

Laparoscopic Anterior 180° Partial Fundoplication - Indian Perspective

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Aim: To evaluate Laparoscopic anterior 180° partial fundoplication for its good long-term relief for symptoms of gastroesophageal reflux disease and association with adverse effects. **Methods:** **Study design:** Prospectively evaluated case series. **Settings:** Tertiary care centers **Patients:** The clinical outcomes were determined for all patients who had undergone a laparoscopic anterior partial fundoplication by us between January 1, 2013 to March 31, 2021. **Interventions:** Clinical outcome, complications, and follow-up after laparoscopic anterior 180° partial fundoplication was obtained using a structured questionnaire. **Results and Discussion:** 228 procedures were performed. The outcome at 0 to 8 years (mean, 4 years) follow-up was determined for 195 patients. 1 death was linked to the laparoscopic procedure and 2 patients died during follow-up due to unrelated causes. For 186 patients (95%) with clinical outcome data at late follow-up, gastroesophageal reflux symptoms were significantly improved following surgery and were well controlled in 9 patients (4.5%). In a subset of 85 patients with more than 5 years of follow-up, relief of heartburn was found in 59 patients (69%). Incidence and severity of heartburn were reduced after surgery in 22 patients (26%), decreased dyspepsia in 80 patients (94%). Normal belching was preserved in 84 patients (99%) and almost all patients were able to eat normally. **Conclusion:** Laparoscopic anterior 180° partial fundoplication is an effective procedure for the surgical treatment of gastroesophageal reflux and is associated with a high rate of patient satisfaction at late follow-up. Compared to Nissen's fundoplication it is as good as control of recurrent reflux as well as reduced adverse effects. The patient goes home in 3-4 days. Hence we recommend it as the procedure of choice for reflux symptoms.

Keywords: Laparoscopic Anterior 180° Partial Fundoplication, Gastroesophageal Reflux Disease (GERD), Dyspepsia

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Biswabasu Das, Mch, Department of Surgical Gastroenterology, Seven Hills Hospital, Vizag, Andhra Pradesh, India. Email: bbdas23@gmail.com	Das B, Sahu S, Radhakrishna Y, Das B. Laparoscopic Anterior 180° Partial Fundoplication - Indian Perspective. Surgical Rev Int J Surg Trauma Orthoped. 2021;7(3):36-43. Available From https://surgical.medresearch.in/index.php/ijoso/article/view/233	

Manuscript Received
2021-04-15Review Round 1
2021-04-25Review Round 2
2021-05-06

Review Round 3

Accepted
2021-05-14Conflict of Interest
NoFunding
NilEthical Approval
YesPlagiarism X-checker
7%

Note



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Introduction

Fundoplication encompasses a well-established role within the treatment of gastroesophageal reflux disease. It is established that open/laparoscopic Nissen's fundoplication achieves a decent long-term outcome for many patients undergoing surgery for reflux disease. [1-5]. Unfortunately, however, some patients undergoing Nissen's fundoplication are troubled by side effects including dyspepsia, bloating, and inability to belch. Besides, the procedure needs a learning curve and also the duration of surgery is more with longer hospital stay and associated financial burden. Due to these problems, anterior and posterior partial fundoplication techniques were developed. [6,7,8]. Randomized trials have shown that partial fundoplication techniques were related to reduced incidence of adverse effects and with good reflux control at short term as well as long term follow-up. [9-14]. Results from a randomized trial shows that, acid, weakly acidic, liquid and mixed reflux episodes are more common after anterior 180° fundoplication than after Nissen fundoplication. On the contrary, gas reflux and gastric belching and patient satisfaction are similar for both procedures. Mean lower esophageal sphincter (LES) resting and relaxation nadir pressure are lower after anterior fundoplication. Overall, these findings suggest less effective reflux control after anterior 180° partial fundoplication, offset by less dysphagia, leading to a clinical outcome that is equivalent to Nissen fundoplication at late follow-up [15]. Systematic meta-analysis of randomized trials has shown that laparoscopic Nissen's fundoplication and 180° laparoscopic anterior fundoplication are equally effective in controlling reflux symptoms and obtain a comparable prevalence of patient satisfaction. 180° laparoscopic anterior fundoplication can reduce the incidence of postoperative dysphagia while this is offset by a higher risk of reoperation for recurrent symptoms. The risk of recurrent symptoms should need to be balanced against the risk of dysphagia when surgeons choose surgical procedures for each individual with GERD [16]. More studies have shown that at 1 and 5 years post-surgery, dysphagia and gas-related symptoms are lower after 180° laparoscopic anterior fundoplication than after laparoscopic Nissen's fundoplication, and esophageal acid exposure and esophagitis are similar, with no differences in heartburn scores, patient satisfaction, dilatations, and reoperation rate.

