Surgical Treatment of Hiatal Hernias by Fundoplication and Gastropexy (Nissen Repair)

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CLINICAL CONSEQUENCES of hiatal hernia are hard to predict. For the para-esophageal type, the choice of treatment presents little difficulty; even in the absence of severe symptoms, the dangers of strangulation and incarceration make operative correction advisable. The para-esophageal type of hiatal hernia occurred in 15% of our patients, and in 20% of these chronic anemia was the leading clinical symptom.

In *sliding hernia,* however, the decision is more difficult. A clearly shown x-ray film of sliding hernia tempts one to attribute to it symptoms which are not in fact caused by the hernia. Coronary artery insufficiency, myocarditis, peptic ulcer, chronic pancreatitis, and inflammation of the extra- and intrahepatic biliary ducts are all possible sources of confusion. Only when these organs are normal is one justified in attributing the symptoms to sliding hernia. Symptomatic hiatal hernia also is frequently associated with cholelithiasis (25% of our cases).

Experience in recent years makes it clear that sliding hernia or its precursor, cardiofundal malposition without hernia, leads to insufficiency of the cardia and, in about one-third of cases, to reflux esophagitis. Quite apart from its association with hiatal hernia, reflux of gastric juice into the esophagus is of importance in its own right. Moreover, persisting reflux esophagitis may lead to post-esophagitic or ulcerating stenosis of the lower esophagus. The shrinking tendency of scar tissue surrounding the ulcer results in longitudinal shortening of the esophagus. Secondary brachyesophagus develops, and the cardia of the stomach is drawn into the thoracic cavity. The result is persistent hiatal hernia of the stomach, which must be treated—when treatment is required—differently from sliding hiatal hernia.

Symptoms of sliding hiatal hernia are unequivocal. Gastric hyperacidity, heartburn occurring predominantly when the patient is lying down or bending forward, pain radiating from the retrosternal space into both sides of the chest—all in the absence of lesions of stomach, duodenum, pancreas or gallbladder—are likely to be due to reflux esophagitis.

The diagnosis is based primarily on clinical criteria. Endoscopic findings are diagnostic in some cases revealing velvety, swollen, highly flushed, slightly bleeding mucosa, sometimes covered with multiple erosions. In most cases, however, the mucosa is quite normal macroscopically and the only positive evidence is reflux of gastric juice into the esophagus. When clinical symptoms establish the diagnosis beyond doubt, esophagoscopy should not be considered a routine requirement, being reserved for cases in which x-ray findings are inconclusive or when there is reason to suspect organic complications as tumor, ulcer, stenosis, etc.

When symptoms are severe and impossible to control by dietetic measures and drugs, operation is indicated. In our experience only the persistence of reflux esophagitis justifies surgical correction of the condition.

FIG. 1 a. Showing the fold of the anterior wall of the fundus being pushed around the esophagus.

In our hands, results of hernioplasty (removal of the hernial sac and narrowing of the hernial orifice) were unfavorable from both clinical and anatomical points of view. The failures, exemplified largely by increased incidence of reflux esophagitis, suggested that intervention which interferes with the anatomical relation existing between cardia, diaphragm, and stomach should be avoided.

The surgical procedure we use for incontinence of the cardia and reflux esophagitis is fundoplication.

In 1937, Nissen reported a successful case of transpleural resection of the cardia in a patient with a perforating peptic ulcer. In this case the stomach was mobilized and the lower part of the esophagus was implanted in the stomach in the same manner as the rubber tube is implanted in a Witzel gastrotomy. Years after the operation patients were free of symptoms of reflux. This procedure was adopted in the mid-fifties to treat reflux esophagitis and the operation was given the

