 1933,* but the bad condition of the patient often contra-indicates the performance of the series of necessary operations which may last as long as a year and a half.

* *Proceedings*, 1934, xxvii., 355 (Sect. Laryng., 8).

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The plastic operation (Fig. 1), as performed by Prof. de Bakay of Budapest, consists of five stages: (1) Bringing the stump of the œsophagus to the surface on the left side of the neck above the clavicle. (2) Forming a tube from the skin of the anterior chest wall. (3) Drawing forward a loop of jejunum and preparing a jejunostomy on the abdominal wall. (4) Uniting the opening of the œsophagus with the upper end of the skin tube. (5) Uniting the lower end of the skin tube with the jejunostomy.

Twenty-four such completed operations have been performed in our clinic and there is at present a further series in the various stages of the operation. The plastic channels, which have been functioning excellently for years, enable the patients to perform hard physical work. The inner covering of the ante-thoracic skin tube becomes adapted to its new function: the hair roots and the

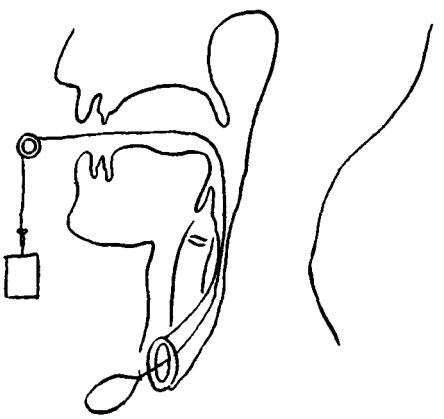


FIG. 2.

sweat-glands degenerate and the skin becomes, on the whole, similar to the mucosa of the œsophagus.

The manner in which food and drink reach the stomach through this new canal is quite different from the normal act of swallowing.

In order to study this process experiments have been performed on two groups of patients. In the first group the œsophagus opened at the surface in the neck (Fig. 2). This group was subdivided into those in which the œsophagus was completely cut across and those—the majority—in which a lateral œsophagostomy had been performed leaving the lumen of the œsophagus continuous down to the stricture. The patients had all been operated on for long periods and were thus accustomed to their new conditions. The second group consisted of cases in which the complete plastic operation had been performed and the new canal was functioning satisfactorily (Fig. 3). The length of period since the operation varied.

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For the experimental bolus, rubber glove-fingers filled with water to make balloons of different sizes, or pieces of bread rolled into balls, were used. These were attached to thick silk threads, since it was found that thinner threads caused distinctly more irritation to the pharyngeal mucosa. This irritation has to be reduced as much as possible, and the application of cocaine is not permissible. The thread passed out of the mouth, over a small revolving drum and had weights attached to its free end by means of a hook. All the experiments were performed with the patients in the sitting position.

In the first group a peculiar fact was observed, namely that all kinds of boluses, even those of smallest dimensions, were pulled out through the œsophagus, pharynx, and mouth without delay. This fact is remarkable since the strength of swallowing is not at all

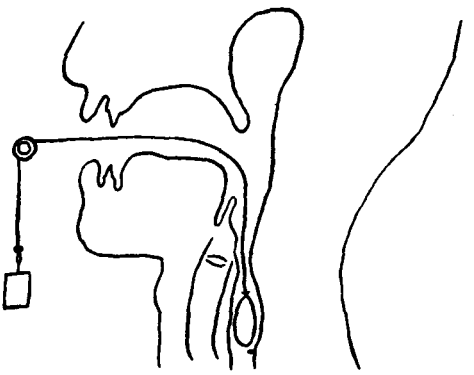


FIG. 3.

diminished, for a bolus is forced out with normal strength through the opening in the neck.

Following these results patients in whom the complete operation had been performed were examined. There was no hindrance to the passage of a bolus through the skin tube, but there was everywhere a measurable resistance to the pull of the weight as in normal subjects. This resistance was most marked at the upper end of the œsophagus. At this point a mass of 45 gm. could be held in equilibrium.