These results lend level 1a support for the use of 180° laparoscopic anterior fundoplication for the surgical treatment of gastroesophageal reflux disease [17]. In the present study, we determined the outcome for a bigger group of patients who had undergone laparoscopic fundoplication and followed them short-term additionally as a long-term basis within the selected subset of patients.

Methods

A prospectively evaluated case series was in patients who underwent surgery between January 1, 2013, to March 31, 2021; primarily at Seven Hills Hospital, Vizag, India. Since commencing laparoscopic anterior reflux surgery in 2013, all of our patients undergoing the procedure have been followed up prospectively and the clinical data have been stored in a database that was accustomed to identifying patients who had undergone a laparoscopic anterior 180° partial fundoplication.

The operative technique for laparoscopic anterior 180° fundoplication has been described well previously. It entails laparoscopic hiatal dissection, posterior hiatal repair, separation of the esophagus from phrenoesophageal ligament, and lengthening the abdominal esophagus by mobilization of esophagus and suturing of anterior wall of gastric fundus and also the right lateral wall of the distal esophagus to the correct hiatal pillar and the apex of esophageal hiatus, to stabilize a length of the intra-abdominal esophagus and to cover the anterior aspect of the intra-abdominal esophagus with gastric fundus.

During the study, all patients who underwent a primary anti-reflux procedure were treated with a laparoscopic approach to fundoplication, regardless of any perceived difficulties at preoperative assessment like obesity, large hiatal hernia, previous upper abdominal surgery, Barret's esophagus. Esophageal manometry was performed before surgery in all patients. Over 90% of patients underwent surgery due to troublesome reflux symptoms that weren't adequately controlled with standard acid medication.

Pre-operative and post-operative outcome data for every patient were collected prospectively and stored in a computerized database. Post-operative clinical follow-up information was obtained employing a standardized questionnaire, administered at 3 months, then yearly after surgery.

The questionnaire was initially mailed to each patient; if not returned, the patient was located and data collected by telephone interview. A concentrated effort was made to secure follow-up information for each patient who had undergone surgery to attain complete follow-up.

The presence or absence of heartburn, dyspepsia was assessed using a 0-10 visual analogue scale (0 indicates no symptoms, 10 indicates severe symptoms). Overall satisfaction with the outcome of the procedure was also determined employing a 1-10 visual analogue scale. (0 indicates unsatisfied, 10 indicates satisfied). The presence or absence of bloating and belching ability to alleviate abdominal distension by belching and eating a normal diet was determined with a yes/no questionnaire. Patient's opinion of whether they thought that they had made the right decision to undergo surgery was also sought.

Details about adverse outcomes, including postoperative complications, hospital readmissions, surgical revision were also recorded. Postoperative esophageal manometry, 24 hours ambulatory pH monitoring, endoscopy performed only in symptomatic patients. For this reason, these data weren't formally analyzed in this report. They were however taken into consideration when determining whether patients had developed recurrent reflux during follow-up.

Outcome data were analyzed to see the short-term and long-term clinical efficacy of the anterior 180° partial fundoplication procedure and also the incidence of adverse outcomes and overall satisfaction with surgical outcome. From January 1, 2013 to March 31, 2021, 228 laparoscopic anterior 180° partial fundoplication procedures were performed by us. These patients constituted the study group.

The present study was approved by the Institutional Ethics Committee, SevenHills Hospital Vizag, India.

Result

Table 1: Age and Gender Distribution

GENDER	No. of patients (percentage)
Male	128 (65%)
Female	68 (35%)
AGE (In years)	
10-19	6 (3%)
20-29	51 (26%)
30-39	66 (34%)

40-49	40 (20.5%)
50-59	19 (10%)
60-69	11 (6%)
70-79	1 (0.5%)

In this study out of 196 patients, 128 were male and 68 were female. (Table 1) Whose age groups ranged between 10-19 years in 6 patients, 20-29 years in 51 patients. 66 patients were of the age group 30-39 years, 40 patients were between the age group 40-49 years and 31 patients were greater than 60 years.

