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A NEW SURGICAL APPROACH

FOR VAGOTOMY, DIAPHRAGMATIC HERNIOTOMY, SPLENECTOMY, AND OPERATIONS UPON THE GASTROESOPHAGEAL AREA THROUGH THE LEFT SUBDIAPHRAGMATIC EXTRAPERITONEAL SPACE*

A PRELIMINARY ANATOMICAL STUDY

H. A. DAVIS, M.D.

INTRODUCTION

Surgical operations upon structures lying immediately beneath the left side of the diaphragm frequently are technically difficult because of inadequate exposure. Such operations include resection of the cardiac portion of the stomach with esophagogastro anastomosis, splenectomy in the presence of dense adhesions between the spleen and the parietal peritoneum, resection of the body and tail of the pancreas and the repair of diaphragmatic hernia and eventration. Recently, as a result of the work of Dragstedt, resection of both vagus nerves has been advocated for the treatment of gastroduodenal ulceration. This procedure may be performed through the thorax or through the peritoneum.

The transperitoneal approach possesses the advantage of enabling the surgeon to examine the stomach and duodenum and to do, if necessary, a gastro-enterostomy in addition to the vagotomy. It has, however, the definite disadvantage that if the patient has been subjected previously to gastroduodenal surgery, adhesions in the upper abdomen will render exposure of the vagus nerves both difficult and hazardous. In the transthoracic approach, on the other hand, the pleural cavity must be opened.

In a recent report Grimson described thoracic complications following transthoracic vagotomy. In 5 of 33 patients postoperative pneumonia occurred. All 33 patients presented a pleural effusion on the side of the thoracotomy, and in 3 the fluid accumulation was great enough to cause a shift of the mediastinum. Atelectasis of the left lung was noted in 5 patients on X-ray examination. The experience of Grimson has been confirmed by others who have used the transthoracic approach. In addition, many of these patients subsequently complain of pain in the left side of the chest in the line of the incision, which is probably due to injury or involvement of the intercostal nerve at the wound site.

These considerations induced us to investigate by anatomical studies the possibility of devising a new surgical approach which would possess none of the disadvantages of the transthoracic and transperitoneal approaches. By using the approach through the left subdiaphragmatic extraperitoneal space, we discovered that not only was it possible to expose the vagus nerves at the lower end of the esophagus but that it was also technically feasible to carry our surgical procedures upon the diaphragm, the splenic artery and vein, the spleen, the body and tail of the pancreas, and the cardio-esophageal junction through the same incision.

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The purpose of this paper is to present a preliminary anatomical study of the left subdiaphragmatic extraperitoneal space and to describe briefly the technic of certain surgical operations carried out through this approach.

ANATOMY OF THE LEFT SUBDIAPHRAGMATIC EXTRAPERITONEAL SPACE

The left subdiaphragmatic extraperitoneal space is, of course, a potential rather than an actual space. It lies between the parietal peritoneum in front and Gerota's fascia behind, and extends downward from the dome of the diaphragm to the lowest point of attachment posteriorly of the left leaf of the dia-

phragm. The shape of the space is irregular, having on cross section the appearance of a truncated cone, which is funnel-shaped, with the narrow end superior and the broad end inferior.

The contents of the space are of interest. It contains fatty and areolar tissues in which are imbedded blood vessels, nerves, the left kidney, the left suprarenal gland, the tail and part of the body of the pancreas, and the upper part of the descending colon. The blood vessels are the left renal artery and vein, the suprarenal vessels, the splenic artery and vein, the inferior phrenic artery (left), and the celiac artery. In the upper and innermost

