History of Esophageal Surgery

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The history of esophageal surgery is not a long one. Although there are some anecdotal reports of interventions on the cervical esophagus by surgeons from ancient civilizations and pioneers of modern surgery, series of cases of real surgical procedures—not just perioral probing of the esophagus—did not start to be published until the twentieth century. The advance of operations for benign diseases had to wait for the understanding of esophageal physiology and the development of diagnostic tools. In addition, the progress of operations for esophageal cancer was limited for decades by technical restrictions, especially the barrier of the open chest and the fear of damage to the vagus nerve, which was considered essential for cardiac function.

The original descriptions of the earliest operations and their eponyms remain solely as homage to their creators, or at least the most well-known individual to perform or modify the technique. This chapter is a brief pictorial review of the origins and development of modern esophageal operations in adults.

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1.1 Benign Diseases

1.1.1 Gastroesophageal Reflux Disease

Nissen fundoplication is the current primary surgical therapy for gastroesophageal reflux disease (GERD). This technique is employed in most patients for whom an operation is indicated. It has excellent and long-lasting results.

Rudolph Nissen (Fig. 1.1) was a German surgeon born in 1896. Nissen started his early academic life under the famous and powerful Sauerbruch, but Nissen later left Germany because of his Jewish origin and Sauerbruch's association with the Nazi party. After a period in Turkey, Nissen moved to the United States, where he spent 12 years. He then moved to Switzerland, where he became the chairman of surgery, described his fundoplication, and retired. He died in 1981.

Before 1956, GERD and hiatal hernia (almost synonyms by that time) were surgically managed with reduction of the herniated stomach and some kind of gastropexy. Not surprisingly, results were disappointing. Nissen recalled an operation in which the anastomosis of a cardia resection was protected by the stomach, like a Witzel gastrostomy, and the patient did not develop esophagitis. He tried wrapping the distal esophagus of patients with GERD with the gastric fundus, and published reports of two cases of this new operation for the first time in 1956. Nissen called the procedure "fundoplication." He later reported clinical and radiological healing of hiatal hernia and reflux in 88 % of patients undergoing this operation. His technique was very soon widely accepted.

The original fundoplication (Fig. 1.2) consisted of wrapping the posterior wall of the stomach around 3–6 cm of the distal esophagus. Short gastric vessels were not divided, nor was a hiatoplasty added. As shown on the figure, Rossetti, Nissen's assistant, described the use of the anterior wall of the fundus as a modification to be used in obese patients. Other peculiarities of the technique were the lateral closure of the hiatus in cases of large hernias, and stabilizing sutures

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fixing the wrap to the gastric wall, replacing the fixation in the esophagus of the fundoplication stitches. Over time, several modifications of the technique occurred (Fig. 1.2).

Nissen fundoplication created a new symptom, the inability to belch, and produced dysphagia in a significant number of patients. Several authors (e.g., Toupet, Lind) developed partial fundoplications in order to prevent these symptoms. For the same purpose, some surgeons insisted on some modifications to the total fundoplication. In 1977, Donahue et al. started creating a loose wrap, called floppy Nissen. DeMeester et al. in 1986 advocated a loose wrap, increasing the caliber of the bougie used to size the gastric wrap to 60 F and reducing the wrap to 1 cm. The first minimally invasive antireflux operation was carried out by Dallemagne et al. in 1991, only 4 years after the first laparoscopic cholecystectomy. Thus, the modern version of the Nissen fundoplication, the laparoscopic "short-floppy" Nissen, was created.