It is a curious fact, that even in the presence of great nausea sometimes lasting for hours, vomiting is never observed in patients with an artificial œsophagus. The explanation of this lies in the fact that there are no smooth muscular fibres in the new œsophagus.

The experiments described, show that the sphincter action at the upper end of the œsophagus may play some part in this also. This sphincter functions again only after the complete plastic

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operation has been carried out, but it is never as strong as in the normal subject.

As a summary of our results it can be stated that to achieve an efficient mechanism for the closure of the upper end of the œsophagus against forces acting from below, there must be a tubular closed continuation of the upper part of the œsophagus. This can be formed by either the normal œsophagus or the ante-thoracic skin tube. This closure cannot be entirely explained by nervous action, as it occurs even when a complete division of the œsophagus has been performed.

III

By A. BROWN KELLY (Glasgow)

A Case of Œsophageal Stenosis of Unknown Origin.—The patient, a girl aged 3 years and 4 months, was admitted to hospital under the care of Dr. Geoffrey B. Fleming, because of gradually increasing difficulty in swallowing and persistent vomiting. She had been in good health until five months previously, when vomiting began; this was severe during the first week, but subsequently became milder. The child was emaciated. No information could be elicited as to the cause of her illness; her mother denied the possibility of a corrosive having been drunk. Tuberculosis and syphilis were excluded. In hospital she refused solids, hid them, and when fed clenched her teeth and spat; she drank milk readily, but a large part was regurgitated.

X-rays showed obstruction of the gullet opposite the lower border of the fourth thoracic vertebra, and above this a dilatation. The œsophagus seemed to pass backwards and downwards from the lower and posterior part of the dilatation and to become gradually narrowed until it tapered to a point. In a lateral skiagram the appearances were somewhat suggestive of a pouch, but differed in that the dilatation opened below and discharged backwards and downwards. Endoscopy confirmed the presence of a large dilatation which gradually narrowed below and posteriorly to a funnel-shaped constriction, the upper end of which was superficially ulcerated. A careful search was made for an exit, but none could be found.

The condition became worse and gastrostomy was performed, but the child died of broncho-pneumonia at the age of 3 years and 8 months.

At the *post mortem* examination, made by Dr. J. W. S. Blacklock, the under-noted conditions were found in the œsophagus: A small semicircular fibrous diaphragm on the anterior wall close below the pharyngo-œsophageal junction; immediately below this there was dilatation as far as the level of the bifurcation; here definite

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narrowing began and continued downwards for about 4 cm.; no gross pathological change was noted in the wall of the narrowed area; below the constriction the dilatation was mottled and discoloured. Microscopical examination of tissue from the stenosed site showed some hypertrophy of the longitudinal muscle-fibres, but more particularly of the circular fibres, in addition to fibrosis between them. Foci of round cells and mononuclears were present between the bundles of circular fibres. The stenosis was possibly due to fibrosis, but the cause was doubtful. The necropsy did not furnish a definite diagnosis; the findings, however, were compatible with the view that a corrosive had been swallowed. This possibility had been considered during the child's life, but the denial or concealment of the occurrence of any such accident by those in charge had led to its being put aside. We are now inclined to assume either that the corrosive was weak and did not burn the mouth or pharynx or disturb the patient sufficiently to attract the mother's attention, or that the mother, although cognizant of the accident, denied all knowledge of it in order to escape the blame.

Vallecular Dysphagia.—This is a peculiar condition which has not yet been fully explained. Slight cases are seen by radiologists and by laryngologists who look for them, but patients with pronounced symptoms are very rare. So far as I know, vallecular dysphagia was first described, and thus named, by R. R. Woods, of Dublin, in 1931.* His patient had distressing dyspnœa and gross dysphagia, owing to the epiglottis being pushed back against the posterior wall of the pharynx. Two and a half years later he stated that he had not seen another case. In 1933, J. E. G. McGibbon and J. H. Mather† reported the investigation by radiology and laryngoscopy of a large number of normal persons and of patients complaining of discomfort in swallowing. They distinguish a primary and a secondary variety of vallecular dysphagia. Briefly stated, the primary is a purely local affection of uncertain ætiology, while the secondary is due to manifest disease. The diagnosis in their cases was made almost invariably by X-ray examination, only in one primary case was food lying in one vallecula seen by indirect laryngoscopy. Another contribution to our knowledge of this disease is a paper by Gerlings and den Hoed.‡ These writers are of opinion that the size and shape of the valleculae and pyriform sinuses, which show great individual variation, may play an important part in holding up food.

