

TRACHEO-ESOPHAGEAL FISTULA

DESCRIPTION OF A NEW OPERATIVE PROCEDURE AND CASE REPORT

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THE congenital anomaly of atresia of the esophagus with tracheo-esophageal fistula is of comparatively infrequent occurrence but by no means as rare as usually considered. Rosenthal,³ in 1931, compiled records of 255 cases. Gage,¹ in 1936, reported six cases which he had seen during a period of 15 months and in a discussion of his paper Doctor Mixter stated that 23 cases had been observed in the Children's Hospital, Boston, during the preceding ten years. Personally, in a rural practice, I have observed two cases during the past seven years, and a search of current literature reveals that the condition is becoming recognized much more frequently than formerly. All cases have ultimately succumbed, most of them dying within the first fortnight. Levens,⁴ however, reports one case which survived for 92 days following operation.

The treatment is essentially a surgical problem. There is gradually becoming evolved from the cumulative efforts of many operators a procedure which, it is to be hoped, will ultimately result in the saving of some of these children. We cannot subscribe to the philosophy of Brennemann when he says: "When one considers on the other hand that nearly all of these infants have other anomalies, that practically all of them either have bronchopneumonia or will eventually get it if the upper portion of the esophagus is not drained into the lower portion; that a restitution *ad integrum* of the esophagus does not yet seem possible, that without this life, even if possible, would be intolerable, that the child could not be made to live even if operated upon, for pediatric reasons, that no such infant has ever lived—no matter how treated, and finally that parental sentiment must be weighed heavily in the balance, then if one, after careful counsel with the parents decides to let the patient die as peacefully and painlessly as possible, one would lose no sleep because of that decision."

Direct attack upon the site of the fistula was described by Richter,⁵ in 1913. The operation consisted essentially in ligation of the esophagus at its tracheal junction combined with gastrostomy. Doctor Mixter has described a method of posterior approach with closure of the fistulous communication and the bringing of the esophagus out through a stab wound, and its immediate utilization as a means of introducing food into the stomach. Up until 1930, gastrostomy was the operation practically universally performed and was invariably followed by death within a few days. Gage, in 1936, described an operation in which he ligated the esophagus at the cardiac end of the stomach in order to prevent regurgitation of food into the lungs, and at the

same time performed a Saabanajew and Frank gastrostomy. Levens described an ingenious operation designed to prevent regurgitation of food, and to date he has probably established a record for longevity of the patient (92 days). His operation consisted of delivering the stomach and lower esophagus and suturing a bridge of tissue beneath it, very much in a manner similar to the