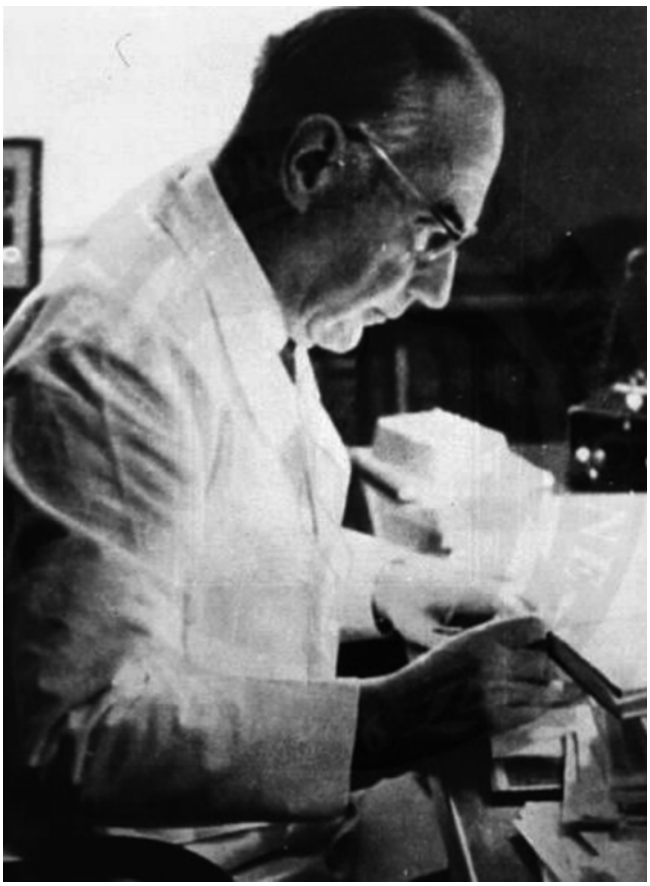
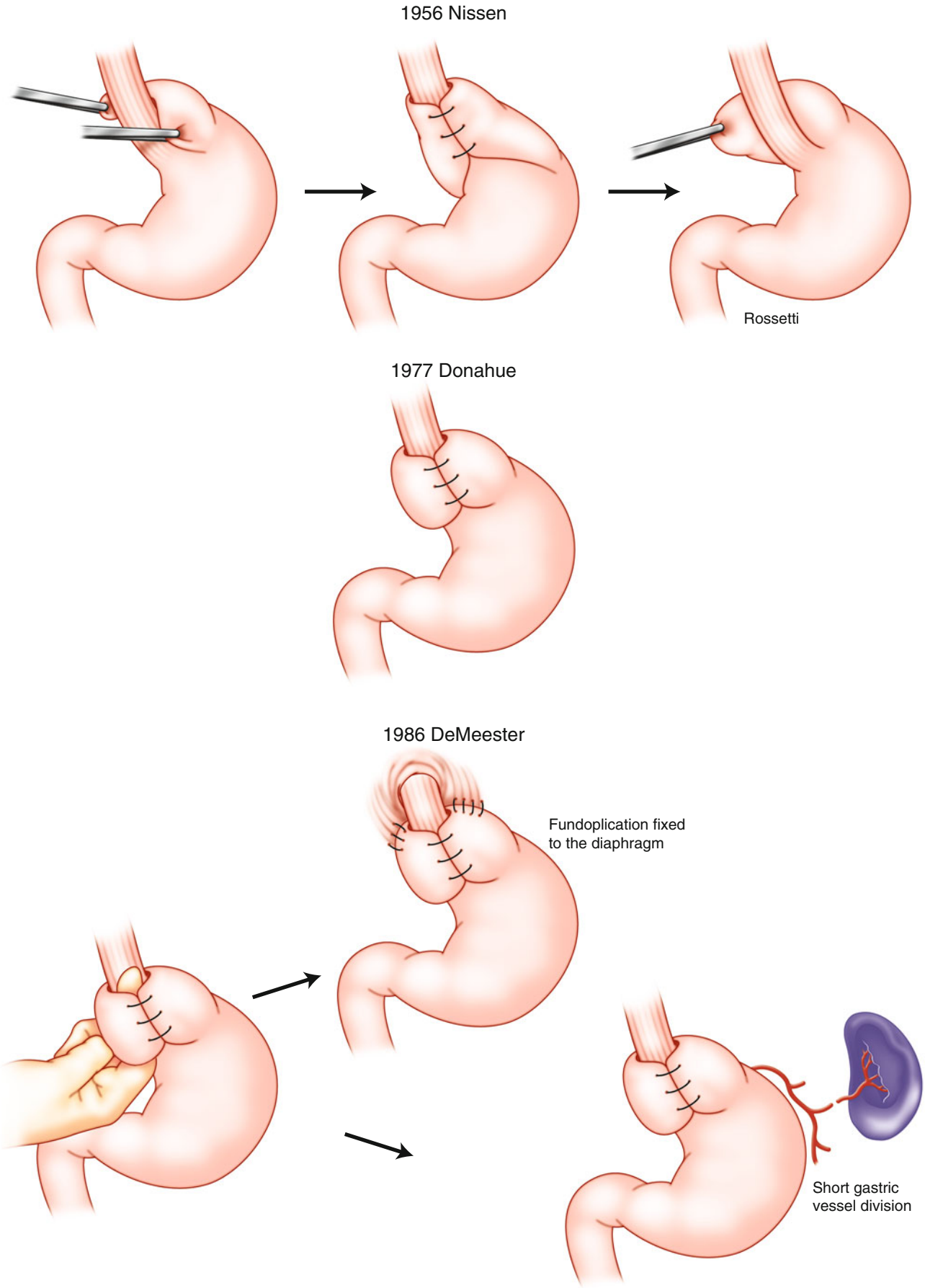