Table 2a: Symptoms Before Surgery

Symptoms	No. of patients (percentage)
Dyspepsia	194 (99%)
Vomiting	57 (29%)
Pain	14 (71%)
Regurgitation	33 (17%)
Cough	3 (1.5%)

99% had dyspepsia (194 patients), 57 patients (29%) had vomiting before surgery. 33 patients were suffering from regurgitation. Before surgery, 14 and 3 patients were suffering from pain and cough respectively. (Table 2a)

Table 2b: Endoscopy Findings Before Surgery

Endoscopy Findings	No. of patients (percentage)
Lax LES	193 (98%)
Esophagitis	16 (82%)
Gastric erosions	20 (10%)
Hiatus hernia	124 (63%)

Table 2b shows endoscopy findings, where 98% of patients (193 patients) with lax LES, 16 patients with esophagitis, 20 with gastric erosions and about 63% of patients had hiatus hernia (124 patients).

Table 3: Conversion to open procedure

Conversion to open procedure	No. of patients
Large paraesophageal hernia	1
Dense upper abdominal adhesions	2
Enlarged fatty liver	1
Esophageal perforation during esophageal dissection	1
Total	5 (2%)

Of the 228 study group patients, 223 were done laparoscopically and 5 converted to an open procedure. The reasons for the conversion were the inability to reduce a large paraesophageal hernia 1, dense upper abdominal adhesions 2, enlarged fatty liver 1, esophageal perforation during esophageal dissection in 1 patient (Table 3). 27 patients were excluded from the study due to associated achalasia cardia. (Figure 1)

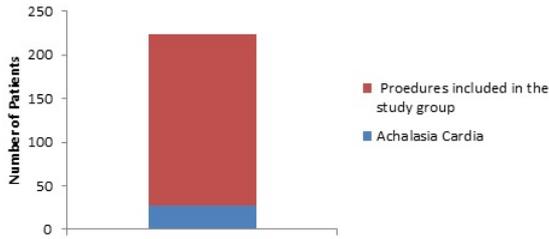


Figure 1: Surgery performed in patients with Achalasia Cardia

Since undergoing the anterior fundoplication 2 patients died during the follow-up and 1 patient died during the post-operative recovery. During follow-up, causes of death in 2 patients were due to Cardiovascular accident and Myocardial infarction. A further surgical procedure was done in 1 patient due to dyspepsia.

The esophageal hiatus was widened by removing 1 hiatal repair suture. Besides, early post-operative dyspepsia sufficient to require endoscopic dilation occurred in 1 patient. The patient needed several dilations before adequate swallowing was achieved.

Outcome and selected subgroup long-term outcome (≥5 years) were done. Follow-up data were not available for patients who could not be located at the time of the present study. Clinical outcome data at ≥5 years were available for 85 patients.

This group excludes 3 patients who died, 5 who were converted to open procedure, and 110 patients who were unavailable for follow-up (<5 years of follow-up). Gastroesophageal reflux disease symptoms were well controlled in 186 patients at follow-up and in 80 patients at long-term follow-up in the selected sub-group.

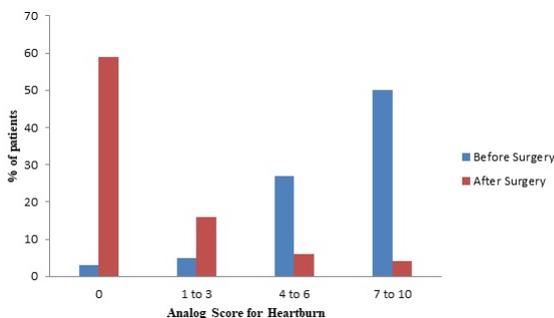
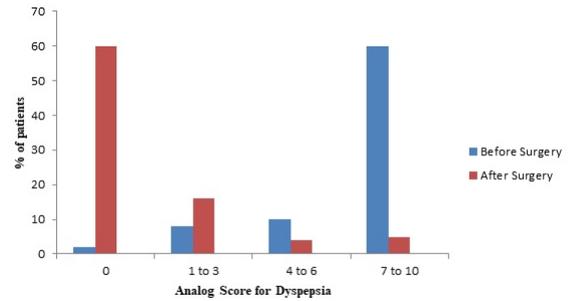


