Effective treatment of symptomatic gastroesophageal reflux disease by laparoscopic fundoplication

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ABSTRACT

Objective: To evaluate the outcome of our initial experience with laparoscopic fundoplication.

Methods: Surgery was indicated if reflux disease was confirmed and more than 6 months of conservative treatment had failed. Nissen fundoplication was applied as the standard procedure, however, if motility disorders of the esophageal body were present partial Toupet fundoplication was performed.

Results: Sixty-seven patients with a median age of 51 (27-78) years were treated with laparoscopic fundoplication. Patients reported typical complaints for 7 (0.5-50) years. Endoscopy revealed 58 patients with esophagitis. At manometry, the median resting pressure of the lower esophageal sphincter was 3 mmHg (normal: 6-25 mmHg). pH-monitoring confirmed significant reflux with a median preoperative DeMeester score of 53.9 (normal: < 14.7). Median operation time was 105 (50-230) minutes. Conversion was necessary in 2 (3%) patients. Postoperative hospital stay was 4 (2-10) days. Mortality was 0%. The first 34 patients were followed retrospectively, all others prospectively. At follow-up (14 (0.5 - 66) months) 95% of patients were symptom free and satisfied with the procedure including 3 patients who were reoperated laparoscopically for recurrent disease.

Conclusion: Laparoscopic fundoplication can effectively treat gastroesophageal reflux disease. It can be performed safely with minimum patient discomfort.

Keywords: Gastroesophageal reflux disease, laparoscopic fundoplication.


Heartburn as the leading symptom of gastroesophageal reflux is experienced by the majority of people with different frequency and intensity. It is a symptom of an unphysiologically long contact of acidic gastric contents with the esophageal mucosa, better known as gastroesophageal reflux disease, possibly leading to reflux esophagitis. The etiology of the disease is multifactorial, but there is a consensus that lower esophageal sphincter insufficiency is most important. Several different techniques for the surgical therapy of reflux esophagitis have been described in the 1950's. The pioneering publication was by Nissen who first described the fundoplication in 1956. After mobilizing the distal esophagus and proximal stomach he created a fundus cuff around the esophagus. With this technique he could effectively prevent reflux. His coworker Rossetti published a technical modification, and several other variants have been described, such as a 270° cuff for better prevention of postoperative dysphagia, an anterior 180° fundoplication with the same goal, the reconstruction of the angle of His or the combination of this operation with a closure of the...
often concomitant hiatal hernia and a gastropexy. The operations according to Nissen or Nissen-Rossetti have been widely applied with good results even after long-term follow-up.8,9

The introduction of H2 - and subsequently of proton pump inhibitors in the 1980's has lead to a predominantly medical treatment of reflux esophagitis. It remains unclear to the authors why people were willing to give up a definitive surgical treatment of the disease so easily. In current discussions with internists (usually the referring physicians) we have had the impression that the individual experiences with operated patients in the past had not been as good as the results described in the literature. This seems to be the reason that the fundoplication has become a rarely performed procedure in past years. The development of laparoscopic surgery and the possibility of performing the fundoplication by laparoscopy has recently changed this situation. Better diagnostic tools as well as further insight into the pathophysiology of the gastroesophageal junction influencing the technical approach10 have further improved the situation. The surgeon is now able to provide a 'competitive' therapeutic option again.

The current management, indication and operative technique, as well as our first results, will be described and discussed.

Methods. Patients admitted to our hospital for persistent heartburn were evaluated and followed. Between May 1992 and November 1997 we performed laparoscopic fundoplications in 67 patients (27 female : 40 male) with a median age of 51 (27-78) years.

Patient history. Typical preoperative complaints were heartburn (78%), retrosternal pain (25%) or pressure (13%) and regurgitation (20%). Patients reported symptom aggravation in the supine position and postprandially. The majority could therefore only sleep with an elevated upper part of the body. Other frequently seen problems were upper airway irritations due to recurrent aspiration. The patients had experienced these complaints for a median of 7 (0.5-50) years. All patients had a history of at least one or more courses of conservative treatment with proton pump inhibitors.

Diagnosis. All patients presented with a report of the latest endoscopic findings, often described under medical treatment. Fifty eight patients suffered from different degrees of esophagitis (grade I: 21%, grade II: 42%, grade III 21%, grade IV 3%; according to Savery and Miller). Nine patients (13%) had no evidence of esophagitis at the time of endoscopy. Routine preoperative manometry and pH monitoring was performed beginning with patient no. 18 after the facility was established at our institution. The median resting pressure of the lower esophageal sphincter was 3mmHg (normally 6-25mmHg), all patients had a pathologically decreased pressure below 6mmHg. Motility disorders of the esophageal body were found in 3 patients. The pH monitoring showed significant gastroesophageal reflux in all operated patients. The median preoperative DeMeester score was 53.9 (normally <14.7).

Indication. We indicate surgery in patients who have recurrent typical symptoms after at least 6 months of conservative treatment. Esophagitis may or may not be present prior to surgery. Manometry and pH-monitoring confirm LES insufficiency and significant gastroesophageal reflux. In the presence of esophageal body motility disorders, a partial fundoplication according to the technique of Toupet3 is applied in order to avoid postoperative dysphagia. In patients with regular body motility a Nissen fundoplication is performed. We also excluded patients with esophagitis but who had atypical manometric findings or no evidence of significant reflux on pH monitoring.

