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DIVERTICULA OF THE THORACIC ESOPHAGUS

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DIVERTICULA located in the initial and terminal portions of the esophagus are called pulsion diverticula, implying that they are caused by pressure originating within the esophageal lumen. On the other hand, diverticula of the midthoracic esophagus are usually called traction diverticula. A common explanation is that inflamed lymph nodes in the mediastinum adhere to the wall of the esophagus and cause a tenting out of the lumen. An alternative explanation is that they are residual embryological communications between the esophagus and trachea. There are mid-esophageal diverticula, however, which are not explained satisfactorily by either of these hypotheses. Many of them are associated with lesions of the distal esophagus and appear to be the result of disordered esophageal peristalsis.

LARGE SOLITARY DIVERTICULUM

CASE 1. A 63 year old man had noticed difficulty in swallowing for some time. Food particles, particularly meat, seemed to stick in the mid-sternal area. The patient had to wash them down with quantities of water or other liquids before he could resume eating. X-rays of the esophagus showed a large solitary diverticulum of the mid-esophagus which communicated with the esophageal lumen by a small opening (Figure 1). Although special attention was paid to the esophagogastric junction by the fluoroscopist, it was reported as normal.

At operation on November 27, 1961, the diverticulum was exposed through an incision in the right fifth intercostal space and resected (Figure 2). On inspection of the lower esophagus, no evidence of hiatus hernia was found. The postoperative course was uneventful and the patient was discharged from the hospital on a full diet on December 9th. When seen subsequently, the patient had an excellent symptomatic result. He was able to swallow all kinds of food and no longer noticed the continual foul taste in his mouth which was present prior to operation.

Primary excision was necessary for this lesion because of size of the diverticulum and the narrow communication with the esophageal lumen. The pressure of the large diverticulum on the esophagus produced dysphagia. Evidently swallowed food could gain entrance to the diverticulum but could not drain out into the esophagus. Because of this mechanical factor, the lesion continually increased in size. No amount of preoperative lavage would have emptied out the lesion and it was full of inspissated mucus and debris at the time of operation. During resection a hazard existed because of the adherence of the wall of the sac to the wall of the esophagus making it possible for too wide a portion of the esophageal wall to be

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Figure 1a
CASE 1. Large solitary diverticulum communicating with the esophageal lumen via a small neck. The diverticulum compresses the esophagus.

Figure 1b
Postoperative x-ray after excision of the diverticulum.

taken away with the lesion. In removing the lesion, a large catheter was placed in the esophageal lumen through an opening in the sac wall. The sutures were placed in the esophagus over the catheter which served as a stent. Prior to tying the sutures, the catheter was removed (Figure 2).

Traction by lymph nodes could not, of course, produce a lesion of this magnitude. No lymph nodes were found near the lesion at the time of dissection, although the sac wall was adherent to the posterior part of the right main bronchus. In the film taken postoperatively, a lower esophageal ring was demonstrated, a lesion we have come to associate with esophageal hiatus hernia. The patient has no symptoms referable to it.

MULTIPLE MID-ESOPHAGEAL DIVERTICULA

All of the patients with multiple diverticula of the mid-esophagus whom we have seen have had disorders of esophageal motility or definite lesions of the esophagogastric junction. One such patient is described.

CASE 2 — An obese woman, 44 years old, complained of dysphagia and regurgitation during and after meals. Between meals, particularly when lying down, she noticed a sensation of a weight beneath the sternum. In addition, she was sometimes awakened at night with choking episodes accompanied by a nonproductive cough and followed sometimes by shortness of breath lasting 5 to 30 minutes.

X-rays showed two diverticula of the mid-esophagus (Figure 3a). The larger of the two came off in an anterior direction and projected toward the trachea. The smaller originated at the tracheal bifurcation. Roentgenograms taken at this time showed no abnormality of the esophagogastric junction. The patient was operated on March 4, 1960, for the purpose of removing the larger diverticulum which, although it had a wide neck, impinged on the membranous portion of the trachea, and was thought to be responsible at least in part for her symptoms. The postoperative course was uneventful and the patient was discharged from the hospital on a full diet. The immediate symptomatic result was good. However, the patient was readmitted to the hospital on November 14,
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Figure 2
Drawing made in the Operating Room at the time of excision of the diverticulum shown in Figure 1. Division of the azygous vein gives excellent access to the mid-esophagus through a right thoracic incision. The mouth of the diverticulum was even smaller than it appeared in the esophagogram. The method of maintaining an adequate esophageal lumen by the use of a rubber stent is shown.
1960, with symptoms of peptic esophagitis. Esophagograms at that time showed a definite esophageal hiatus hernia with reflux of barium into the esophagus (Figure 3b).