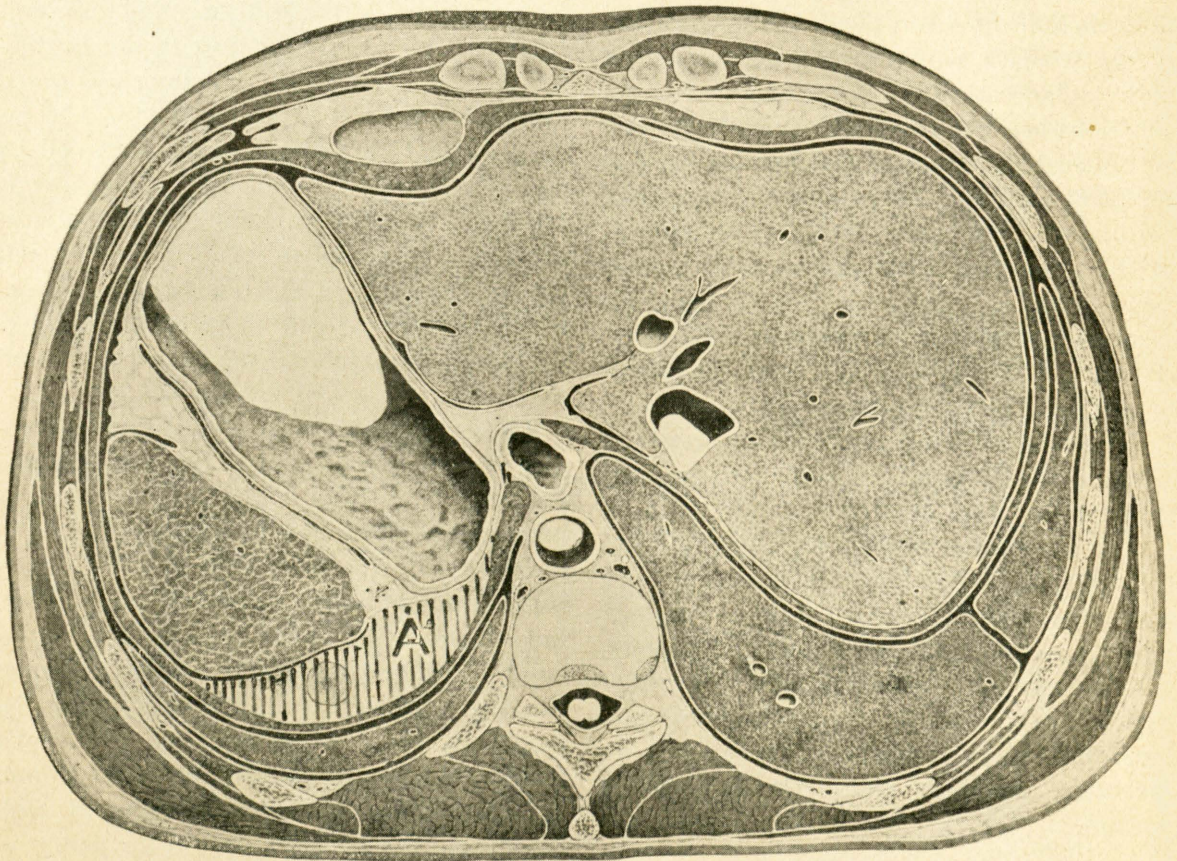


Fig. 1.—Cross-section through upper part of left subdiaphragmatic space. (Shaded area marked A.)

(Modified from Eycleshymer, A.C., and Shoemaker, D.M.: *A Cross-section Anatomy*, p. 71, D. Appleton and Company, New York, 1923.)

portion of the space is found the esophagus as it passes through the esophageal hiatus of the diaphragm at the level of the 10th thoracic vertebra (figure 1).

The relations of the left subdiaphragmatic extraperitoneal space are:

(a) Upper anterior—the parietal peritoneum, the cardiac portion of the stomach, the esophagus, the spleen, and the left lobe of the liver.

(b) Middle anterior—the parietal peritoneum, the stomach, the liver, the left side of the colon, and the spleen.

(c) Lower anterior—the parietal peritoneum, the stomach, the liver, the colon, and the jejunum.

(d) Posterior—the diaphragm, the pleural cavity, the inferior tip of the left lung, the 10th, 11th, and 12th ribs, Gerota's fascia, the latissimus dorsi, and the serratus posterior inferior muscle.

(e) Lateral—the spleen, the diaphragm, the pleural cavity, the inferior tip of the left lung, the 7th, 8th, 9th, 10th, and 11th ribs, the intercostal muscles, the latissimus dorsi, and the external and internal oblique muscles.

(f) Medial—the esophagus, the aorta, the diaphragm, the pleural cavity, the inferior tip of the left lung, and the bodies of the vertebrae.

THE SURGICAL APPROACH

The skin incision is shaped like a hockey stick. The 12th rib on the left side is carefully palpated, and an incision is made starting 1 inch above the junction of the 12th rib with the transverse process and extending over the 12th rib to a point 1 or 2 inches beyond its tip. The incision is deepened so as to expose the latissimus dorsi muscle and the sacrospinalis sheath. The latissimus dorsi muscle is incised, exposing the 12th rib. The serratus posterior inferior and part of the external and internal oblique and transversus abdomi-

nis muscles are divided in the line of the incision. The sheath of the sacrospinalis muscle is opened and the muscle is retracted medially. This provides a more adequate exposure of the 12th rib close to the transverse process. The periosteum over the 12th rib is incised and the rib is resected subperiosteally. It is important that the rib be divided at the transverse process, in order that sufficient exposure of the "space" be provided. The 12th intercostal vessels and nerve will now be seen. The subcostal ligament should be divided, since this will permit the retraction upward of the intercostal vessels and nerve and the periosteal bed of the rib. The ilio-inguinal and iliohypogastric nerves will be observed lying more inferiorly and should be avoided. The fascia of Gerota, or the perirenal fat capsule, is incised over the perirenal fat in a line lying at the level of the spinous process of the 1st lumbar vertebra. In this way it is possible to avoid entering the pleura. It is to be remembered that the pleural reflection extends to or slightly below the 12th rib. After Gerota's fascia has been opened, the left subdiaphragmatic extraperitoneal space is entered.