Operative technique. After establishment of a pneumoperitoneum, a total of 5 trocars are inserted (one for the video camera and 4 working trocars (2x5 mm, 2x10 mm)). With one instrument the left liver lobe is elevated, another pulls the stomach downwards. The surgeon stands between the patient's legs and performs the operation through the remaining trocars.

Nissen fundoplication. First of all the peritoneum at the esophagogastric junction is incised and both diaphragmatic crura are dissected. The herniated part of the stomach is reduced in the presence of a hiatal hernia. After elevation of the esophagus the hernia is closed with one or 2 stitches. We continue by mobilizing the gastric fundus by dissecting the short gastric vessels using clips or the ultrasonic scissors. It is now possible to pull one part of the fundus behind the esophagus and the other part anteriorly towards the right side and to form a tension free cuff by suturing the 2 parts of the fundus with 2-3 single stitches of nonabsorbable suture material (Figure 1). The esophagus is armed with a thick nasogastric tube in order to prevent a stenosis of the lumen.

Toupet fundoplication. The preparation is basically the same as described above. The esophageal hiatus is not closed though. After the mobilization of the fundus the fundoplication is created by the rows of stitches. The fundus is pulled through behind the esophagus but only so far that it can be sutured to the anterior esophageal wall at approximately 8 o'clock of the esophageal circumference. It is first sutured to the right crus of the diaphragm with 3 stitches and than to the esophageal wall with another 3 stitches. The left fold of the fundus is finally sutured to the esophagus at approximately 4 o'clock of the circumference.
Figure 1: Nissen Fundoplication.

(a) Incision of the peritoneum at the gastroesophageal junction and dissection of the right crus. The upper clamp is a self-holding sharp clamp that is placed in the diaphragm to retract the left lobe of the liver for better exposure of the hiatus.

(b) The esophagus is dissected completely and elevated with 2 instruments.

(c) The hiatal hernia is closed with a single stitch.

(d) The greater curvature is dissected using ultrasonic scissors.

(e) Both folds of the fundus are brought together by tying the first stitch.
After reduction of the cuff and closure of the hernia the patient was symptom free. The other 2 patients showed a disrupted cuff at relaparoscopy so that a new fundoplication was performed. All other patients are symptom free and satisfied with the procedure.

**Discussion.** Laparoscopic fundoplication is an advanced laparoscopic procedure and should only be performed if enough experience has been gained with standard procedures. We, ourselves, had some difficulties in the beginning. Many operative details have been modified since the beginning due to personal experience, reports at certain meetings or by watching others who had even more experience with the procedure. New instruments have been introduced simplifying the procedure. Our approach, however, has been unchanged for the last 30 procedures so that the authors have the impression they are able to perform the fundoplication as a standard procedure now. The results described above with a success rate of 94% are excellent and are comparable to other series’ published. The good experience with the cases recently performed is encouraging. The reasons for this are manifold. The preoperative diagnosis has improved with the routine application of manometry and 24-hour-pH-monitoring. The indication for surgery is only given if the typical findings for gastroesophageal reflux are present. This has definitively lead to better patient selection. On the other hand, we do not believe that the severity of the esophagitis should influence the decision for an operative or nonoperative treatment. Some patients are suffering from recurrent acid reflux without always showing severe esophagitis. Those patients are seeking a definitive treatment. The quality of the operation has become better with the laparoscopic approach. The gastroesophageal junction can be visualized much better than in open surgery. The dissection is more subtle. The postoperative course is more pleasant due to reduced pain and postoperative intestinal paralysis is not as severe so that the intake of a regular diet can be achieved early. The dismissal on the 2nd postoperative day is possible, but usually this happens on the 4th postoperative day. The cosmetic result is obviously better than after median laparotomy. The technical modifications in the past have improved the results. A short cuff (2 cm) now prevents reflux just as well as a long cuff (4-5 cm) that was used in the past, but is not as often complicated by postoperative dysphagia. The same is true for the diameter of the cuff. Today we mobilize the fundus so that a ‘floppy’ cuff can be formed. Patients still become free of reflux. In the past some people believed that the cuff functioned by actually stenosing the distal esophagus which resulted in too tight cuffs leading to postoperative...
dysphagia. The closure of the hiatal hernia was not always performed in conventional surgery, today we think it is mandatory. Of course we have asked ourselves how this cuff works to prevent reflux. There are several theories about the function of the fundoplication. In many ways the regular anatomy is reconstructed. The angle of His' (between esophagus and fundus, wide open in patients with hiatal hernia) is reconstructed, the length of the esophagus is regained bringing the sphincter back under intraabdominal pressure. The length of the esophagus is maintained by the cuff, that prevents herniation through the closed hiatus. Possibly the narrowing of the angle of the muscle fibers by lengthening the esophagus is also of importance. The contractility could be improved. Last but not least, it could also be the cuff itself that produces some pressure to prevent gastroesophageal reflux.

Further insight into the physiology of the gastroesophageal junction will be of great interest. Nevertheless, we think that with laparoscopic fundoplication we can provide an effective tool to treat gastroesophageal reflux with minimum patient discomfort.

References