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SURGICAL ENDOSCOPY
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Five-year results of laparoscopic Toupet fundoplication as the primary surgical repair in GERD patients: Is it durable?

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Abstract
Introduction: Most surgeons operate on gastroesophageal reflux disease (GERD) patients using the concept of "tailored approach," which depends on esophageal motility. We have abandoned this concept and performed laparoscopic Toupet fundoplication in all patients suffering from GERD, independent of their esophageal motility.
Methods: In a prospective trial we have assessed and evaluated our 5-year results of the first 100 consecutive patients treated with laparoscopic Toupet fundoplication. All patients were evaluated preoperatively by endoscopy and 24-h pH manometry. The patients were followed up clinically 1, 2, 6, 12 and 60 months postoperatively. The course of clinical DeMeester score, appearance and treatment of wrap-related side-effects as well as long-term outcome and patient satisfaction were evaluated.
Results: The 5-year follow-up rate was 87%. Laparoscopic Toupet fundoplication achieved a 5-year healing rate of GERD in 85%. Of all operated patients, 3.5% had to be reinstalled on a regular PPI treatment because of postoperative GERD reappearance. The median clinical DeMeester score decreased from 4.27 ± 1.5 points preoperatively to 0.47 ± 0.9 points 5 years postoperatively ($p < 0.0005$). Because of persistent postoperative dysphagia, 5% of the patients required endoscopic dilatation therapy. Persistent postoperative gas-bloat syndrome occurred in 1.1%. Wrap dislocation was identified in 3.4% of patients. Reoperation rate was 5%. Total morbidity rate was 19.5% and operative related mortality rate was 0%. Overall, 96.6% of patients were pleased with their outcome at late follow-up, and 95.4% of patients stated they would consider undergoing laparoscopic fundoplication again if necessary.
Conclusion: Our long-term results showing a low recurrence and morbidity rate of laparoscopic Toupet fundoplication encourage us to continue to perform this procedure as the primary surgical repair in all GERD patients, independent of their esophageal motility. Laparoscopic Toupet fundoplication has proven to be a safe and successful therapeutic option in GERD patients.

Key words: Laparoscopic antireflux surgery — Toupet partial fundoplication — Long-term outcome

Gastroesophageal reflux disease (GERD) is the most common benign disorder of the upper gastrointestinal tract in the Western world.

Since the first description of laparoscopic fundoplication by Dallemagne et al. [5] in 1991, an increasing number of patients have been treated for GERD by minimally invasive or endoscopic surgery. Various operation techniques of fundoplication such as Nissen, Nissen-Rossetti, Toupet, and other variations of anterior or posterior partial wraps as well as endoscopic techniques are currently performed for the surgical treatment of GERD.

A significant number of surgeons operate on patients suffering from GERD applying the concept of a "tailored approach." Depending on manometric findings, a Nissen fundoplication is performed in the case of normal esophageal motility, whereas a Toupet fundoplication is preferred if an esophageal motility disorder is found. The concept of a tailored approach proposes that the Nissen fundoplication offers better long-term reflux control, whereas the Toupet procedure should be reserved for patients with motility disorders, thus lowering the rate of wrap-related side effects as dysphagia or gas-bloat syndrome in comparison to the Nissen procedure.

Zornig et al. [17] were not able to substantiate the hypothesis of a tailored approach in their recent prospective randomized trial. Indeed, they found a higher

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postoperative dysphagia rate in the Nissen group compared to the Toupet group. They concluded that the concept of tailored approach should be abandoned and that laparoscopic Toupet fundoplication could become the surgical treatment of choice for symptomatic GERD.

We abandoned the concept of tailored approach as early as 1993, performing laparoscopic Toupet fundoplication in all patients suffering from GERD, independent of their esophageal motility. We published our 1-year results of the first 100 consecutive patients in 2001 [6].

After completion of the 5-year follow-up in these patients, we investigated and assessed the long-term outcome and durability of laparoscopic Toupet fundoplication as the primary surgical repair in patients suffering from GERD.

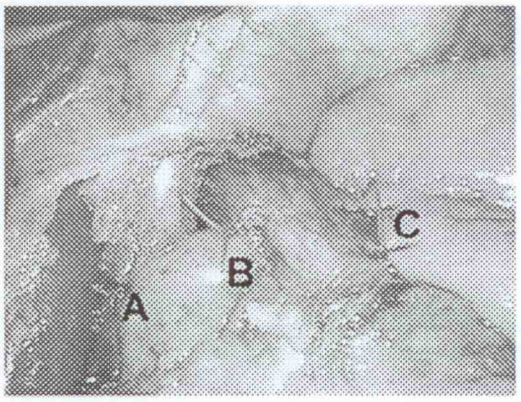

Fig. 1. Laparoscopic intraoperative view after completion of the partial posterior Toupet 270° wrap with sutures at the right crus (A), between the wrap and the esophagus (B), and between the gastric fundus and the esophagus (C).