In the case to which I wish to direct attention, I found difficulty in determining what was wrong, as the man's mental state rendered

* *Lancet*, 1931 (i.), 1137; Id., *Brit. Med. Journ.*, 1933 (ii.), 1139.
† *Brit. Med. Journ.*, 1933 (ii.), 1013.
‡ *Acta-Oto-Laryngologica*, 1935, xxii., 519.

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him unable or unwilling to describe his symptoms. The information given by the nurses, of his occasionally half-filling a sputum-mug with mucus in the course of two or three minutes, and the constant hypersecretion of saliva, raised the suspicion of a pharyngeal pouch or of obstruction in the œsophagus, but the presence of these conditions was disproved by endoscopy and radiology; on the other hand, the hold-up of barium in the valleculae and pyriform sinuses was revealed.

When this man was first seen, unfortunately I omitted a procedure which I usually adopt in cases of dysphagia—the laryngoscopic examination of the patient immediately after the swallowing of soft food. Later, when this method was employed, it immediately demonstrated the condition at fault even better than X-rays. As the patient swallowed, the food gradually collected in the abnormally roomy valleculae, covered the median glosso-epiglottic fold, and reached even above the level of the upper edge of the epiglottis. For this test the food should be such as will form a fairly firm coherent bolus.

A striking feature in this case which may be an ætiological factor, is the great distance between the posterior wall of the pharynx and the structures opposite—the base of the tongue and the epiglottis (Fig. 1).

Ascending Fibrosis of the Œsophagus in an Infant.—Fibrosis of the œsophagus appears to be an affection of not infrequent occurrence in infants. Our attention has been directed to it as a serious and possibly fatal complication in cases of congenital shortening of the œsophagus. In the case about to be described, the comparative slightness and occasional absence of symptoms during the first three months of life and their progressive aggravation during the last two months, seem to indicate that the chief changes found in the œsophagus after death were of post-natal origin, and also that the slight shortening in the œsophagus was not congenital but secondary to fibrosis.

A female infant, 6½ weeks old, was admitted to the Royal Hospital for Sick Children, Glasgow, under Dr. Stanley Graham, on account of vomiting, which had been frequent from birth. Sometimes it took place immediately after a feed, at others, a half to one hour later, and occasionally it was projectile. The infant was sent in as a case of pyloric stenosis, but the evidence being insufficient she was discharged in a few days with instructions as to diet. For about a month she kept well and then vomiting recurred. It now differed from that previously present, in that the main trouble was to get the food down. Choking was excited readily and often caused regurgitation by the mouth or nose. Mucus was also expelled. She was readmitted to hospital when 4½ months old, and was then found to be mentally defective. Despite the vomiting,

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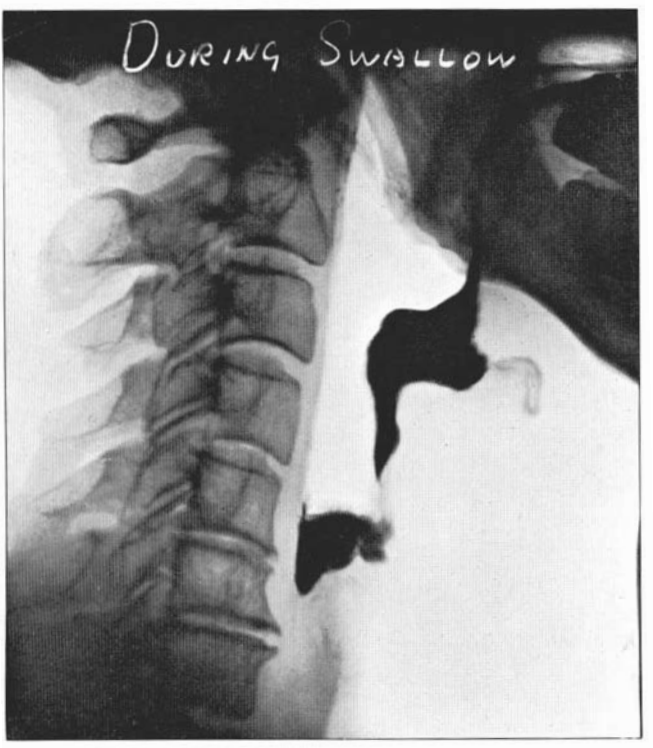