Fig. 1.1 Rudolph Nissen (Source: National Library of Medicine)

Fig. 1.2 Nissen fundoplication evolution from the original description in 1956 of a long and tight wrap to the final short-floppy valve. Minor modifications, such as the use of the anterior wall of the stomach and division of the short gastric vessels, are shown on the right-hand side


1956 Nissen
Rossetti
1977 Donahue
1986 DeMeester
Fundoplication fixed
to the diaphragm
Short gastric
vessel division

1.1.2 Achalasia

Ernst Heller (Fig. 1.3) devised a very successful technique for the surgical treatment of achalasia, which is used to treat most patients with this disease, similar to Nissen's contribution to the treatment of GERD. Heller was born in 1877 in Eichenwalde, Germany, and died in Leipzig in 1964. He described the famous myotomy in 1913, just before serving in the First World War.

Surgical treatment for achalasia started with cardioplasties of the esophagogastric junction. Heller's "extramucosal cardioplasty" (Fig. 1.4), an idea based on pyloromyotomy, was first proposed by Gottstein in 1901 but he never performed it. It consisted of an anterior and posterior vertical extramucosal esophagomyotomy of 8 cm, from the dilated segment of the esophagus to a small extension into the stomach, performed through a subcostal incision. Additionally, omentum was fixed to the anterior myotomy to prevent its approximation. A single myotomy, as described by Groeneveldt in 1918, became more usual, and a fundoplication was added later. The first minimally invasive myotomy was carried out by Shimi et al. in 1991.

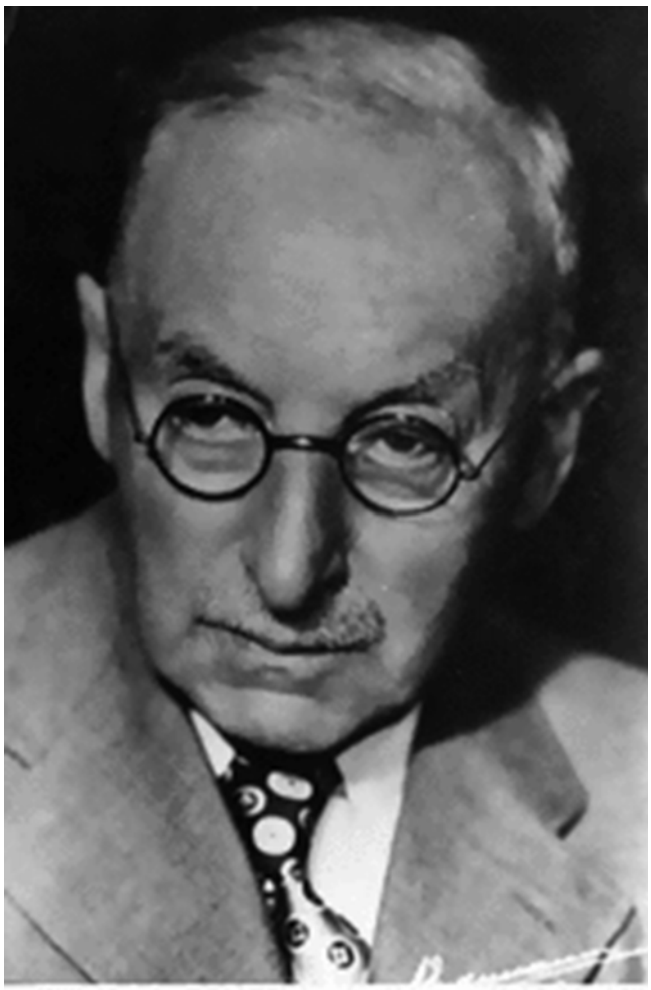


Fig. 1.3 Ernst Carl Paul Heller (From Weiner RA. Ernst Heller und die myotomie. Chirurg. 2014;85:1016–22; *with permission from* Springer Science + Business Media)