Figure 2: Analog score for heartburn before surgery and late follow-up (5 years)

Figure 3: Analog score for dyspepsia before surgery and late follow-up (5 years)



When they reported heartburn using the analogue scale, 59 patients had a postoperative score of 0 (no heartburn); 16 had a score of 1, 2, or 3 (occasional minor episodes of heartburn); 6 reported a score of 4 to 6 (moderate heartburn symptoms); and 4 gave a score of 7 or higher (significant troublesome heartburn). Most patients reported a moderate-to-severe heartburn score before surgery.

Figure 2 compares the symptom of heartburn before surgery with that at late follow-up. All of these patients reported symptoms of heartburn. At late postoperative follow-up, patients were less likely to describe dyspepsia compared with preoperative scores (Figure 3). Overall, fewer patients reported dyspepsia after surgery than had before surgery. The overall data demonstrated a reduction in dyspepsia after surgery.

At follow-up 194 belch normally. Occasional epigastric bloating after eating was reported by 68 and all of them were able to relieve this by belching. Some food types were avoided by 11 patients either by food intolerance/ dyspepsia. 95% of patients reported that they believed their original decision to undergo surgery was correct.

Table 4: Visick score

Grade	Remark	No. of Patients
I (No symptoms)	Resolved	186 (95%)
II (Mild occasional symptoms easily controlled)	Improved	10 (4.5%)
III (Mild symptoms not controlled)	Unchanged	1 (0.5%)
IV (Not improved)	Worsened	0

The visick grading system was used to analyze the severity of reflux symptoms. Overall, 184 patients judged their overall results as being “resolved” (Visick I; 94%) and 10 patients judged their overall results as “improved” (Visick II; 5.5%). 1 patient scored the results as “unchanged” (Visick III; 0.5%) as shown in Table 4.

Discussion

Since Nissen's [18] original description, the 360° total fundoplication has been the most common surgical procedure used for the treatment of gastroesophageal reflux. Although initially performed using an open abdominal or thoracic surgical approach, most of Nissen's fundoplications are now performed laparoscopically. Previous reports of outcome including long-term outcome following open Nissen fundoplication have confirmed a success rate of approximately 90% at 5-10 years after surgery. [1,13]. Most recently, longer outcomes following laparoscopic Nissen fundoplication have also been reported. [4,19,20]. It is now widely accepted that the Nissen fundoplication achieves an effective barrier to reflux in most patients at medium to long-term follow-up. Unfortunately, however, the new anti-reflux barrier is more effective than a lower esophageal sphincter in normal patients, which means that some patients will be troubled by adverse effects following surgery, such as persistent dyspepsia, flatulence, gas bloat, and inability to belch. [14,21]. In some of these patients, adverse effects are sufficiently troublesome to interfere with the quality of life, which can result in a poor overall outcome despite the fundoplication having provided effective control of the reflux symptoms. For this reason, anterior and posterior partial fundoplication variants have been developed to reduce the incidence of adverse effects while still achieving effective control of gastroesophageal reflux symptoms. In so many prior studies, it is recognized that anterior fundoplication can achieve effective reflux control but with fewer adverse effects than either Nissen/post partial fundoplication. Early and late clinical data in previous studies is promising with significantly reduced incidence of both dyspepsia and gas-related adverse effects compared to Nissen's fundoplication. The present study was undertaken to determine the short-term and long-term efficacy of anterior fundoplication and see whether lesser complications including dyspepsia and gas bloating are seen in these patients on follow-up. Further, the easy reproducibility, lesser duration of surgery, and early return to home are also studied. Our results show that anterior 180° partial fundoplication is an effective procedure. Reflux remained well controlled in approximately 95% of patients at late follow-up, with less than 5% reporting an analogue heartburn score of 7 or greater.

