Laparoscopic Nissen fundoplication with mesh-hiatoplasty: Single center experience and early-term results

Abstract

Purpose: In this study we report early-term results of laparoscopic Nissen fundoplication with mesh hiatoplasty that we perform to treat gastroesophageal reflux disease.

Methods: We retrospectively reviewed the medical records of 68 patients who underwent laparoscopic Nissen fundoplication with mesh hiatoplasty at our clinic. Thirty-six (53%) patients were male and 32 (47%) were female. The mean age of the study population was 46.1 (25-72) years. All patients underwent esophagitis in the preoperative endoscopic examination. The mean operative time was 80 (40-125) minutes, the median duration of hospital stay was 1.2 (1-4) days and the median follow-up time was 12 (2-30) months. Functional outcome was excellent in 65% of patients, good in 24.5%, moderately good in 7% and poor in 3.5%.

Conclusion: Fundoplication with mesh hiatoplasty is a surgical procedure performed for the treatment of gastroesophageal reflux disease and hiatal hernia. Surgery can be safely carried out with low morbidity and mortality rates and constitutes an alternative to long-term drug therapy. We believe that this operation is beneficial since it reduces the rate of recurrences to a significant degree.
Gastroesophageal reflux disease (GERD) is an illness that causes irritation and injury of esophageal mucosa due to the regurgitation of stomach contents into esophagus. In 1956, Nissen described a 360 degrees fundoplication technique for the treatment of GERD. It has become the most widely accepted technique worldwide, although various different fundoplication techniques have been described since the original publication. With the advent of laparoscopic techniques, the morbidity, mortality and recurrence rates have significantly decreased [1]. The use of mesh has also become common during surgery. Postoperative outcomes of most patients treated with laparoscopic antireflux surgery are excellent [2]. This study reviews the outcomes of laparoscopic Nissen fundoplication with mesh hiatalplasty.

Materials and Methods

This study retrospectively reviewed the specially prepared forms containing the medical information of 68 patients who were operated with laparoscopic Nissen fundoplication (LNF) with mesh hiatalplasty at our clinic between January 2011 and November 2015. All patients were examined by the Gastroenterology Department with endoscopy, esophagus pH metry and manometry. Patients with Barret esophagus were not operated on and were excluded from the study. All operations were performed under general anesthesia using five ports. The surgeon stood between patient’s legs, the primary assisting physician holding liver retractor and camera to the left of patient, and the secondary assisting physician to the right of the surgeon.

Techniques

Pneumoperitoneum is created by inserting a Veress needle above the umbilicus and connecting it to a CO₂ insufflator. An intra-abdominal pressure of 12–14 mmHg is achieved and maintained. The patient is placed in a reverse Trendelenburg position (45°) before intraabdominal manipulation. Five trocars are inserted into the peritoneal cavity at the usual sites: the epigastrium, the right subcostal area, the left subcostal area, above the umbilicus on the middle abdominal line, and at 4–5 cm lateral to the midline in the left upper quadrant. The short gastric vessels and gastroludiphagmatic ligament are divided to release the gastric fundus. On the side of the small gastric curve, the hepatogastric ligament is cut, and via blunt dissection the right diaphragmatic crus is exposed, followed by the left one. The esophagus is mobilized from the medial margins of the left and right crura. A device (Goldfinger; Obtech Medical, Zug, Switzerland) is inserted through the epigastric port, and the tip is passed between the medial margin of the right crus and the right lateral margin of the esophagus. As the device is passed posteriorly around the esophagus, the instrument’s curvature is gradually increased to provide retraction. The vagal nerves should be included within the curve of the device called a Goldfinger (name of a special instrument and technique). This retraction, followed by dissection, provides a wide posterior window behind the esophagus. Above the crura, the first 3–4 cm of the mediastinal esophagus is mobilized so that this portion can pass into the abdomen without tension. The crura are then sutured to each other with 2–3 nonabsorbable sutures behind the esophagus, with the Goldfinger remaining in position to provide retraction (Figure 1a,b,c). In addition to this suture repair of the hiatus, mesh reinforcement is performed. All patients were placed an U-shaped polypropylene mesh in addition to the cruroplasty procedure. A 5×5-cm patch of polypropylene mesh (Prolene; Ethicon, Johnson & Johnson, Somerville, NJ, USA) is cut into a U-shaped piece, measuring approximately 4 cm horizontally across the middle, tapering to 3 cm at the apex, with the arms of the U each measuring approximately 1 cm across. This is introduced through one of the 10-mm ports (Figure 1d). The mesh is placed to cover the crura, with the open end of the U pointing anteriorly (Figure 1c). Special attention is paid to avoid any contact between the mesh and the esophagus. The mesh is secured to the crura with the use of 6–8 titanium staples placed via a 5 mm tacker (Figure 1f, g).