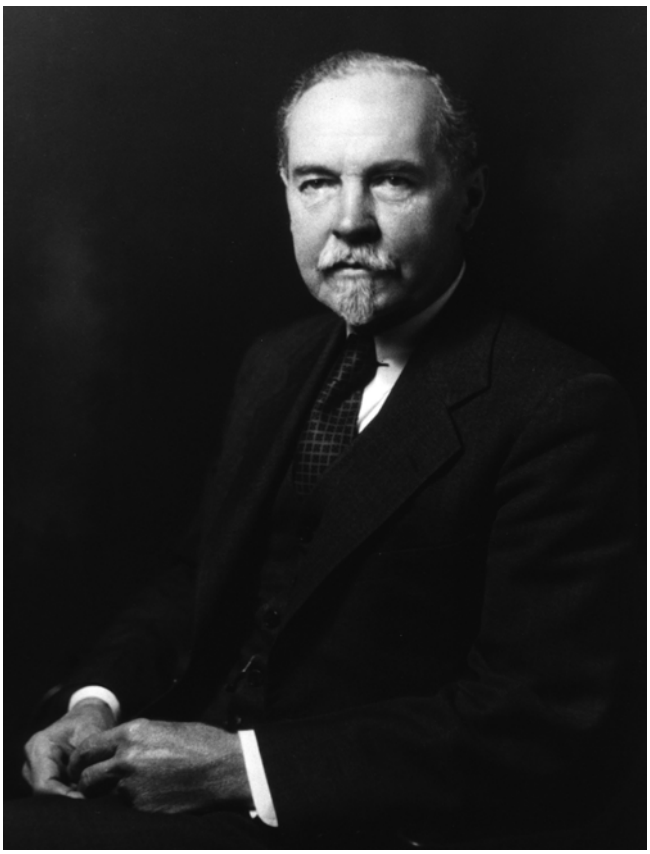


Fig. 1.4 Franz Torek (Source: National Library of Medicine)

1.2 Malignant Diseases

1.2.1 Esophageal Cancer

It is frequently said that the development of transhiatal esophagectomy preceded the transthoracic approach as a way of avoiding the open chest prior to mechanical ventilation, but in reality, 1913 marked the beginning of both procedures.

In the same year, Alwin von Ach (1875–1924), a German surgeon, described the first esophagectomy without thoracotomy in his doctoral thesis. Not is much known about him. The esophagus was resected by stripping through the neck after the divided proximal stomach was connected to a steel rod (Fig. 1.5a). The alimentary tract was not reconstructed, and the patient died on the 17th day.

Franz John A. Torek (1861–1938), a German surgeon working in the United States, performed the first successful transthoracic esophagectomy in that year. The alimentary tract was not reconstructed, but the patient was fed with an external rubber tube connecting the cervical esophagostomy and the gastrostomy (Fig. 1.5, *top* in b). This patient had a long survival.

In 1931, Turner performed the first transhiatal esophagectomy with alimentary tract reconstruction (through a skin flap) with patient survival (Fig. 1.5, *lower left* in a). In 1933, Ohsawa, from Japan, reported the first use of the stomach for reconstruction of the resected esophagus (Fig. 1.5, *lower left* in b). In 1946, Lewis described a two-stage approach to esophageal resection, employing a right thoracotomy and a separate laparotomy with immediate reconstruction of the tract (Fig. 1.5c). In 1976, McKeown suggested a three-stage operation, with an incision in the neck through which the anastomosis was created to avoid the severe consequences of an intrathoracic anastomotic leak (Fig. 1.5d). De Paula et al. in 1995 performed the first minimally invasive esophagectomy through a transhiatal approach.