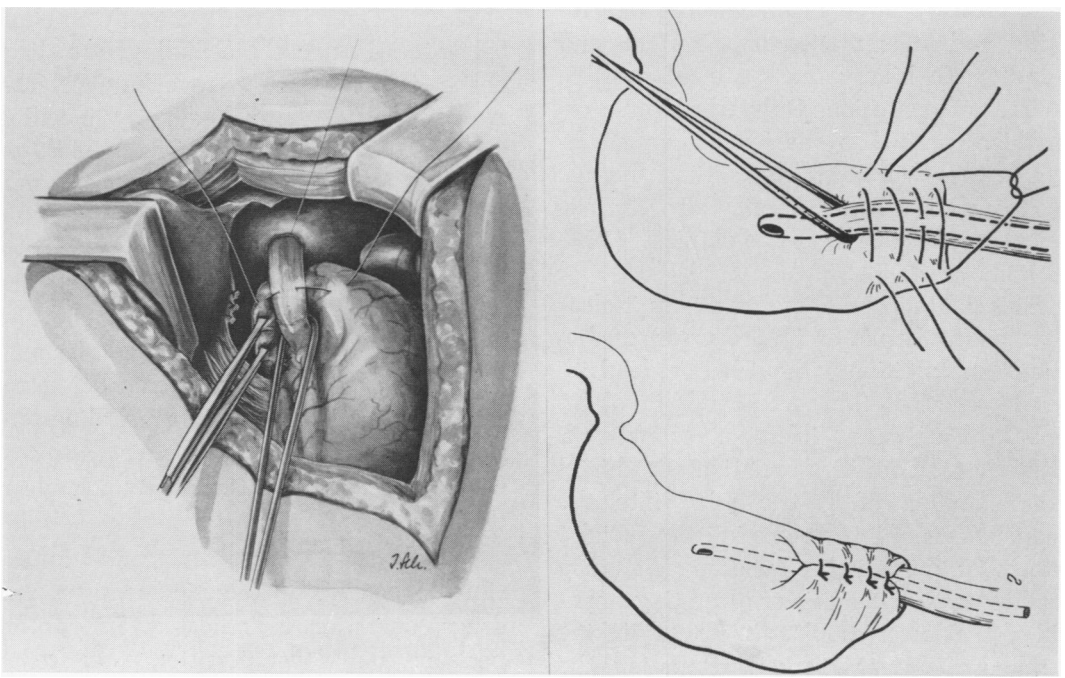

FIG. 1 b, c. Fold of the fundus has been grasped with Allis forceps and plicating sutures have been placed. The uppermost suture includes the esophageal wall. At the lower right fundoplication is completed.

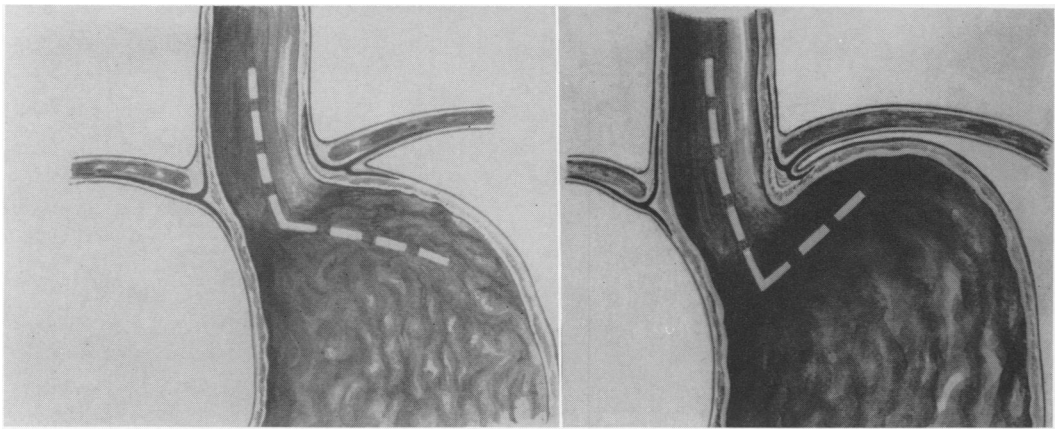

FIG. 2. (Left) The funnel-like appearance of the cardia in the cardiofundal malposition or in the sliding hernia which gives rise to cardial incontinence. (Right) Normal appearance of the angle of His.