FIGURE 1. Procedure for hiatal closure, and mesh reinforcement. a, b, c Crural closure with intracorporeally knotted nonabsorbable sutures d, e, f, g View of mesh hiatalplasty with polypropylene h Passage of the fundus behind the esophagus i Formation of the 360° Nissen antireflux wrap and completed Nissen fundoplication with nonabsorbable sutures 1 cm apart.
After hiatal closure, a single nonabsorbable Ethibond 2-0 suture (Ethicon, Johnson & Johnson) is passed through the external layer of the fundus and is knotted at approximately 1.5 cm away from the fundal wall so as to create a closed loop. The loop is snugged into the notch on the tip of the Goldfinger device. The device is then gently retracted so as to pull the fundus behind the esophagus (Figure 1h). A short, 2–3- cm loose fundic wrap is created around the esophagus, and the operation is completed with the formation of a 360° Nissen antireflux Wrap (Figure 1i).

All patients underwent loose Nissen fundoplication. All patients started to receive watery food orally on the first postoperative day. Patients without complication were discharged on the first postoperative day and were invited for follow-up examination on 7th day, at the 1st month and at the 6th month. They were instructed to take soft food for 2 months. They were also called via telephone and questioned about their complaints (dysphagia, gas-bloating syndrome, diarrhea, etc.). Functional outcomes were considered “excellent” when a patient was asymptomatic and did not need any medication; “good” when a patient had symptoms not severe enough to require medications; “moderately good” when a patient’s symptoms could be controlled with medication; and “poor” when a patient’s symptoms were not eliminated by the operation. This study was approved by the Clinical Research Ethics Committee of our university.

Results

Thirty-six (53%) patients were male and 32 (47%) were female. Their mean age was 46.1 (25-72) years. All patients had burning sensation in chest and regurgitation of gastric content up into mouth. The mean age from the onset of the symptoms to operation was 28 (6-84) months. 21 (31%) patients were operated for gastroesophageal reflux disease in addition to re\(\text{lux} + \text{hiatal hernia}\) and 47 (69%) had reflux alone (Table 1). All patients had esophagitis at the preoperative endoscopic examination. All patients underwent a 360-degree loose Nissen fundoplication procedure. A switch to open surgery was not required in any patient. No perioperative or postoperative mortality occurred. The mean operative time was 80 minutes. The median duration of hospital stay was 1.2 (1-4) days. Fifty-seven (83%) patients attended all follow-up appointments; the median follow-up duration was 12 (2-30) months. Two foreign patients were lost to follow-up after second postoperative month. Thirteen (19%) patients developed dysphagia, all of which were temporary and improved with symptomatic therapy. None of the patients developed severe and permanent dysphagia. Four patients developed diarrhea and seven patients suffered gas-bloating syndrome (due to blocked normal vomiting and burping reflexes). Two patients with diarrhea were also under follow-up for inflammatory bowel disease suspected. The symptoms of the patients with gas-bloating syndrome could generally be controlled by medical therapy. Among 57 patients with complete follow-up data, 37 (65%) had an “excellent” functional outcome, 14 (24.5%) had “good” functional outcome, 4 (7%) had “moderately good” functional outcome, 2 (3.5%) had “poor” functional outcome. One patient developed lymphoplasmocytic sclerosing pancreatitis (LPSP) accompanied by fibrosis 6 months after the operation. That patient was started on prednisone 0.5-0.9 mg/kg/day, which was was reduced to 5 mg/week one month later, and he had a 6-month complication-free follow-up thereafter.

Table 1. The preoperative and postoperative analyses of the patients

<table>
<thead>
<tr>
<th>Indications for surgery</th>
<th>n (%)</th>
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<tbody>
<tr>
<td>GERD</td>
<td>47 (69%)</td>
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<tr>
<td>GERD + Hiatal hernia</td>
<td>21 (31%)</td>
</tr>
<tr>
<td>Operation time (minute)</td>
<td>80 (40-125)</td>
</tr>
<tr>
<td>Length of hospitalization (day)</td>
<td>1.2 (1-4)</td>
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</table>

Discussion

Gastroesophageal reflux disease is a chronic disorder that usually requires long-term medical therapy and worsens patients’ quality of life. Its medical treatment consists of proton pump inhibitors (PPI), H\(\text{2}\) receptor blockers, antacids and prokinetic agents [3]. Lifelong medical therapy both complicates treatment compliance and increases cost. An alternative treatment alternative is antireflux surgery [4]. Laparoscopic antireflux surgery completely abolishes symptoms and reduces the need for medical therapy in a majority of patients [5]. There was endoscopically detected hiatal hernia in addition to reflux symptoms in 31% of our patients.
Although antireflux surgery is successful for controlling both esophageal and extraesophageal symptoms in GERD, some patients may develop some additional symptoms in the postoperative period. These include bloating, retrosternal burning sensation, regurgitation, incontinence to burp and diarrhea [6]. Excluding surgical complications and failed surgical interventions, antireflux surgery is more cost-effective compared with medical therapy in GERD management. Nissen fundoplication is considered to be the gold standard for the surgical management of gastroesophageal reflux disease [7].