Fig. 1.
Vallecular dysphagia. Barium is seen passing over the base of the tongue and collecting in the valleculae and pyriform sinuses.

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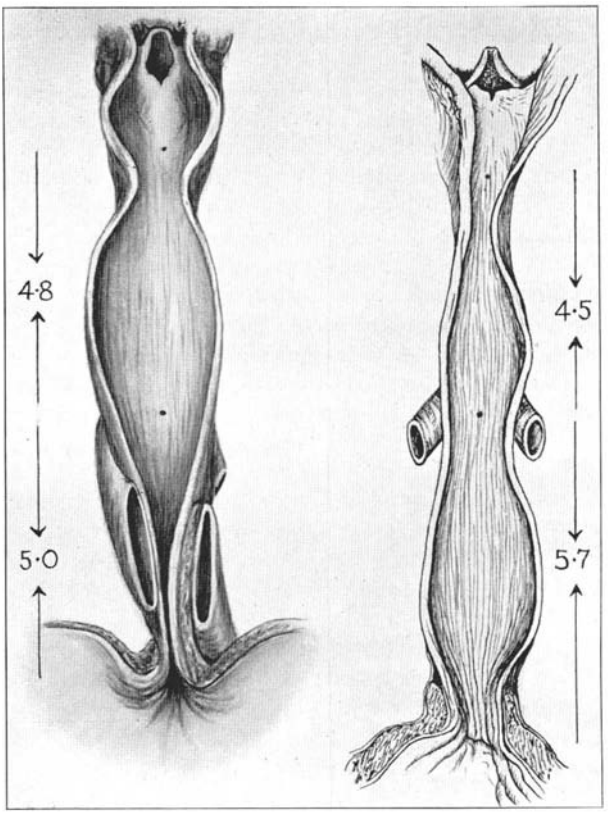


FIG. 2.

Left: Fibrosis of lower third of œsophagus in a girl aged 5 months. Right: Average normal œsophagus (boy, same age). The level of the upper end of the œsophagus and of the bifurcation of the trachea is indicated by dots in both sketches.

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she was thriving and gaining weight, when she died from broncho-pneumonia, aged 5 months.

About a week before her death an X-ray examination was made. Immediately after the swallowing of barium, the œsophagus appeared sausage-shaped and distended to the level of the lower edge of the seventh thoracic vertebra. A small tail was continued down from the left margin in front of the inter-vertebral disc. No barium passed below this level throughout the examination.

The *post mortem* examination was made by Dr. J. W. S. Blacklock who found, in addition to evidence of acute broncho-pneumonia and double acute otitis media, the convolutions of the brain small (microgyria), internal hydrocephalus, and malformation of the œsophagus.

The œsophagus when opened along the middle of its posterior surface was seen to be dilated from near the upper end to 1 cm. above the bifurcation where a maximum width of 2·5 cm. was attained. Below this level the width rapidly diminished to the cardiac canal, the upper end of which was not sharply demarcated. It was thus difficult to estimate the exact length of the canal, but this might be regarded as at least 3 cm. In the middle 2 cm. the lumen was so reduced as scarcely to allow the passage of a fine probe (Fig. 2). The wall of the lower half of the canal was of cartilaginous hardness which was most marked below and diminished in passing upwards. The lining membrane of the canal and of the œsophagus for a short distance above it was smooth with no longitudinal ridges, lustreless, and of a dirty grey colour. These pathological changes were suggestive of a morbid process having invaded the lowest part of the œsophagus and extended upwards, whereby the cardiac canal, which normally is very dilatable, together with about 2 cm. of the œsophagus above it, had been converted into a rigid channel with an abnormally small lumen.