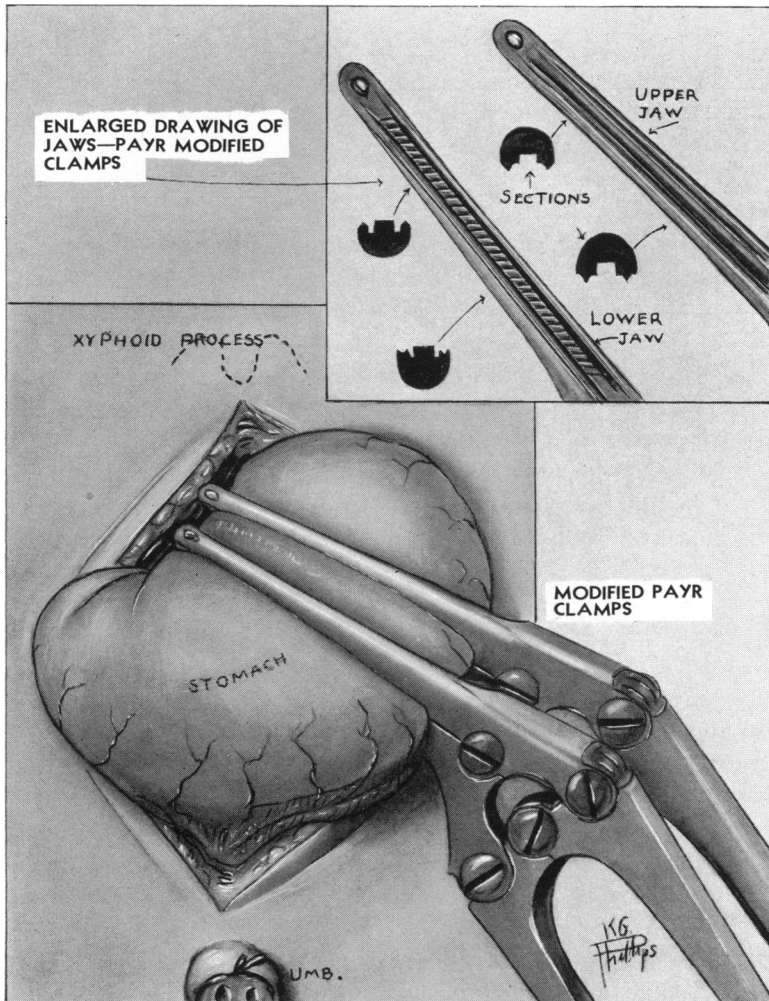


FIG. 1.—Division of stomach just below its proximal one-fourth. Note tongue and groove modification of Payr clamps.

first stage of a Mikulicz operation upon the colon, thus angulating the stomach and esophagus and preventing regurgitation, the operation being complete with a gastrostomy and later division of the stomach at the point of angulation.

The surgical approach to this problem is either by directly attacking the condition or by indirect methods. In the indirect approach at least three stages are necessary in order to relieve this condition. The indications in the

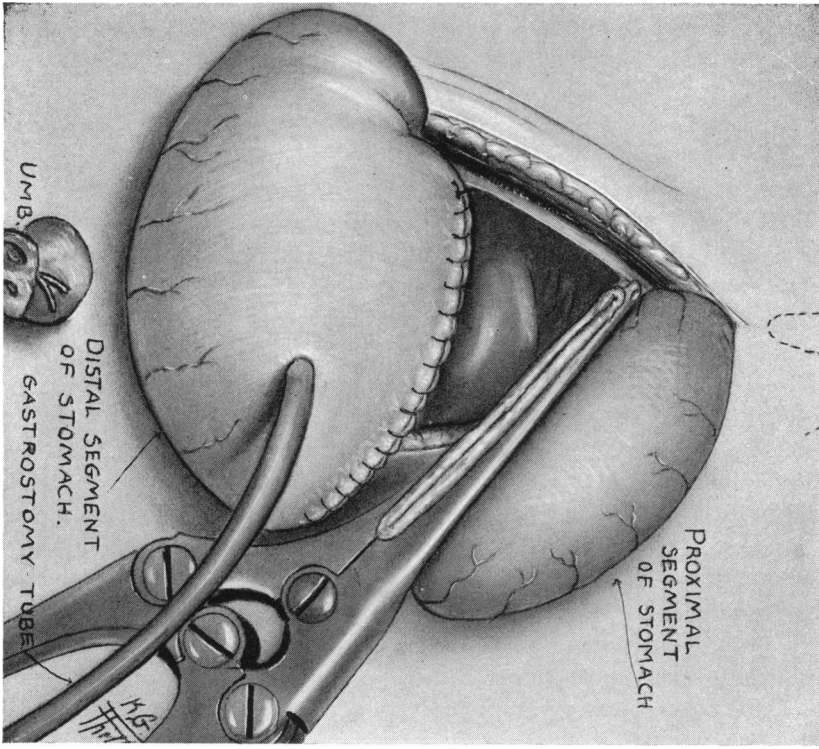


Fig. 2.—Gastrostomy in distal segment.

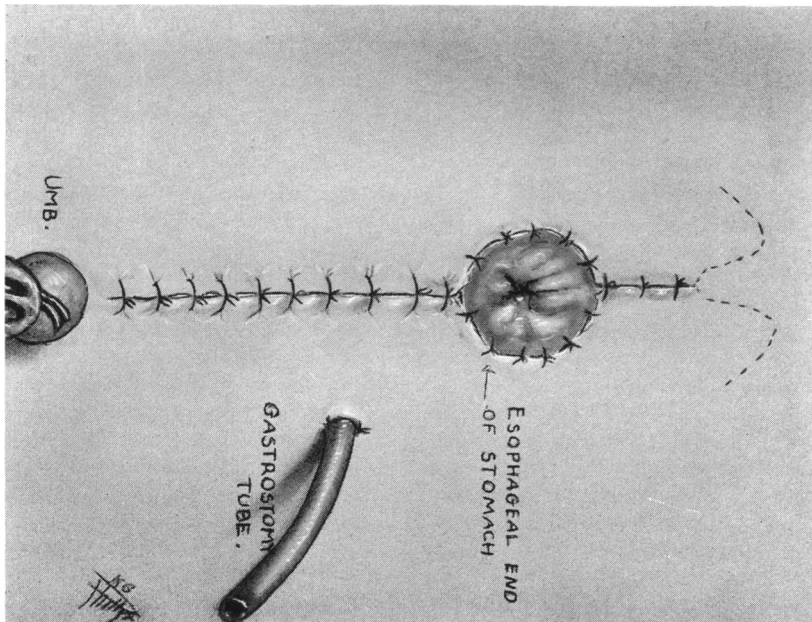


Fig. 3.—Abdominal wound closed with proximal end of stomach brought out at upper angle of wound and sutured to skin. Gastrostomy tube brought through stab wound to the left of abdominal incision.