name of fundoplication, since a fundic cuff is wrapped around the lower esophagus.[1]

Technic of Fundoplication

A left subcostal incision provides adequate access to the hiatus. With the patient supine, the left costal arch is raised by placing a cushion under the left kidney region. Prior to operation, a thick gastric tube (Charrière 20–22) is passed which facilitates identification of the esophagus and guides sutures in the wall of the gastric fundus. This tube is removed at the

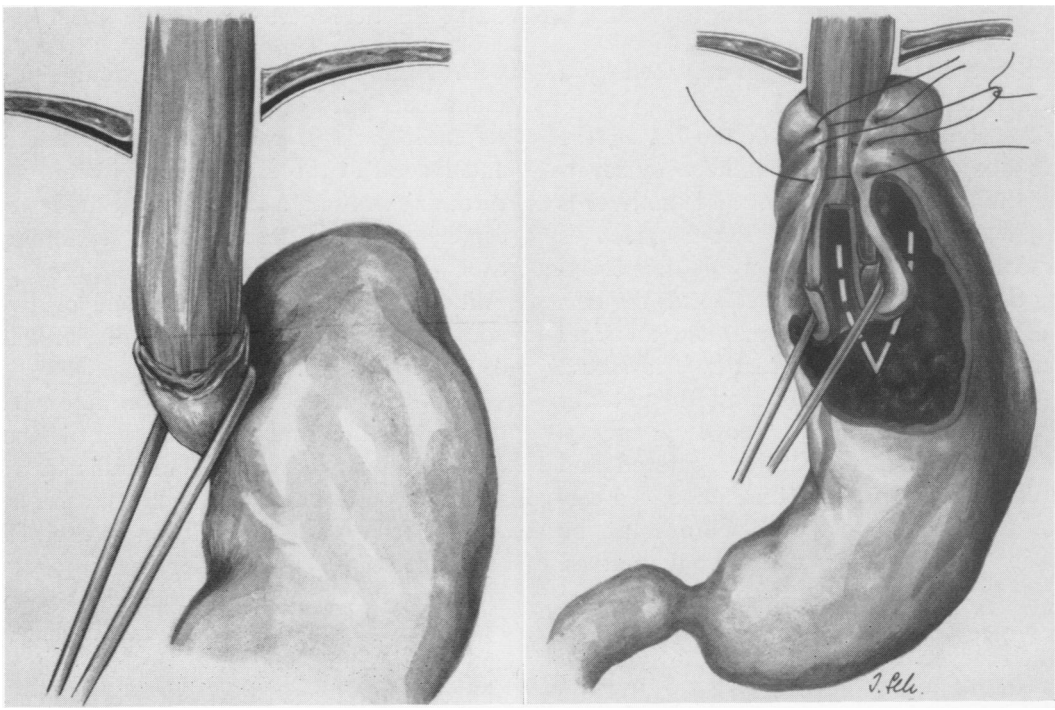

FIG. 2 C, D. Correction of the condition by fundoplication.

FIG. 3. Showing reflux-esophagitis in sliding hernia before and after correction by fundoplication.

end of the operation and is replaced by a normal thin gastric tube.

To facilitate exposure of the hiatus, the left lobe of the liver is mobilized by severing the triangular ligament and the liver is displaced to the right. The stomach is drawn downward under tension, thus everting the peritoneal fold which forms the hernial sac. An incision is made in this fold immediately below the hiatus. The serosa is pushed to the side to expose the anterior wall of the esophagus. The esophagus is then carefully and bluntly separated and circumvented with umbilical tape; the cardia is drawn downward. Care must be taken to avoid injury to the vagus nerves.