The measurements of this abnormal œsophagus are given below, together with the corresponding average measurements of six normal œsophaguses from infants of the same age (five months).

	Abnormal œsophagus. cm.	Average normal œsophagus at 5 months. cm.	Differences in abnormal œsophagus from average normal. cm.
Cricoid to bifurcation ..	4·8	4·5	+0·3
Bifurcation to cardia ..	5·0	5·7	−0·7
Total length	9·8	10·2	−0·4
Bifurcation to upper end of cardiac canal ..	2·0	4·7	−2·7
Length of cardiac canal	3·0	1·0	+2·0

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The two sets of measurements reveal but little difference between the diseased œsophagus and the average normal, either in the length of the whole œsophagus or in that of its upper and lower sections respectively. The seat of the morbid process, and the effect that it has produced, become apparent, however, when the two parts of the lower section—the cardiac canal, and the part of the œsophagus between the upper end of the canal and the bifurcation, are compared with the corresponding normal regions. In the abnormal œsophagus the cardiac canal seems to have gained considerably in length, while the region extending from its upper end to the bifurcation is shortened by an even greater amount.

I am indebted to Dr. J. W. S. Blacklock for the histological examination of the part of this child's œsophagus extending from the bifurcation of the trachea to the stomach. His investigation demonstrates the undernoted conditions and thereby confirms the presence of an ascending fibrosis.

Thickness of Wall of Œsophagus
From outer edge of longitudinal muscular coat to inside edge of muscularis (microscopic measurements)

Portion.	Œsophagus with ascending fibrosis. mm.	Normal child of same age. mm.
Upper (1)		
At bifurcation	1·08	0·9
Middle (2)		
Upper end	1·17	1·35 at thickest portion
Lower end	2·08	
Lower (3)		
Upper end	2·17	1·53 at thickest portion
Middle	2·89	
Lower end (just above gastric epithelium) ..	1·53	

Pathological Report on the Œsophagus (lower part, from bifurcation to cardia). By J. W. S. Blacklock :—

(1) *Upper portion at and below bifurcation of trachea* (14 *mm. in length*). Shows no abnormality. A small lymph-gland outside the œsophagus at this level shows some catarrhal change in the sinusoids.

(2) *Middle portion, below* (1) (19 *mm. in length*). Shows interstitial fibrosis involving all the muscular coats, including the muscularis. The longitudinal coat is least involved and the fibrosis is most marked in the plane between the longitudinal and circular muscular coats. Focal accumulations of round cells are present and, like the fibrosis, are most marked around and in the neighbourhood of small blood-vessels. Many of the groups of ganglion cells are surrounded by small round cells, but for the most part little degenerative change has occurred in the large nerve-cells. The inflammatory lesion and the fibrosis are

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(*a*)

(*b*)

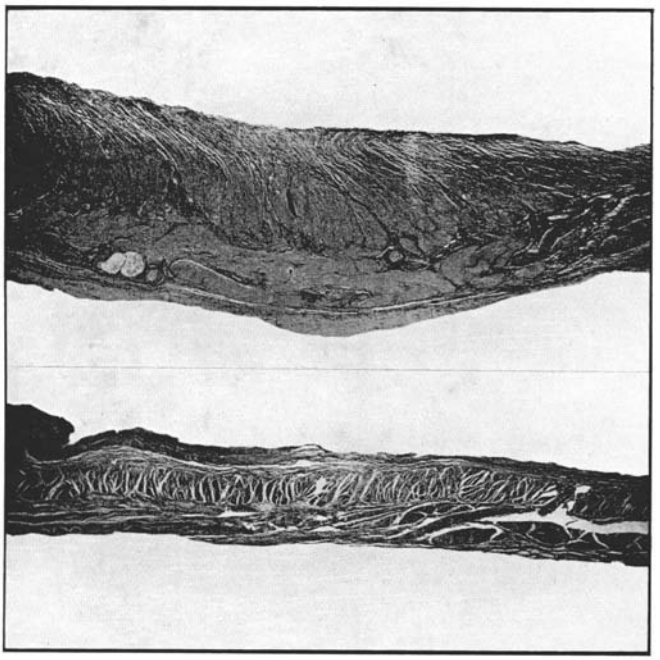


FIG. 3.