The diverticulum which was excised was not large and its communication with the esophagus was big enough so that material in the sac would have no trouble emptying out into the esophageal lumen. The interior of the sac at the time of operation was clean. The proximity of the lesion with a compressible part of the trachea seemed to support the idea that it caused the patient's choking episodes. However, the presence of multiple diverticula should have prompted a more meticulous examination of the esophagogastric junction. The preoperative symptoms were probably those of gastric regurgitation and the correct operation a repair of the hernia.

LOWEST ESOPHAGEAL DIVERTICULUM ASSOCIATED WITH HIATUS HERNIA

The association of epiphrenic diverticula with hiatus hernia has been stressed by Effler. There are, however, diverticula of the esophagus arising below the bifurcation of the trachea which are too far removed from the diaphragm to merit the designation "epiphrenic" but are found in association with hiatus hernia.

CASE 3 — A 63 year old woman complained of longstanding burning epigastric and retrosternal pain, which was accentuated when she bent over to work in her garden. After meals she belched repeatedly. Although she had used various medicines to alleviate the symptoms, she was not satisfied with the results. X-rays showed a sizable hernia through the esophageal hiatus and the fluoroscopist noted free reflux of gastric contents into the lower esophagus. A "large diverticulum in the mid-esophagus" was also noted.

The patient was operated on May 25, 1962. A repair of the hiatus hernia was carried out by fixation of the phrenoesophageal ligament beneath the diaphragm and posterior approximation of the crura. The hiatus itself was not large and the herniated stomach appeared partially obstructed. The cardia was examined through a small gastrotomy. The opening into the esophagus was normal, admitting one finger easily. The postoperative course was benign. The patient reported complete relief of her preoperative symptoms when
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Figure 4a
CASE 3. Diverticulum of the mid-thoracic esophagus associated with a hernia of the esophageal hiatus. The constriction of the stomach in the region of the hiatus is quite evident with partial obstruction of the herniated stomach.

Figure 4b
Postoperative film following hiatus hernia repair. The hernia is corrected; the diverticulum is still present, but the lumen distal to it appears wider.

seen on June 22, 1962. X-rays taken at that time showed good reduction of the hernia. There was no reflux from the stomach into the esophagus. The diverticulum was unchanged.

It will be interesting to see if the diverticulum decreases in size now that the hiatus hernia is corrected. Constriction of the herniated stomach with partial obstruction is an important part of the pathology of hiatus hernia. A large hernia may exist with a relatively small hiatus. The free flow of gastric juice out of the herniated stomach is impeded. If the esophagogastric sphincter is competent, gastritis rather than esophagitis may be the predominant lesion with bleeding from the herniated stomach. The diverticulum in this case is thought to be secondary to obstruction at the hiatus necessitating increased pressures in the esophagus to allow it to empty.

DISCUSSION

It has been recognized for a long time that diverticula of the cervical esophagus (Zenker's diverticula) are related to an abnormal contraction of the sphincter muscle distal to the mouth of the diverticulum. Negus who has been prominent in emphasizing this relationship, has advocated dilatation of the cricopharyngeus muscle at the time of excision of the diverticulum. Sutherland, an Australian surgeon, has carried out extramucosal division of the muscle layer as is done in the distal esophagus for cardiospasm. Although we have not found these procedures necessary in the treatment of Zenker's diverticulum, we shall be aware of their possibilities particularly in instances where the diverticulum recurs after adequate primary excision.
Surgeons have also commented on the frequent association of the so-called epiphrenic diverticulum of the esophagus with hiatus hernia. Excision of epiphrenic diverticula without repair of the hernia has given poor results.

Recently, Dr. Frederick Cross of Cleveland has emphasized the possibility that diverticula of the mid-esophagus are also the result of abnormalities in esophageal emptying rather than from traction by lymph nodes. His study of the esophageal pressure has demonstrated levels of 60 to 80 mm. of Hg. above a hiatus hernia in contrast to normal pressure levels of 25 to 30 mm. of Hg. This has led him to warn against simple excision of diverticula without attention to the distal esophagus. At the present time we would consider for excision only those mid-esophageal diverticula which because of their size produce significant symptoms. In smaller diverticula and those with wide mouths, which allow easy emptying into the esophageal lumen, the distal esophagus should be studied for the presence of hiatus hernia and the treatment directed toward the primary lesion.

**SUMMARY AND CONCLUSIONS**

Diverticula of the mid-esophagus are usually found in connection with lesions of the distal esophagus which interfere with esophageal emptying. Some of these diverticula reach a size large enough to require primary excision. In most cases, however, attention should be directed to the distal esophagus for demonstration of the primary lesion. Correction of an esophageal hiatus hernia with or without excision of the diverticulum may be the operation of choice.

**REFERENCES**