5 % of patients were receiving anti-secretory medication at late follow-up in our study, although this is similar to that reported in most other late follow-up studies after Nissen's fundoplication. [3,22]. Surprisingly, not all patients with recurrent reflux at late follow-up were unhappy with their outcome. Patients who have poorly controlled, troublesome reflux symptoms before surgery, despite using proton pump inhibitors have resolved symptoms of the majority (93%). The symptoms of some of the patients who have developed recurrent reflux after surgery, however, were fully controlled by acid-suppressing medication, whereas these medications had been ineffective before surgery. [23]. Hence this subgroup of patients with recurrent reflux regarded themselves as having benefited from surgery. Many of these patients rated the overall clinical outcome highly, which probably explains why 95% of patients were highly satisfied with the outcome of surgery; eventually, full reflux by the operation alone was achieved in only 80%. Overall, it is reasonable to conclude that anterior 180° partial fundoplication achieved a satisfactory rate of overall success at 5-11 years follow-up. In general, other clinical outcomes investigated in the present study improved after surgery. Dyspepsia was uncommon at follow-up.

Most patients unable to belch effectively Epigastric bloating was much less after surgery and most patients could eat a normal diet. We observed younger patients (<20 years) presented more commonly with vomiting. Vomiting resolves in all our patients after surgery. (4 patients). Dyspepsia, epigastric pain resolves in the majority of patients. The majority of patients do not have any severe complications. 5 patients developed an epigastric infection, 3 of which needed a biopsy of the port site, which came out to be Tuberculosis. The wound healed with anti-tubercular treatment (ATT). These findings confirm that anterior 180° partial fundoplications are associated with a low rate of adverse effects after surgery. Compared to a high rate of satisfaction and symptom relief. One more observation is the duration of operation theatre (OT) time and hospital stay. OT duration was approximately 60 minutes and hospital stay 3-4 days. This does not only culminate in a better quality of life but also makes it economically more suitable to most patients. When evaluating the outcome of surgery for gastroesophageal reflux, it is important to consider the completeness of clinical follow-up.

In the era of open anti-reflux surgery, most follow-up studies failed to determine the outcome for more than 20% of their patients. [1,13,24]. In general, case series of patients undergoing laparoscopic anti-reflux surgery have similar rates of follow-up. [4,20]. The exceptions are the 99% follow-up rate in our previously reported 5 to 8-year follow-up after laparoscopic Nissen fundoplication, [3]. and the 100% and 98% 5-year follow-up rates in 2 of our randomized trials. [9,14].

Analysis of data from one of those randomized trials demonstrated that clinical outcomes may appear to be better than they are if complete or near-complete follow-up is not obtained. [25]. However, the results reported herein should be interpreted with some caution. It is not appropriate to directly compare these results with outcomes for Nissen fundoplication reported elsewhere because some selection bias was involved with these patients that were not in the randomized trials. Nevertheless, the outcomes are at least consistent with the outcome at 5 years in the previously reported randomized controlled trial of anterior 180° partial fundoplication vs Nissen fundoplication. [9].

Therefore, the larger patient cohort and longer follow-up in the present study support the contention that laparoscopic anterior 180° partial fundoplication is an appropriate procedure for patients with gastroesophageal reflux. Our study might also be criticized for not reporting objective outcome data. Patients were not systematically reevaluated with esophageal manometry, pH monitoring, or endoscopy at late follow-up, and we have therefore limited our report to clinical outcomes. Ultimately, however, the measure of success after a surgical procedure is determined by the patient's view of the outcome rather than by the results of various investigations.

Conclusion

We conclude, therefore, that laparoscopic anterior 180° partial fundoplication is an appropriate procedure for patients undergoing surgery for gastroesophageal reflux. It has significant reflux-related symptom relief, uncommon post-surgery complications like dyspepsia, inability to belch compared to standard Nissen's fundoplication. This procedure is economical due to less duration of surgery and the duration of hospital stay. Since surgery reproducibility is simpler than Nissen's, it can be done in a smaller setup.

What does this study add to present knowledge?

The laparoscopic anterior 180° partial fundoplication is an appropriate procedure for patients undergoing surgery for gastroesophageal reflux. Patients offered this procedure should be informed that the procedure is associated with a higher risk of recurrent reflux at late follow-up after surgery than in Nissen's fundoplication. However, they should also be made aware that the risk is offset by a lower risk of adverse effects and lesser cost and for this reason the overall satisfaction with the procedure at late follow-up is high.

Author contribution

Das Biswabasu: conceptual framework, data collection. **Sahu Sandeep, Y Radhakrishna, Das Bibhabasu:** a review of literature, methodology review. **Das Biswabasu:** manuscript writing and editing.

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