In very large case series and long term follow-up, the outcomes of LNF are satisfactory. In a 1340-case series, satisfactory outcomes were achieved over a period of 5 years in 1248 (93.1%) patients [8]. Also in our study, 51 (89%) patients achieved satisfactory results at early period; however, we lack long-term results.

Dallemagne et al. published their results in laparoscopic reflux surgery and found surgery superior to medical therapy in respect to quality of life and symptom burden at long term. Difficulty swallowing is the most common complaint in first week after LNF [9]. Although this usually resolves spontaneously, endoscopic dilatation is required in patients who had persistent difficulty swallowing over the long term. This condition is rare, however. In a 50 case series, three (6%) patients were operated with repeat laparoscopic surgery for difficulty swallowing [10]. In our series 13 (19%) patients developed difficulty swallowing but their symptoms abated without any surgical or endoscopic treatment.

It is still being debated whether hiatus should be closed, or when it is to be closed, whether a graft should be used. Herniation can occur in more than 7% of patients in whom hiatus is not closed. Closing hiatus routinely can reduce this complication by upto 80% [11]. Closing large hiatuses with grafts has been reported to prevent recurrences [12,13]; however, complications such as migration into lumen can be experienced with graft use [14]. Routine graft use is recommended particularly for patients who are re-operated for repeat fundoplication [15]. We routinely used mesh cruroplasty to minimize recurrence risk, and we observed no mesh-related complication in any patient except for one patient in a short follow-up period. Only one patient developed chronic pancreatitis secondary to LPSP accompanied by fibrosis at 6th month postoperatively. That patient was diagnosed with laparoscopic biopsy and developed no further complications for the next 6 months.

The indication of mesh use in hiatal hernia operation is put entirely by subjective criteria. Surgical expertise plays an important role in this decision. Cruroplasty alone is insufficient for large hernias. Soricelli et al. reported a recurrent case in the form of intrathoracic migration after fundoplication [16]. Mesh repair constitutes the common indication for many surgeons in paraesophageal hernias. Some surgeons use mesh in all cases [17]. Others, however, use mesh in patients with intrathoracic gastric location and recurrences [18,19]. Many surgeons approximate cruses with sutures and lay mesh on cruses [17,20]. They advocate that by doing so mesh would be in less contact with esophagus. We also placed mesh on cruroplasty.

Meshes have variable dimensions and shapes. Meshes with a shape of A, U, O, or H can be formed from a small, triangle-shaped mesh [19]. We preferred a U-shaped mesh. The choice of mesh material is another controversial subject: PP (polypropylene); PTFE (polytetrafluoroethylene); composite meshes; and, recently, biological meshes have all been used [21]. Biological meshes have been developed against organ resection and loss that occurs secondary to mesh erosion [22]. It has been stressed that mesh problems that have been reported to occur at a low rate do not constitute any major contraindication for mesh use [13]. Mesh fixation can be accomplished with various different materials including sutures, metal fixators and glues [23]. We used endotacker for mesh fixation after cruroplasty.

Literature studies have reported that complications occur rarely after mesh fixation [24]. Some studies have reported that the rate of dysphagia was in excess of 13% after mesh application [25]. In our U-shape technique, the anterior part of the esophageal orifice is left open to prevent stricture or dysphagia. Soricelli et al. reported that the recurrence rate dropped from 1.8% with the tension-free technique to 1.1% with the use of cruroplasty and mesh placement [16]. The need for medications was eliminated in 90% of our patients. We are of the opinion that with increasing number of patients and experience, operative time, duration of hospital stay and complication rates will drop to far lower figures than the current ones.

Conclusion

Mesh application in addition to Nissen fundoplication significantly reduces recurrences in laparoscopic antireflux surgery. No consensus has been reached for indications, mesh shape, material and fixation in routine practice. Our current knowledge suggests that complications of this procedure are negligible. Although no short-term complications occur with mesh hiatalplasty, long-term outcomes will more clearly determine the success of this procedure.
References