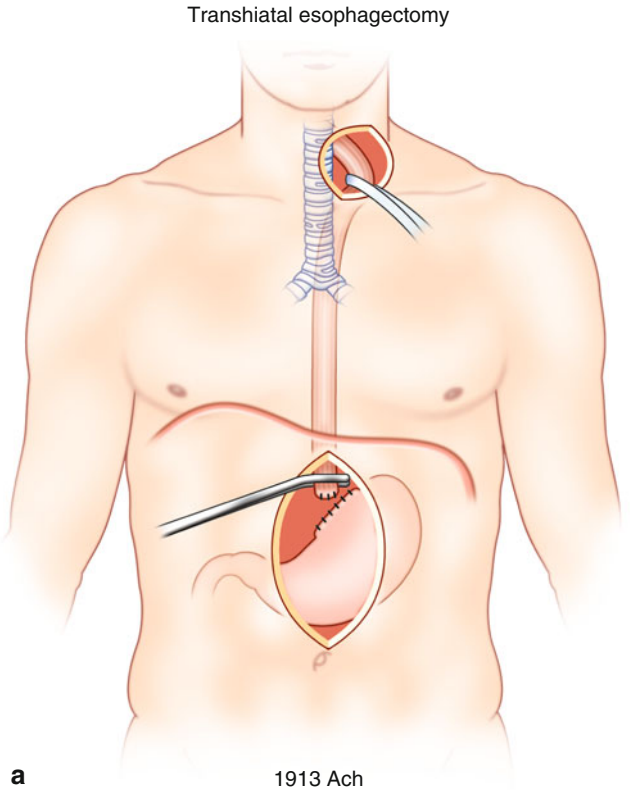
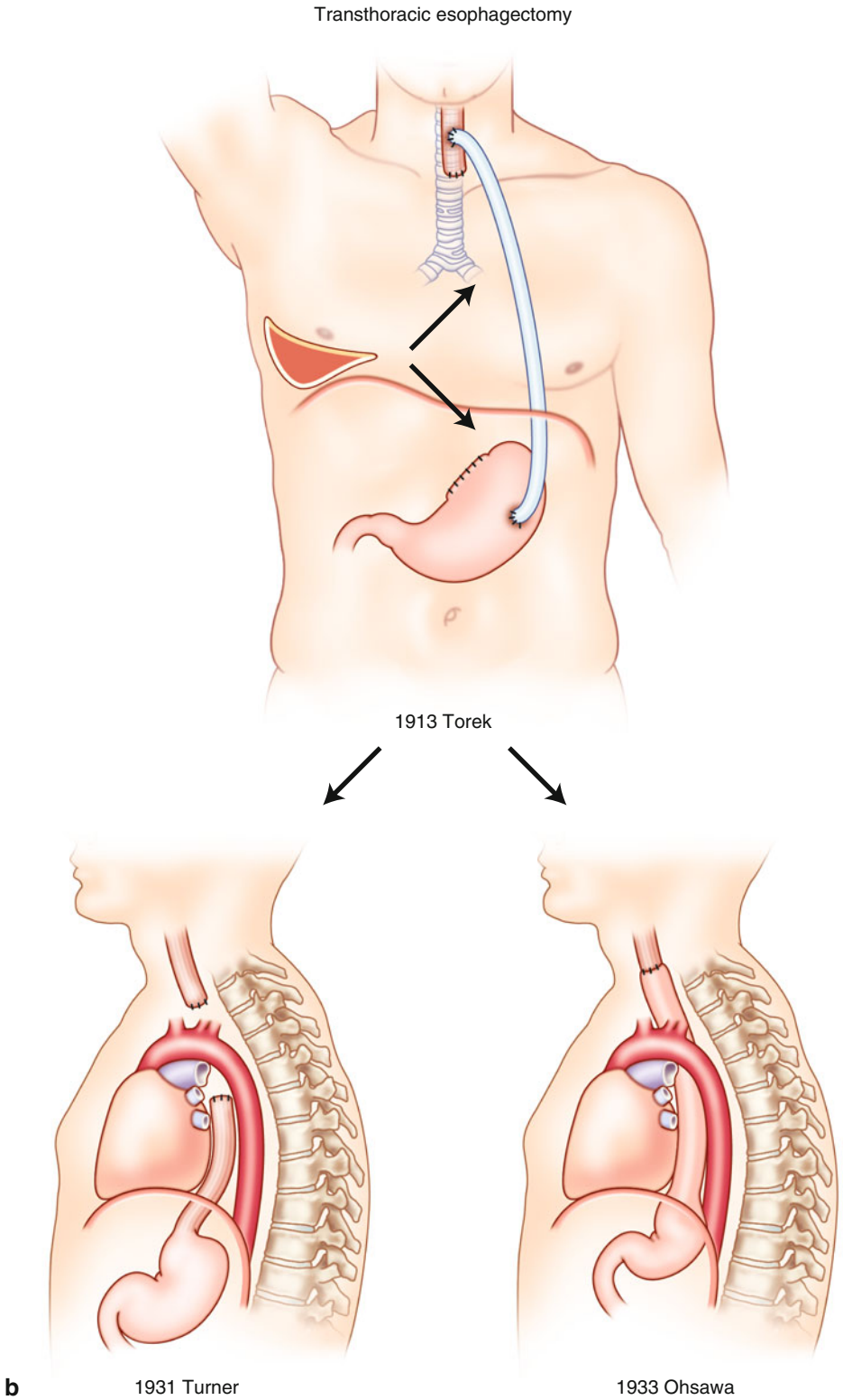