(*a*) Microphotograph of vertical section of hypertrophied and fibrosed wall of œsophagus. (*b*) and of the normal œsophagus from a child of same age (5 months). Both sections have been stained with hæmatoxylin and eosin. × 8½.

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most marked at the lower end of this portion and diminish in an upward direction; at the upper end they are practically absent. A small lymph-gland at this level shows catarrhal change in the sinusoids.

(3) *Lower portion, from below* (2) *to cardia* (24 *mm. in length*). The chronic inflammatory and fibrotic lesions are most marked in this portion, particularly at the lower end just above the level where the gastric type of epithelium stops. In this portion many of the muscular cells show degeneration. The cellular exudate and fibrosis around the capillary vessels are very marked and some of the capillaries show closure due to proliferation of their endothelial lining.

The histological examination proves, at least in this case, that the fibrosis began at the lower end of the œsophagus and had reached the level of the bifurcation at the time of death. In an earlier case the process passed even higher.

H. P. Mosher*—who has written extensively on infection of the œsophagus, with resulting fibrosis—states that fibrosis first attacks involuntary muscle and thus begins in the lower part of the œsophagus. In the region extending a few millimetres above the anatomical cardia, a more definitely localizing and predisposing cause is the presence of patches of gastric mucosa. Schaffer, who specially studied the cardiac glands, could demonstrate them in 70 per cent. of autopsies. P. E. Ireland† recently indicated that these glands are more susceptible to infection than the mucous glands of the stratified squamous epithelium, and that they are often involved through the blood in an acute infection. Dr. J. W. S. Blacklock has frequently found what appear to the naked eye to be small erosions or ulcers in the lowest part of the gullet. On microscopic examination these prove to be breaches in the normal squamous epithelium whereby the underlying submucosa is exposed.

In this case an opinion cannot be expressed as to whether the infection was ante- or post-natal. If we may judge from the other regions and organs that are occasionally infected during intra-uterine life the involvement of the œsophagus at this period is quite conceivable. Mosher states that he has found evidences of pre-natal infection of the œsophagus, shown by peri-œsophageal glands and a localized hypertrophy of the musculature opposite the glands.

Discussion

Herbert Tilley showed two skiagrams of the chest of a patient who had suffered from rapidly increasing dysphagia. The first revealed a clearly defined ovoid swelling in the right mediastinum, about the size of a hen's egg. It was in close contact with the

* *Inter-State Post-Graduate Medical Assembly of North America*, 1930, 95.
† *Laryngoscope*, 1933, May.

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œsophageal wall at the level of the sixth and seventh dorsal vertebrae. In the second there was a calcified gland as large as a pea above the right bronchus, and numerous diffuse shadows radiating from roots of each lung.

History.—The patient, a man, aged 37, was under the care of Dr. Batty Shaw in University College Hospital, in July, 1930, on account of dysphagia of sudden origin and quickly increasing degree, accompanied by substernal pain aggravated by swallowing, and a superficial hyperæsthesia.

On July 25th, X-ray examination demonstrated the conditions noted. Three days later, the gullet was examined by direct endoscopy, but no lesion could be detected in the mucous membrane above, within, or below that portion of the lumen which was much narrowed by the pressure of the mediastinal " tumour ". Within a few hours of the examination the symptoms began to disappear, and by the end of a week the patient was taking ordinary food, and recovering his lost weight. He was convalescent within a month. In a letter received on February 5th, 1936, he states that there has been no recurrence of the dysphagia, his health is excellent, and during the past $5\frac{1}{2}$ years he has put on from 14 to 16 pounds in weight.