first stage are: (1) To provide a means for nourishing the child; (2) to prevent regurgitation of food; and (3) the prevention of pulmonary complications. The second stage is concerned with the reconstruction of the esophagus, and the third stage has to do with the reestablishment of the continuity of the gastro-intestinal tract. The operation performed upon our second case was designed to fulfill these requirements.

Operative Technic.—The stomach was delivered through an incision to the left of the midline and completely transected at its upper fourth between small modified Payr clamps (Fig. 1). The proximal end of the distal segment was then completely closed and a gastrostomy of the Stamm or Senn type accomplished at the same time, the gastrostomy tube being brought out through a stab wound to the left of the incision (Fig. 2). In this manner regurgitation of food into the lungs was completely eliminated. The site for division at the upper fourth of the stomach was selected in order that the esophageal end of the stomach would have a sufficient amount of stomach tissue left to enable one finally—after ultimately reconstructing the esophagus—to reestablish the continuity of the gastro-intestinal tract by anastomosing the two segments of stomach. The proximal fourth of the stomach was then brought out at the upper angle of the wound and after closure of the incision the Payr clamps were removed and the stump sutured to the skin (Fig. 3). This is an important step toward the prevention of pulmonary complications, as it provides free drainage of the whole bronchial tree. It is surprising the large amount of fluid that drains from this esophageal stump. Any operation which closes the esophagus creates a blind pouch which rapidly fills with secretions, which inevitably regurgitate into the lungs and are an active factor in the causation of the pulmonary complications from which most of these patients succumb. The provision for free drainage is an essential feature of the operation. An esophagostomy of the proximal esophagus later removes any further menace to the lungs.

Case Report.—J. T. S., male, born January 10, 1937, was admitted to the King's Daughters Hospital at 11 A.M., January 13. The child was well developed but as soon as he began to nurse developed cyanosis, and regurgitated all food. A catheter passed down the esophagus met an obstruction. Although the phenomena of strangulation, regurgitation, and the presence of air in the stomach was sufficient to make a positive diagnosis, a roentgenogram was taken which showed the blind esophageal pouch clearly. Dehydration was combated by the subcutaneous administration of 5 per cent glucose and at 10.30 P.M. the operation described was performed under local and light ether anesthesia. The baby stood the operation well and it was remarkable how few evidences of shock were present. Upon returning to bed a drip of 5 per cent glucose was administered through the gastrostomy. The nasopharynx was aspirated at intervals to clear the secretion from the esophageal pouch. Progress was without incident until early morning of the fourth day when there developed a slight oozing of blood from the wound. It was thought at first that this was due to a prolonged coagulation time due to some blood dyscrasia and he was given 50 cc. of whole blood subcutaneously. The oozing gradually increased in amount so that on the afternoon of the fifth day the wound was opened and a bleeding point on the lesser curvature of the stomach was secured and ligated. Again there was little shock manifested and his progress was satis-

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factory until the thirteenth day when his general condition began to retrogress and he died on the fifteenth day.

Autopsy showed that death was due to a general peritonitis secondary to the perforation of an ulcer on the anterior wall of the stomach, and that the lungs were not involved in any way. The autopsy report by Doctor White follows.

Name—J. T. S. Age 15 days. Date, January 25.

Autopsy Report.—The abdomen was distended and there was present a diffuse suppurative peritonitis, resulting from a perforated ulcer in the lower segment of the stomach. The esophagus formed a blind pouch running posterior to the trachea for 30 Mm. where it ended. Opposite this point there was a fistula between the esophagus