THE TECHNIC OF VAGOTOMY

The left subdiaphragmatic extraperitoneal space is entered in the manner which has been described. Following division of the fascia of Gerota, the fingers of the right hand are introduced between the left kidney and the diaphragm, and the kidney with the left suprarenal gland is gently retracted laterally. The fingers of the hand are now passed along the medial leaf of the diaphragm, and encounter the peritoneum, which is carefully stripped from the diaphragm from above downward and from the medial to the lateral aspects of the posterior portion of the diaphragm. In this manner the intraperitoneal contents which occupied the superior portion of the

left subdiaphragmatic space are displaced downward. These contents include the cardiac portion of the stomach, the spleen, and the body and tail of the pancreas. In this way the esophageal hiatus of the diaphragm can be visualized and palpated.

The exposure is considerably enhanced by retracting the tissues with Balfour and Deaver retractors. Retraction downward and outward of the peritoneum and its contents will permit the surgeon to see readily the cardiac portion of the stomach and the esophagus just prior to its passage through the diaphragmatic hiatus into the mediastinum. By blunt dissection the esophagus immediately above the stomach can be mobilized and drawn downward into operative field. The vagus nerves are palpable as cordlike structures on each side of the esophagus and can be readily resected.

After completion of the operative procedure the peritoneum with its contents is replaced. The opening in Gerota's fascia is closed with a continuous suture. Interrupted sutures are used to close the opening in the sacrospinalis fascia, to approximate the divided muscles, the subcutaneous fat, and the skin.

THE TECHNIC OF DIAPHRAGMATIC HERNIOTOMY

Since most instances of diaphragmatic hernia and diaphragmatic eventration occur in the region of the esophageal hiatus of the diaphragm, the same exposure is used as for vagotomy. After the peritoneum and its contents have been stripped away, the diaphragm is well visualized and is easily accessible for the performance of various surgical procedures.

THE TECHNIC OF OPERATIONS UPON THE CARDIOESOPHAGEAL AREA

The same exposure is used as for vagotomy. If such procedures are to be done as Heller's

cardiomyotomy, the Heyrovsky-Grondahl esophagogastrostomy, or resection of the cardiac portion of the stomach followed by anastomosis between the esophagus and stomach, the peritoneum should be opened and the stomach exposed. A strip of umbilical tape is passed around the esophagus at its junction with the stomach. The esophagus is mobilized from the edge of the hiatus in the diaphragm by means of the right index finger. The operations enumerated above are carried out in the usual manner. The anastomosis of the esophagus to the stomach may be kept extraperitoneal by suturing the edges of the opening in the peritoneum to the stomach wall below the anastomotic site. In the event that a leak occurs at the suture line, the escaping fluid will enter the subdiaphragmatic extraperitoneal space, from which it can be readily evacuated by external drainage. This provides an extra safeguard against postoperative peritonitis. The details of this procedure will be described in a subsequent paper.

THE TECHNIC OF SPLENECTOMY

Through this approach it is possible to perform a splenectomy. After incision of the fascia of Gerota, the left kidney and suprarenal gland are retracted medially toward the spine. The peritoneum is stripped from the diaphragm laterally. The peritoneal cavity in the region of the spleen is entered by incision of the parietal peritoneum, and the extent of the perisplenic adhesions is determined. The splenic artery and splenic vein may be ligated before the spleen is exposed. In this way the blood supply to the spleen is controlled at the outset of the operation. When the spleen is surrounded by dense adhesions, exposure of the vascular pedicle may be very difficult.

The approach to splenectomy which has been described here renders it unnecessary to separate the dense adhesions between the

spleen and peritoneum, because after control of hemorrhage by ligation of the splenic artery and vein, the spleen, with its adhesions and the surrounding parietal peritoneum, can be removed in one mass. When this is done, the opening in the peritoneum is closed with a continuous suture.

Finally, the tail and part of the body of the pancreas are easily palpated through the same approach, which may be used for exploration and resection of this part of the pancreas.

CONCLUSIONS AND SUMMARY

In this paper are presented anatomical studies carried out in the cadaver on the left subdiaphragmatic extraperitoneal space.

The anatomy of the space is discussed, and it is pointed out that the space lies between Gerota's fascia and the parietal peritoneum, and has an irregular funnellike shape whose narrow end lies superiorly at the esophageal hiatus and whose broad end is inferior.

The space is approached through an incision over the left 12th rib, which is resected subperiosteally.

It is possible to expose through this space

the cardiac portion of the stomach, the lower end of the esophagus, both vagus nerves, the diaphragm, the tail and part of the body of the pancreas, the splenic vessels, the spleen, and the colon.

The surgical approach through the left subdiaphragmatic space has the advantage of being both extrapleural and extraperitoneal.

It should be emphasized that no major blood vessels are encountered in exposing these structures through this space.

It is suggested on the basis of these anatomical studies that this approach may be utilized for vagotomy, for splenectomy, and for operations upon the diaphragm, the cardio-esophageal junction, the body and tail of the pancreas.

I wish to take this opportunity of thanking Dr. R. M. Andrews and Dr. E. T. Smith for their assistance in carrying out certain of these dissections.

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