In view of the history, radiographic findings, and rapid subsidence of symptoms after œsophagoscopy, it seems probable that the ovoid swelling in the mediastinum was a suppurating tuberculous gland which was on the point of bursting into the gullet when that viscus was investigated. The patient's mother died of tuberculous peritonitis.

A more detailed account of the case, including Dr. Batty Shaw's comments, was published in the *Proceedings*, 1931, xxiv., 443 (Sect. Laryng., 19).

ERIC WATSON-WILLIAMS said that some œsophageal ulcers were peptic. He had once removed such an ulcer; the pathologist reported that the specimen was normal œsophageal mucosa, with some muscular tissue, and that in one place there was a small area of gastric mucous membrane ulcerated in the centre. He had seen three cases of peptic ulcer in which the pathologist supported his diagnosis, and in none of those was there a stricture subsequently. All were relieved by alkaline treatment.

The other type which he wanted to mention was a congenital stricture at the level of the seventh dorsal vertebra. The only two cases he had seen were in adults. One had had gastrostomy performed, and was unable to swallow anything at all. On examination there was a complete obstruction 28 cm. from the mouth. The patient was given a string to swallow, and a week later it was possible to dilate the œsophagus, and to put in a Souttar's tube; this was passed in four days. The procedure was repeated with

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a bigger tube, and that also was passed. Later the man saw Mr. E. D. D. Davis, who reported a typical congenital œsophageal stricture. At the end of a year the patient returned; ulceration had been followed by fibrous stricture and he was supplied with a bougie which he passed every day. That was three years ago, and even now, if he missed more than one day he experienced some difficulty.

DOUGLAS GUTHRIE said that some years ago he had seen at his clinic a child aged 4 years who had difficulty in swallowing. Two small fibromata were discovered just within the œsophagus. Removal was accomplished by snare, and no stricture followed. The fibromata together were the size of a small walnut.

D. R. PATERSON related a case which he had seen before the days of X-rays and direct vision. The patient, a man aged over 70, had begun to complain that his swallowing was not right, and after some months he died. On *post mortem* examination a large pedunculated fibroma, the size of a small pear, growing from the middle third of the gullet, was found.

Mr. Tilley's case reminded him of one in a girl aged 12, who had difficulty in both swallowing and breathing. She came into hospital very ill, and the passage of a tube showed some obstruction in the œsophagus. Careful examination was impossible, because the breathing was so bad. After her death a few days later, a large abscess, due to caries of the spine, was discovered; this had pressed on both the œsophagus and the air passage.

H. BELL TAWSE said his impression was that vallecular dysphagia meant the presence of particles of food in the valleculae which had to be dislodged by coughing or straining before they could be swallowed. If a normal person was given barium to swallow, none was seen in the valleculae. He doubted whether the term dysphagia should be applied to this condition. Why food was side-tracked into the valleculae during deglutition he did not know, but he had seen three cases in ten years, all associated with nasal and post-nasal catarrh, in men who smoked cigarettes to excess. The first patient was continually choking and coughing at meals and began to fear he had cancer of the throat. Beyond a little mucopus and saliva in the valleculae, and some reddening, no lesion could be found. A dry biscuit could be swallowed with ease, but particles found their way into the valleculae. There was no œsophageal obstruction in any of the cases. All were cured in a fortnight by giving up cigarettes, and they had no recurrence with pipe smoking.

J. E. G. MCGIBBON said that he had recently seen four cases of spasm of the lower two-thirds of the œsophagus.

One was in a man aged 70, who complained of difficulty in swallowing. X-ray examination showed a smooth stricture, with some dilatation above, in the middle third of the œsophagus. The

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dysphagia lasted only two or three days, and disappeared after a barium meal and X-ray examination. Œsophagoscopy on the following day did not reveal anything that might have accounted for the condition. The second case was in a woman aged 30, who had a diffuse spasm of the lower two-thirds of the œsophagus, so that it presented a wavy outline. The spasm had passed off in two or three days.

