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Laparoscopic Nissen Fundoplication Outcomes in Children with Gastroesophageal Reflux Disease and Hiatus Hernia: Retrospective Trial

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ABSTRACT

Background

Diagnosis and treatment of infant gastroesophageal reflux (GER) can be accomplished in a number of ways. Although the long-term effects on high-risk infants are unknown, laparoscopic surgery has led to an increase in the number of children needing antireflux surgery. This study aims to assess the outcome of laparoscopic nissen fundoplication in children younger than 18 years old.

Methods

Retrospective study of infants younger than 18 years' old who underwent laparoscopic Nissen fundoplication (Lap-NF) between 2020 and 2023 had their outcomes tracked until 2024.

Results

There were 44 cases, with a mean weight of 12.9 kg±3.5 and a median age of 3.32 year±1.9. An improved respiratory status following nasoduodenal feeding tube insertion was a typical rationale for surgical consultation.There were minimum postoperative problems. Median times for feeds were 1.61±0.72 days and for reaching the objective were 3.93±1.8 days. Hospital stay range from 3 : 7 days . During the postoperative phase, Three patient required readmission due to recurrence.

Conclusion

In children younger than 18 years old, Nissen fundoplication is a successful treatment for GER symptoms and hiatus hernia (HH). In this population, the procedure has a low rate of complications.

Keywords: *laparoscopy, fundoplication, gastroesophageal reflux, hiatal hernia*

INTRODUCTION

Infants frequently experience gastroesophageal reflux (GER), the diagnosis of gastroesophageal reflux disease (GERD) in infants can be subjective and difficult to make. GERD is diagnosed when symptoms of GER become chronic and detrimental to the child's health. It can be difficult to tell if GER is contributing to the infant's underlying health problems when they already have many issues. GER symptoms may potentially be made worse by the underlying medical disorders or by the medications used to treat them. Surgery for GERD varies widely between hospitals [1].

Some children's hospitals employ nasal or gastroduodenal feeding tubes to treat newborns with feeding difficulties or GERD, however these tubes are difficult to maintain and have a high perforation rate (3%). 8.3% of children with neurological impairment who were fed with gastrojejunal feeding tubes in a retrospective study required surgery to correct the problem . Increased surgical intervention for GERD may occur as a result of the perceived lower morbidity of laparoscopic fundoplication [1].

Surgery is suggested as a viable option for treating GERD because it provides a mechanical remedy for the condition. In 1956, surgical therapy was pioneered by Rudolph Nissen, and by 1991, using a minimally invasive approach, the surgery had been refined by Dallemagne to be both safe and effective. Laparoscopic Nissen fundoplication has largely supplanted its open predecessor as the anti-reflux operation of choice. In cases of moderate to severe gastro-esophageal reflux disease, laparoscopic Nissen fundoplication is currently the standard surgical treatment [1].

The fundoplication procedure, used to treat GERD symptoms surgically, entails wrapping the gastric fundus around the lower end of the oesophagus. Recent advances in laparoscopic methods have allowed for improved GERD management with fewer postoperative complications and quicker recoveries. If these changes are implemented, more patients may be referred for this surgery. Positioning the fundoplication above the gastroesophageal junction is necessary for successful outcomes. If the fundoplication is not placed too low or too high, slipping fundoplication are less likely to occur [2].

Hiatal hernia (HH) is common in those who also suffer from GERD, and HH contributes to the progression of GERD by weakening the anti-reflux barrier. There is substantial evidence linking more severe HH to more severe reflux symptoms, and esophagitis. Patients with GERD who have HH greater than 2 cm typically have laparoscopic HH repair, and then, if necessary, anti-reflux surgery. By delaying acid drainage from the oesophagus, HH exacerbate GER and esophagitis.Many children suffer from GER, which is linked to HH in some cases. Very few research had looked at the link between GER and HH in children and young adults. However, it is not known if the existence of HH is a predictor of therapeutic failure. It was emphasized in 1984 that the prognosis of GER in children with HH varies from that of those without HH. However, other studies disregarded the importance of HH in children with GER disease [3].

Thus this study aimed to assess the outcome of laparoscopic fundoplication following hospital release were assessed in a sample of infants less than 18 years with medical complexity.

METHODOLOGY AND PATIENTS

Study design and data collection

Multi-center retrospective study included children (younger than 18 years old) who had been diagnosed with GERD and HH and admitted to Pediatric surgical units at Minia University Hospital & Asyut University Hospital during the period from April 2020 and April 2023.

Data collection: the collected data included:

-Patient demographics: Age, sex and weight

-Medical history, preoperative diagnostics, The surgical team’s indication for surgery was recorded,Presentations of GERD in the studied cases, associated comorbiditie.