Once the esophagus is molilized, a fold of anterior wall of the fundus can be fitted into the gap between the esophagus and the posterior abdominal wall (Fig. 1). The edge of this fold is held in this position with Allis forceps. Medium-strong individual silk sutures are placed around the seromuscularis of the fundus wall lateral and medial to the esophagus; with the sutures drawn tight, a canal around the lower esophagus and around the gastrotomy tube (Fig. 2–4) is formed. To ensure stability it is advisable to pass one or two additional sutures through the anterior wall of the esophagus.

In cases where it is difficult or impossible to mobilize the fundus sufficiently, it is necessary to open the bursa omentalis to expose the posterior wall of the stomach, so that a fold of posterior wall can be used for fundoplication. The superior portion of the gastrohepatic ligament is divided between ligatures. The gap medial to the esophagus and the cardia is thus widened. Vessels above the left gastric artery are tied and cut so that the posterior wall of the stom-

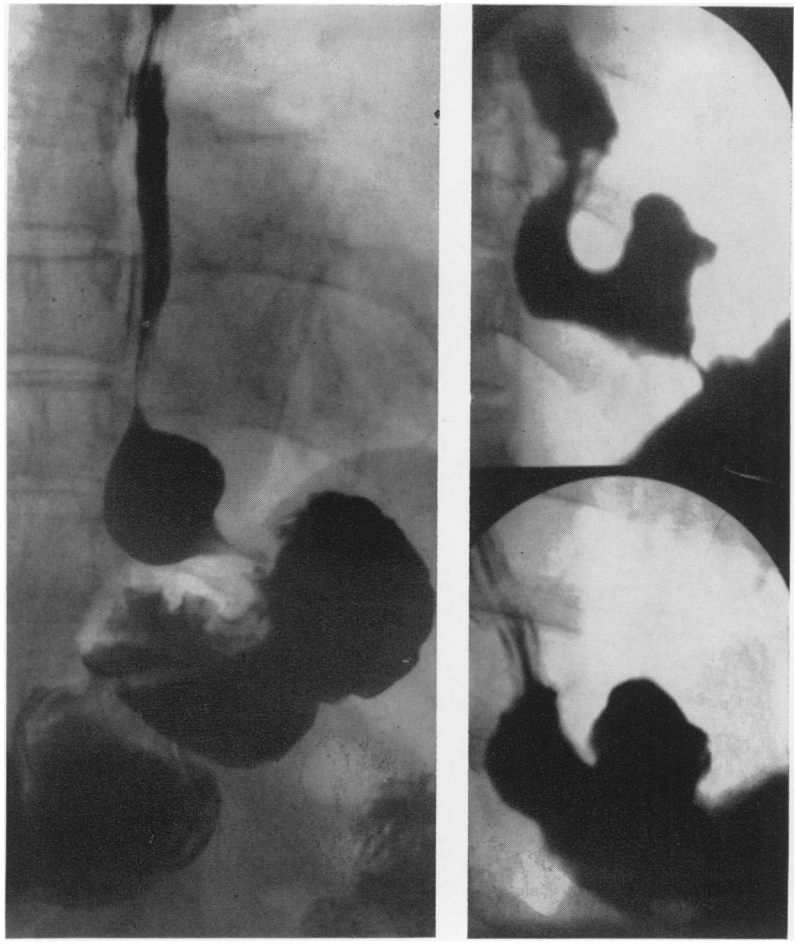

FIG. 4. Showing a mixed hernia corrected by fundoplication.

ach can be folded medial to the cardia. The thin gastric tube is left in place for about 24 hours. As soon as peristalsis is restored, the patient may take nourishment by mouth.