Fig. 1.5 The evolution of esophagectomy. Transhiatal (**a**) and transthoracic (**b**–**d**) esophagectomy had a parallel course. Alimentary tract reconstruction followed years afterwards

Fig. 1.5 (continued)



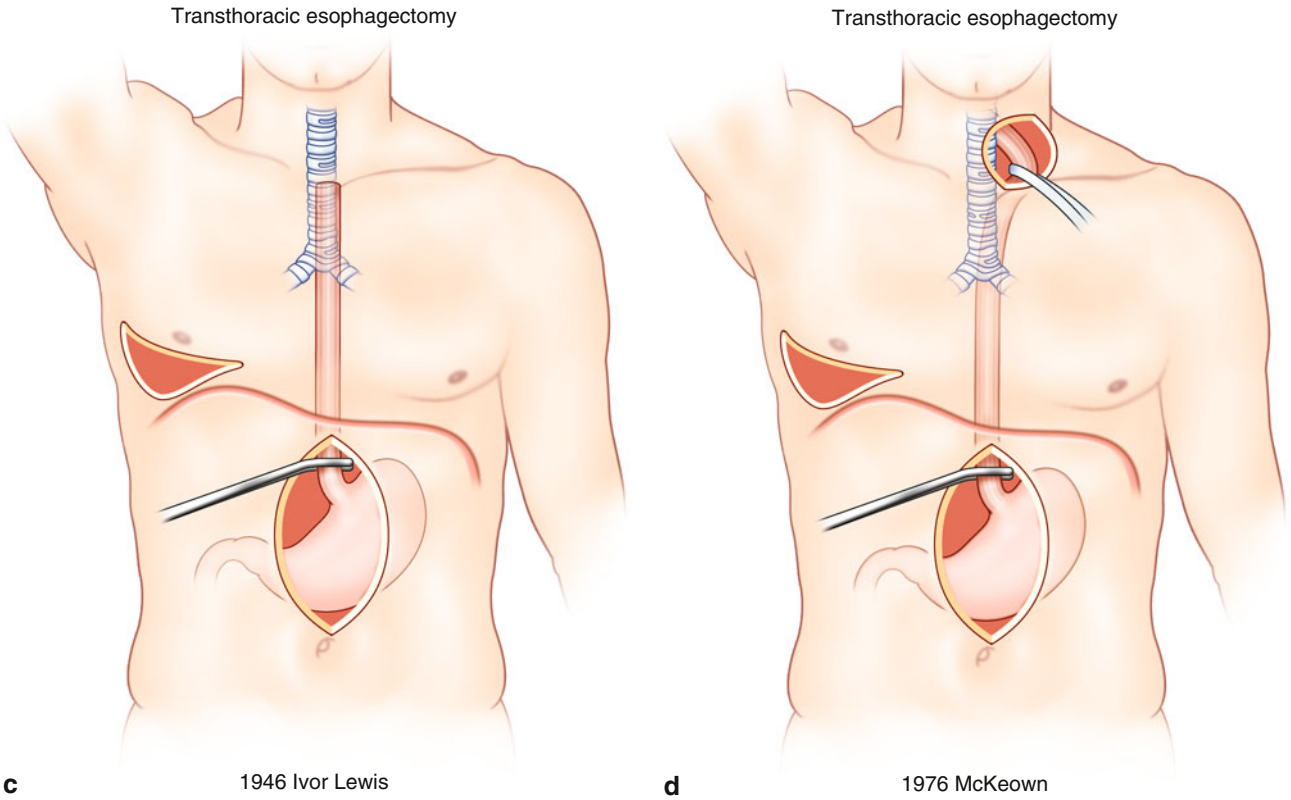


Fig. 1.5 (continued)

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