Yet another case was that of an old lady who appeared to have a pouch at the lower third of the œsophagus. X-rays showed it filling and emptying again. Nothing was found with the œsophagoscope, and a week later the passage of barium was seen by X-rays to be normal.

G. H. STEELE (who showed a cinematograph film illustrating his remarks) said that retrograde œsophagoscopy was applicable to the surgery of carcinoma. At a joint meeting of this Section with the Section of Surgery a year ago the question of carcinoma had been discussed, and it was agreed that major surgery, including transpleural implantation of radium, was not of much use in these cases, as nearly all the patients died. At the other end of the scale were dilatation and gastrostomy, and the only hopeful advance was in irradiation. X-ray therapy produced good results, but, if too much was given, burning of the lungs occurred, while to give too little failed in its object. He and his colleagues had been carrying out the radon treatment of these cases through the œsophagoscope ; this method caused no upset of the patient, and in forty cases there had been no mortality. The great majority were re-enabled to swallow, and in two cases the patients had lived for three years afterwards. In all these cases the insertion of seeds had been from above. Malignant stricture of the œsophagus was often a long one, and the seeds could only be pushed in an inch or two. He had wondered why one should not, in addition, open the stomach, pass an œsophagoscope up the œsophagus, and distribute the radon seeds more evenly up and down the growth. He had done this in four cases, in one of which the patient was now alive and well. Its application to non-malignant obstruction would, he admitted, be very limited ; he had not carried it out in any non-malignant cases.

V. E. NEGUS (in reply) said he did not mention simple spasm as a cause of obstruction, because he had not seen such a case. He had had cases in which physicians and radiologists thought the condition was spasm, but an organic cause had been discovered.

Though it was away from the actual subject, he must make one remark about Mr. Steele's observation that it was impracticable to implant radon seeds from above to a depth of more than an inch. If one used a muzzle-loading type of introducer with an indicator which could be set to any depth, and then got the œsophagoscope exactly into line, it was easy to plant seeds to a depth

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of 2 in. or more. The implantation could be done accurately, and with good results. Therefore it seemed undesirable to perform such an operation as gastrostomy for a similar purpose.

G. KELEMEN (in reply) said that with the artificial œsophagus it was interesting to watch the swallowing movement ; it came only to the lower end of the skin tube. He agreed that the tube was composed only of skin, but it was an elastic tube, and it acted whether the patient sat or stood up, and when he was swallowing in those positions.

A. BROWN KELLY (in reply) said he was glad to hear that among Members of the Section there was no disposition to operate on children with shortening of the œsophagus.

The cause of the temporary obstruction in these children was spasm, which yielded to an endoscope or bougie. He had had a notable case of spasm in a healthy adult lasting two days. He remembered Dr. Guthrie's case, and could confirm all that was said about it.

ABSTRACTS

EAR

Researches on the Hearing Power and Hearing Organs of Fishes. B. FARKAS. (*Acta Oto-Laryngologica*, xxiii., 3 and 4.)

Researches in which the author has been engaged since the year 1931 have led to the following conclusions :

(1) Hearing power has been proved to exist in certain kinds of fish, in particular in the Lebistes reticulatus, a species of carp, known as the " guppy ". The present article is concerned mainly with this fish, in which previous attempts to demonstrate hearing power had been unsuccessful. As it has no auditory ossicles, it was usually regarded as being without hearing.

(2) Various electrical sound-producing apparatus were employed, and Pawlow's method of conditioned reflexes showed that most aquarium fish react to tones produced in the air.

(3) With Lebistes the range of optimum tone perception lay between F (86 d.v.) and a^1 (435 d.v.) the tone which gave the best and most rapid reaction being c^1 (258 d.v.).

(4) Both optimum and total range of tone perception varied with the age of the fish. The highest tone perceived by Lebistes was a little more than 1,200 d.v. but this was exceeded by fish of other kinds, especially those with a chain of ossicles.

(5) Lebistes reacted well to the sound of the Budapest church bells transmitted by " wireless ". It could be shown to possess a

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