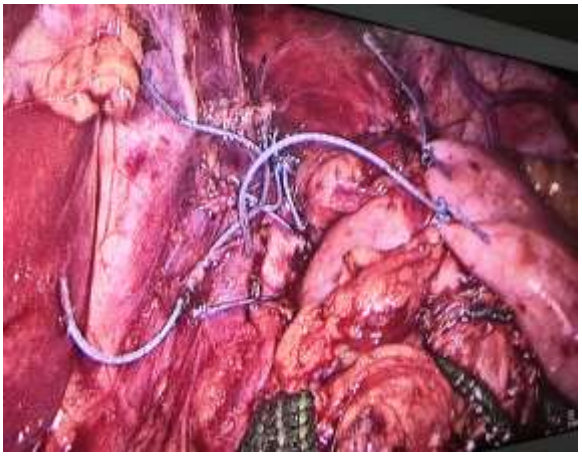
Operative techniques

Standard clinical evaluations and investigations were performed, such as a contrast study and upper endoscopy. Patients were told to be fasting for 6 hours except water and clear fluids for at least 2hours before surgery.

A standard procedure was followed for the surgery, under general anesthesia, patients were placed in the frog-leg position for younger children and the lithotomy position for older children. The table was arranged in a Trendelenburg posture that was backwards. Using the Hasson's approach, a 5-mm, 30-degree- angled telescope optical trocar was introduced into the umbilicus. Under direct observation, two functional ports were implanted, one on each side of the Mid clavicular line in the hypochondrial region.

The stomach was then tracted by inserting a 5-mm grasper below the left costal border.

Finally, a grasper introduced in the epigastrium retracted the majority of the liver, revealing the hiatus. After inflating the peritoneum with carbon dioxide (8-12 cm H2O), the posterior gastrophrenic attachments that hold the fundus to the diaphragm were divided and dissected on the left side. The short gastric vessels were divided with a 5-mm hook cautery or a Harmonic scalpe. In order to access the right crus, we dissected the phreno-esophageal ligament. The hiatus was exposed by dissection posterior to the oesophagus and looping it to create a window in the back of the oesophagus. Nonabsorbable 2/0 sutures were used to close the gap between the crura. After that, the mobilized fundus was transferred through the window created posterior to the esophagus and placed on the right side. To achieve a loose, floppy, and symmetric fundoplication, the "shoeshine" maneuver was used to wrap the fundoplication around the oesophagus. The fundus was then brought around the oesophagus using a simple interrupted 2/0 suture. One centimetre above the first stitch, a second suture was applied to include the wrap to the oesophagus and crura. Sometimes a third suture would be inserted below the first two.



Picture of intraoperative fundoplication

Assessment of outcome:
All patients were followed for a year after surgery.
Details of post-operative course was recorded, including length of stay, tube feeding, complications, re-admission and failure of technique.

Ethical approval: The study followed common ethical principles for scientific research. Research proposal was approved by IRB committee of the Faculty of Medicine. Approval number . All information gained from study was to be treated as confidential and private

Statistical analysis
Statistical Procedures for the Social Sciences (SPSS) Version 25 was used for the analysis. Data of both quantitative and qualitative nature were summarized using statistical methods, the mean, standard deviation and were evaluated.

RESULTS

44 patients attempted Nissen fundoplication during the course of the study period. Male patients were (19)43.18%, while (25) 56.82% were female. Patients had a mean age of 3.32±1.9 years, and body weight 12.9±3.5 kg .

30 (68.1%) individuals had GI symptoms, 14 (31.8%) had extra-GI symptoms and 5 . 31 (70.5%) cases diagnosed with GERD only, 8 (18.2%) diagnosed with GERD with hiatal hernia, 1 (2.3%) diagnosed with GERD with antral web, and 4 (9.1%) diagnosed with GERD with intestinal malrotation. Comorbidities found were 5 (11.4%) developmental delay, 6 (13.6%) hydrocephalus, 4 (9.2%) chest problems, and 8 (18.2%) neuromuscular disease.

Table 1: Presentations of GERD in the studied cases

Symptoms n (%)	
GI symptoms	30 (68.1%)
Extra-GI symptoms	14 (31.8%)
Diagnosis n (%)	
GERD only	31 (70.5%)
GERD with hiatal hernia	8 (18.2%)
GERD with antral web	1 (2.3%)
GERD with intestinal malrotation	4 (9.1%)
Comorbidities n (%)	
Developmental delay	5 (11.4%)
Hydrocephalus	6 (13.6%)
Chest problems	4 (9.2%)
Neuromuscular disease	8 (18.2%)

Table 2: Preoperative symptoms

Symptoms	
Dysphagia	5 (12.9%)
Gagging	8 (20.6%)
Regurgitation	7 (15.9%)
Feeding difficulties	14 (31.8%)
Failure to thrive	5 (11.3%)

Depending on how the children were doing, feedings were started on day one after surgery (mean 1.61±0.72 days). It took 3.93±1.8 days, on average, to reach target feedings. Hospital stay ranged from 3 : 7 days .