Thoracic Approach

The thoracic approach to hiatal hernia is justified only in exceptional cases such as relapse following hernioplasty or clear-cut short esophagus. Thoracotomy is advisable when there is a chronic ulcer of the cardia, cicatricial stenosis, or when carcinoma is suspected. Severe esophagitis or peri-esophagitis, which must be expected with short esophagus and recurrent hernia, adds to the operative risk.

Gastropexy in Para-esophageal Hernia

Here again a left subcostal incision provides adequate access to the hiatus (Fig. 5). The hernial sac need not be touched since it is obliterated. The hernial contents are reduced and the wide hiatus is narrowed with a few strong silk sutures. Excessive narrowing not only incurs the danger of obstruction but is quite pointless in correcting the hernia, since gastropexy prevents recurrent prolapse into the sac. The sutures anchoring the stomach are placed in an oblique line across the fundus, a line running parallel to the convexity of the stomach from the lesser to the greater curvature (Fig. 6, 7). In the abdominal wall, the sutures pass through peritoneum

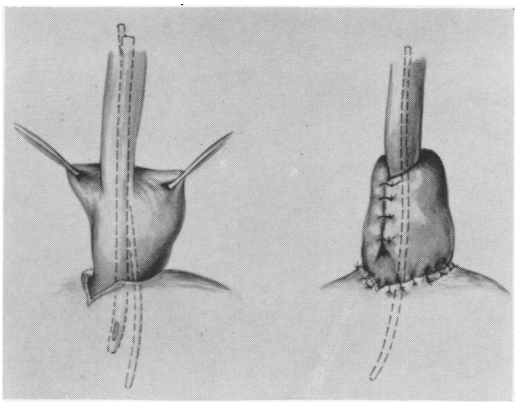

FIG. 5. Showing the technique of fundoplication by means of the transthoracic approach. (Left) The diaphragm divided to prepare the fundic cuff. (Right) The divided or dilated hiatus is sutured circumferentially to the gastric wall.

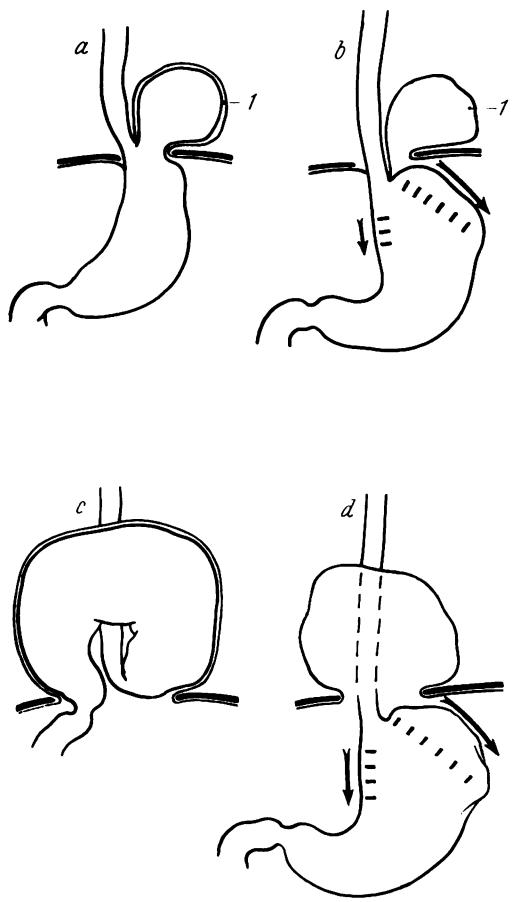

FIG. 6. a) Small para-esophageal hiatal hernia with mushroom-like prolapse of the fundus ventriculi. c) large para-esophageal hiatal hernia with intrathoracic gastric volvulus, "upside-down"-stomach. b and d) Situation after repositioning and placement of sutures for gastropexy.

and posterior rectus sheath; in the stomach wall, through the seromuscular coats. As the gastropexy is performed 2 to 3 cm. above the abdominal incision it does not impede closure of the abdominal wall.