Materials and methods

Patient data

Between September 1993 and June 1998, 100 consecutive patients were treated for symptomatic GERD by laparoscopic Toupet fundoplication (by C.K.). During the period of this study no cases were excluded from the study. All patients were informed and asked for permission for participation in this prospective study. All patient data were collected prospectively and recorded in a data base. Clinical follow-up was obtained 1, 2, 6, 12, and 60 months postoperatively.

All patients were evaluated preoperatively by endoscopy and 24-h pH-manometry.

The course of clinical DeMeester score, appearance, and treatment of wrap-related side effects as well as patient satisfaction were evaluated.

Data are expressed as mean ± SD unless stated otherwise. Normal distribution of data was tested using the Lilliefors test (software SPSS 10.0, SPSS Inc, Chicago, IL, USA). Where appropriate, differences between groups were tested for significance using the Mann-Whitney U test (software SPSS 10.0). $p < 0.05$ was considered significant.

Indication and preoperative diagnostic

The indication for operative treatment of GERD was proposed according to the SAGES criteria [13]. The consent for operative treatment was made after diagnosis of GERD by endoscopy and/or 24-h pH-manometry. In patients with nonpathological 24-h pH-manometry but typical clinical symptoms of GERD (esophagitis grade IV), the indication for operative treatment was also proposed. One or more of the following criteria had to be fulfilled by all patients:

1. Unsatisfactory response of GERD to conservative medical antireflux treatment
2. Patient wish for operative treatment
3. Development of GERD complications (esophageal strictures, Barrett esophagus, esophagitis grade III/IV)
4. Atypical reflux-related symptoms such as cough, asthma, aspiration, hoarsenessGERD symptoms were evaluated pre- and postoperatively by the modified clinical DeMeester score [4]. This clinical score of GERD, which should not be confounded with the DeMeester score used in 24-h pH-manometry, includes variables such as heartburn, dysphagia, regurgitation and gastrointestinal bleeding (range 0–12 points).

Preoperatively all patients received an endoscopy (with biopsy) and 24-h pH-manometry. All patients stopped their medical treatment for GERD at least 7 days before the 24-h pH-manometry. Normal values were defined as pressure curve with a normal amplitude (> 40 mmHg) with > 30% of propulsive contractions and < 5% of retropulsive contractions in all measures; mean time for contractions < 6 sec; fraction time with pH < 4 in less than 4% of measured time; longest reflux period < 300 sec and total incidence of reflux periods > 5 min < 2.

In selected cases (paraesophageal or mixed hiatal hernia diagnosed at endoscopy) an x-ray barium-swallow examination was performed. Endoscopic evaluation of esophageal mucosa was made according to the Savary-Miller classification [12].

In the first 34 patients a postoperative control endoscopy and 24-h pH-manometry was performed 8 weeks postoperatively. Because of highly significant results the postoperative control endoscopy and 24-h pH-manometry were not performed in further patients due to high costs and patient discomfort.

Operative technique

All patients were operated regardless their esophageal motility by a laparoscopic partial posterior 270° fundoplication as described by Toupet [15] for open surgery. In the following we will only summarize the important operative steps, as we have described the procedure elsewhere [9, 10].

Subxiphoidal insertion of a Nathanson static liver retractor to retract the left liver lobe

Mobilization of the gastroesophageal junction without dissection of the triangular ligament

Preparation of the left and right diaphragmatic crus without dissection of the hepatogastric ligament. The short gastric vessels are not dissected.

Mobilization of the distal esophagus and the distal mediastinum with preparation and preservation of the dorsal vagal nerve. The abdominal part of the esophagus is mobilized over a length of 5–8 cm. Distal crurorraphy is performed by nonresorbable single sutures (Ethibond 2-0). A gastric tube Ch 40-60 is inserted to control the width of the neohiatus. The mobilized anterior part of the gastric fundus is passed behind the esophagus to the right and fixed with two sutures to the left crus.

Second fixation with two or three sutures to the right crus and fixation of the wrap to the anterior esophageal wall by two sutures on both sides to form a partial dorsal wrap of about 270° (Fig. 1).

In case of a paraesophageal or mixed hiatal hernia a gastrophrenicopexy with four to five single sutures was performed between the anterior gastric fundus and the left diaphragm.

Postoperative follow-up

By use of Telebrix (Guerbet AG, Zürich, Switzerland), a contrast medium-enhanced roentgenogram was usually performed during the same day of the operation. If the findings excluded esophagogastric leakage, the patients were put on a normal diet. Patients were released on the 3rd postoperative day in case of an uneventful course.