The length of time needed to reach goal feeds and be discharged from the hospital following surgery also varied by underlying medical condition .

Table 3 Postoperative results

Post operative feeding	
Days to start	1.61±0.72
Days to reach goal	3.93±1.8
Complications	
Pneumothorax	2 (4.5%)
Gas-bloat syndrome	5 (11.3%)
Dysphagia	3 (6.8%)
Diarrhea	6 (13.6%)
Recurrent heartburn	2 (4.5%)
Chest pain	1 (2.3%)
Unable to belch	8 (18.1%)
Recurrence	3 (6.8%)

DISCUSSION

Fundoplication is the most often used surgical treatment for pathologic GER. Regurgitation of stomach acid after surgery is a typical side effect, and fundoplication is a common treatment. In children, the rate of repeat fundoplication can reach 24%. Small case series of successful laparoscopic fundoplication in adults have been published since 1995. The biggest adult series (307 patients) demonstrates a high percentage of laparoscopic completion and satisfactory symptom alleviation. Several cases of youngers having similar but less intense encounters have also been documented [4]. Information on feasibility, complication rate, and symptom resolution is provided in our report of 44 patients.

Preoperative contrast studies not indicated hiatal hernia in most of our patients. HH is common not only in children but also in adults. Smaller paediatric series have indicated lower occurrences[5], although this may be due to sample discrepancies. In the larger series of adults and children, converting to laparotomy to complete the fundoplication is unusual. Initial findings from an adult randomised controlled study indicate that the incidence of recurrent hiatal hernia is significantly reduced following mesh placement [6]. Additionally, recurrence was encountered in 6.8 % of patients in our series and was due to giant hiatus hernia that was managed successfully by open surgery with mesh repair .

In our series, complications occurred infrequently. In addition, we cannot ascribe any serious problems to the laparoscopic approach during or after surgery. Although there is no comparison group, we hypothesise that patients with this level of

comorbidity had a decreased rate of complications like dysphagia, recurrent heartburn, and chest pain and wound infection than following laparotomy.

The majority of our patients who sought treatment for GERD saw improvement in their initial complaint. A sizeable number, however, kept experiencing GI distress. 5 cases suffer from gas- bloat syndrome, 6 cases had diarrhea, 8 patients were unable to belch. Our series shows that laparoscopic fundoplication has a high success rate, provides significant symptom alleviation, and seldom results in problems.

Failure to thrive, aspiration pneumonia, oesophagitis, oesophageal stricture, and sudden infant death syndrome are all complications of chronic gastric reflux, which leads to GERD. Oesophageal dysmotility, greater muscle stiffness, and a heightened gag reflex all put children with neurological impairments at a higher risk [7]. Treatment of GERD is necessary to prevent problems. The effectiveness of medicinal treatments such as proton pump inhibitors or prokinetics in neonates and infants has not been established. Thus, fundoplication is recommended for infants and newborns with GERD [8].

The pulmonary condition of patients with respiratory impairment has improved in some research. In most tertiary care facilities, it has replaced previous methods of treating GERD. The results of the largest series of laparoscopic Nissen fundoplication were reported by Rothenberg [9]. Thatch et al. reported on a study that compared open and laparoscopic fundoplication in a neonatal critical care unit population. When comparing the open and laparoscopic groups, the latter required much less narcotic pain medication in the first 24 hours following surgery [10]. The laparoscopic group experienced no sudden problems. There was a lack of information, however, regarding recurrence, conversion, and other problems. Patients in the laparoscopic group enjoy a shorter hospital stay, earlier feeding, and fewer morbidity, according to a meta-analysis of six comparative studies conducted by Siddiqui et al [11]. At 12 months, there was no statistically significant variation in recurrence. Overall, a 2% conversion rate was discovered. However, there were significant disparities in patient age and neurological health between the investigations, and none of the research were randomised. The authors advocated using laparoscopic fundoplication as a primary surgical option in cases where it was feasible to do so [11].

Significant complications following laparoscopic nissen fundoplication surgery include dysphagia. Multiple factors contribute to postoperative dysphagia, including the wrapping technique, the twisting and tightness of the wrapping, the apposition of the crura, and postoperative swallowing. Several factors may have contributed to the Nissen fundoplication's increased risk of severe, long-lasting dysphagia in this cohort. The patients' time in hospital was comparable to that of other studies[12].

CONCLUSIONS

In conclusion, the results of this study show that, laparoscopic of the Nissen fundoplication is frequently successful. It can be safely performed in infants, low recurrence rate (up to 6.8 %) is shown by our long term follow-up data. Rare complications that are unrelated to the laparoscopic approach are uncommon. In light of these findings, we recommend laparoscopic Nissen fundoplication to be considered in managing infants with GERD.

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Approval No The study was approved by the Minia University Faculty of Medicine Research Ethical Committee (FMREC) with approval number: 1307/11/2024

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