Results

Reduced surgical risk, wider field of indication in elderly patients, the possibility of examination of the abdominal cavity—all constitute arguments in favor of the abdominal approach. Results with this method are satisfactory. A third of our patients were over 60 years of age (Table 1). Among 31 patients over 70 and four over 80 years of age, we had no fatalities (Table 2). To the end of January 1964, 545 patients have been operated upon. Long-term results (Table 3) may be judged from two follow up studies carried out in 1958 and 1961, respectively. When fundoplication was used, signs and symptoms of reflux esophagitis disappeared in

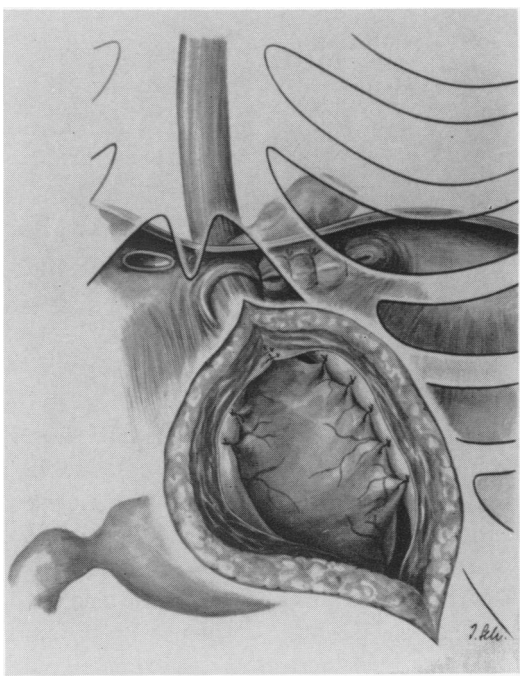

FIG. 6e. After completion of the operation but before closure of the abdominal wall. The constricted hernial orifice and the obliterated hernial sac are also seen.

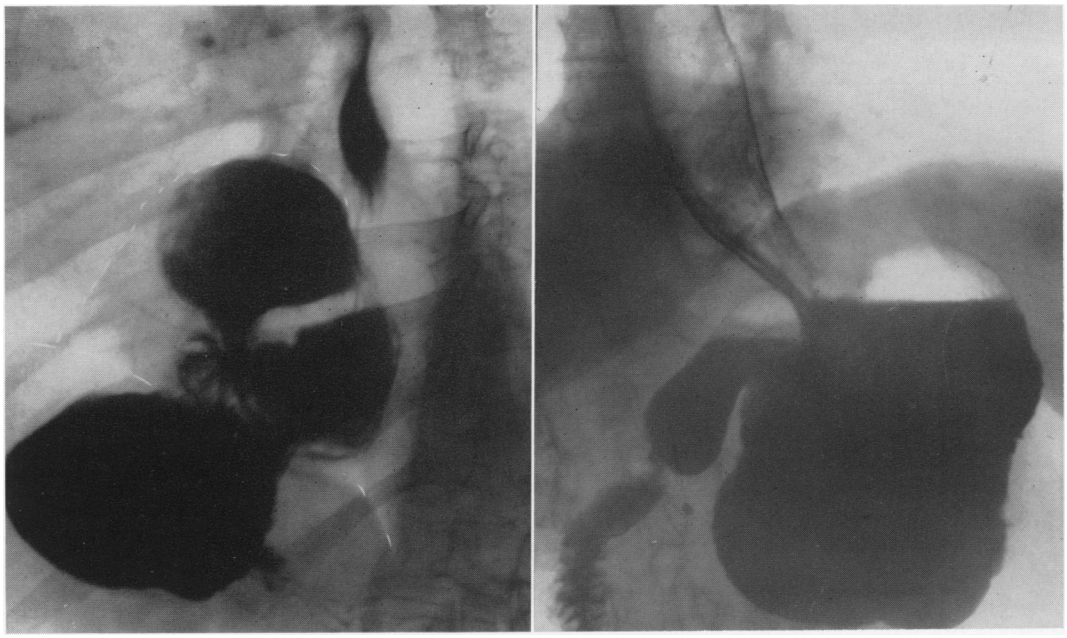

FIG. 7. Showing x-ray findings in a para-esophageal hernia before and after gastropexy.