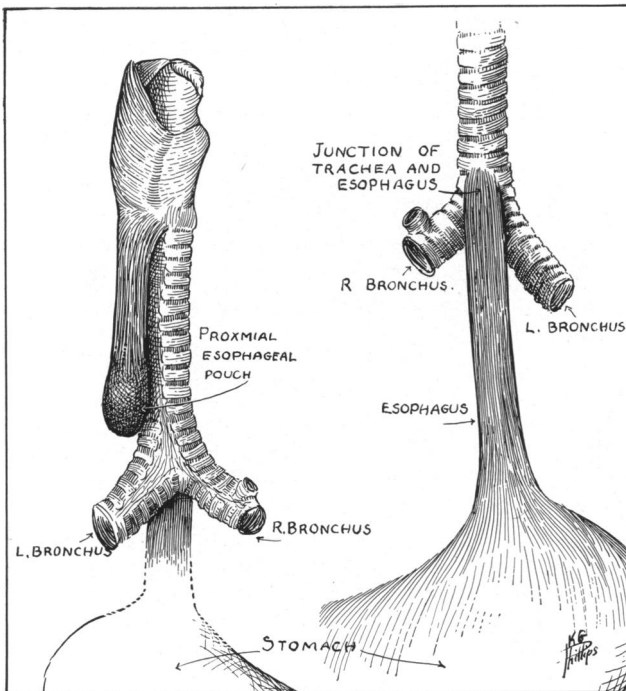


FIG. 4.—Sketch showing anatomic relations found at autopsy. The proximal esophageal pouch ended blindly posterior to the trachea, just above the bifurcation. At the same time there was a fistulous communication between the anterior surface of the trachea and the distal segment of the esophagus.

and trachea opening on the anterior surface of the latter about 8 Mm. above the point where the trachea bifurcates (Fig. 4). The lungs were slightly congested but there was no consolidation.

Pathologic Diagnosis.—General peritonitis following perforated ulcer of the stomach.
Anatomic abnormality.—Tracheo-esophageal fistula.

It was unfortunate that there should have developed a perforation of the stomach, possibly due to interference of the blood supply of the stomach at the second operation for the control of secondary hemorrhage, and that the patient should have died of a general peritonitis. However, the case does demonstrate the practicability of transection of the stomach to prevent regurgitation and the benefits accruing from drainage of the esophagus in the

prevention of pulmonary complications. The importance of providing for drainage of the distal esophagus and the bronchial tree should again be emphasized, for unless this is done the infant will inevitably succumb to pulmonary complications.

CONCLUSIONS

The indirect surgical treatment of congenital tracheo-esophageal fistula should be divided into three stages. The indications in the first stage are: (1) To provide means for nourishing the infant. (2) To prevent pulmonary complications, the most essential features of which are the prevention of regurgitation of food, by transection of the stomach and the drainage of the bronchial tree through the open proximal stump of the stomach, and an esophagostomy of the proximal esophageal pouch. The second stage consists in reconstruction of the esophagus and the third stage in the reestablishment of the continuity of the gastro-intestinal tract.

An operation has been described which, despite its formidable appearance, is well tolerated by these infants, and which we believe fulfills all of the conditions postulated. It or some modification based upon the principles enunciated will solve the problem of the surgical treatment of congenital tracheo-esophageal fistula.

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DISCUSSION.—DR. VILRAY P. BLAIR (St. Louis, Mo.).—Doctor Gamble has presented a very intriguing surgical problem, and the ingenuity evidenced by him, and his comparatively large experience with this rare occurrence, leave little if anything to be added, especially by one who has never even seen any. However, based upon some experience with extensive operations on very young babies, I would corroborate the emphasis he has put upon the importance of early operation.

Granting that it be possible to bridge the hiatus between the upper and lower parts of the gullet by an intrathoracic epithelial lined passage, I believe one would be more apt to succeed if this part of the operation were performed within the first 24 hours—better still, within the first four hours after birth; conceivably this might save a gastrostomy. From the standpoint of eventual recovery, it would be equally important to, at the same time, give external drainage to the lower end of the blind pharyngeal pouch. Either of these would be a formidable procedure, but if done at all, I am inclined to believe that the baby's best chances for ultimate recovery with normal life will be inverse to the age at which both of these are accomplished. A four or two

hour old baby probably has had little mouth contamination and less ballooning of the lower end at the blind pharynx. The lack of size minimizes the field of most any operation, and except in babies that have been allowed to become jaundiced, bleeding is as a rule very easily controlled. In addition to the above there are two other really outstanding advantages in very early operation, both of which dwindle with every passing hour. The first is that the baby is not subject to shock, and short of cutting off the breath, great loss of blood or massive crushing of the body or head—a day old baby normally withstands a tremendous amount of trauma, such as being pulled by the neck through a tight parturient canal. The second, and possibly greater, is that in the event of death the loss of a day old baby is a minor tragedy compared to that of one that a mother has fondled and suckled. I hope for the sake of both baby and parents that Doctor Gamble's next case will be turned over to him before it has had its first bath.