95 per cent of cases, although side effects due to hyperfunction of the cardia developed in about 10 per cent of cases. Among subjective complaints, the most common was a sensation of fullness due to tight closure of the artificially strengthened cardia.

Postoperative complications are comparatively rare, and include:

1. Gastric fistula in the region of the fundoplication (2 cases; in both, the fistula closed spontaneously after a few weeks).

2. Intra-operative injury to the spleen (additional splenectomy to fundoplication—one case).

TABLE 1. *Hiatal Hernia. Distribution According to Age*

Age	No. Cases	
80	4	
70–79	31	181 = 33% over 60 yr.
60–69	146	
50–59	179	
40–49	111	
30–39	58	
20–29	12	
10–19	1	

Mean age in para-esophageal hernia: 65 years; mean age in brachyesophagus: 62 years.

3. Postoperative stenosis in the region of the fundus flap. This functional disorder occurs fairly frequently but is usually temporary, subsiding spontaneously in most cases within 4 to 6 weeks. In two cases there was severe dysphagia due to stricture at the operative site. In one, prolonged dilatation (bouginage) was necessary; in the other, the dysphagia gradually subsided without treatment.

There were four deaths after abdominal fundoplication, three due to perforating peritonitis, one arising from a ruptured peptic ulcer which was overlooked at operation.

The mortality of abdominal operations (fundoplication and gastropexy) was six cases in a total of 524 = 1.1 per cent.

Mortality of transthoracic operations was

TABLE 2. *Hiatal Hernia. Patients Operated Upon Between 1955 and January 1964*

Para-esophageal hernia	59
Mixed forms	26
Cardiofundal formation	45
Sliding hernia	388
Brachyesophagus	27
Total	545

TABLE 3. *Hiatal Hernia. Long-term Results Among Patients Operated Upon Since 1955. Follow Up of 96 Patients (1958)*

Clinical and radiological cures	85	= 88%
Recurrence (symptom free in 7 patients)	11	
Elimination of specific symptoms	92	= 95%
Follow up of 210 patients (1961)		
Gastropexy alone	101	
Elimination of specific symptoms	81	= 81%
Recurrence (symptom free = 15 cases)	35	
Fundoplication	109	
Elimination of specific symptoms	105	= 96%
Recurrence	4	

five cases in a total of 30 = 16.6 per cent. Two deaths were due to a fistula in the region of the fundoplication.

Summary

Our experience with 545 operations on patients with hiatal hernia is reported.

Surgical treatment in hiatal hernia of the sliding type should be restrained. Failure of conservative treatment and chronic reflux esophagitis are indications for operation in order to prevent brachyesophagus, ulcer, or cicatricial stenosis. The technic of fundoplication in the operative treatment of sliding hiatal hernia or in cardiofundal malposition is described in detail. The advantage of the abdominal approach is emphasized.

In para-esophageal hernia operative correction is required almost without exception because of the danger of strangulation and obstruction. Gastropexy is, for us, the procedure of choice.

References

1. Nissen, R.: Dtsch. Zschr. Chir., **249**:311, 1937.
2. Nissen, R. and Rossetti, M.: Die Behandlung von Hiatushernien und Refluxösophagitis mit Gastropexie und Fundoplicatio. Indikation, Technik und Ergebnisse. Stuttgart, Thieme, 1959.
3. Nissen, R. and Rossetti, M.: J. chir., **83**:659, 1962.
4. Nissen, R. and Rossetti, M.: Brun's Beitr. klin. Chir., **207**:16, 1963.