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SURGICAL ENDOSCOPY
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Long-term outcome of laparoscopic Nissen and Toupet fundoplication in normal and neurologically impaired children

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Abstract

Background: Laparoscopic fundoplication is a commonly performed procedure in children. This report describes the incidence of long-term recurrence and complications after laparoscopic Nissen or Toupet fundoplication in neurologically impaired and normal children.

Methods: Fifty-three children operated on before 1999 were reviewed. All children were evaluated clinically and with a barium meal study thereafter. Symptomatic children and those with abnormal barium meal underwent 24 h pH monitoring.

Results: A total of 45 patients were included in the study. The mean follow-up was 4.5 years. All, except one asymptomatic child that declined, had a barium meal. Four were abnormal (2 parahiatal hernias and 2 slight episodes of reflux). Four patients had symptoms related to the operation and 2 to clinical recurrence. Only 1 asymptomatic child with slight reflux at barium meal revealed abnormal 24 h pH monitoring. Finally, 6.6% patients were found to have late recurrence (2 clinical and 1 pHmetry). There was an obvious increase in children's weight, especially in neurologically impaired patients.

Conclusion: Laparoscopic antireflux surgery is of value in children with gastroesophageal reflux disease. The long-term results are comparable with open surgery, and there was no difference in term of wrap failure between neurologically impaired and normal children.

Key words: Gastroesophageal reflux — Laparoscopic — Gastrostomy — Neurological status — Outcome

Gastroesophageal reflux disease (GERD) is a commonly encountered pathology in children. The laparoscopic era started in the 1980s with laparoscopic cholecystectomy and then expanded quickly to involve most surgical procedures, including antireflux surgery, which was begun approximately a decade ago by Dallemagne et al. [7] in 1991 for adults and by Georgeson [11] and Lobe et al. [14] in 1993 for children. Since then, the laparoscopic antireflux surgery has proven its immediate benefits for the patients, and several reports in the literature have shown that this procedure can be safely performed in children with low morbidity and mortality and shortened hospital stay [15, 17]. It is shown to be comparable in term of recurrence rate and complications at 5 years follow-up in comparison to open surgery in adults [4, 12]. In children, long-term results are few. These long-term results are a matter of concern to patients and medical staff, especially in children. The present study was undertaken to determine the incidence of long-term recurrence and complications in children after a laparoscopic approach to GERD.

Materials and methods

This study is a retrospective study. All records of patients who underwent laparoscopic antireflux surgery at our institution before 31/12/1998 were reviewed (minimum 2 year follow-up). The patients were reviewed clinically and with barium meal study thereafter. The symptomatic patients (whatever the type of symptom) and the patients with abnormal barium meal were then subjected to a 24 h pH monitoring. The study focused on late postoperative complications which are related to the antireflux surgery per sé or to the recurrence. Reoperation after failed antireflux surgery were included if they were performed laparoscopically more than 2 years before the study (1 case). Interviews with the patient or the patient's parents focused particularly on dysphagia, heartburn, gas bloat, medical treatment, and weight. All operated patients had, preoperatively, an abnormal 24 h pH monitoring. Technically we performed a Nissen procedure with gastrostomy tube placement in the neurologically impaired children and a Nissen (beginning experience) or a Toupet (after the learning curve) procedure in the normal children.

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Table 1. Symptoms at clinical evaluation[a]

Symptoms related toleration (4)	*n*	Symptoms related to recurrence (2)	*n*
Dysphagia	2	Heartburn	1
Dumping syndrome	1	Retrosternal pain	1
Flatulance/diarrhea	2	Vomiting	0
Gas bloat	1	Respiratory syndrome	1

[a] Six children were symptomatic

Table 2. Weight evolution of normal and neurologically impaired children

NI children			Normal children		
Weight charts	Preoperative (*n*)	Postoperative (*n*)	Weight charts	Preoperative (*n*)	Postoperative (*n*)
−40	0	0	−40	1	0
−30	10	1	−30	4	0
−20	3	0	−20	6	0
−10	2	2	−10	10	6
Medium	0	4	Medium	2	13
+10	0	7	+10	3	11
+20	0	1	+20	3	0
+30	0	0	+30	1	0

Results

A total of 53 patients were undergone laparoscopic antireflux surgery in our institution, Lenval Hospital for Children in Nice, France, before 1999. There were 35 males and 18 females. The age average was 7 years with a range from 2 months to 19 years. Eighteen patients (34%) were neurologically impaired (NI). All had an IQ less than 60. Two patients (3.7%) were previously operated for esophageal atresia who came presenting at the time of the study with GERD. Of the patients, 27 were operated according to Toupet and 26 according to Nissen (18 NI and the first 9 normal children operated during our learning curve).

Two operations were converted to open surgery in the beginning of our experience, the first time to confirm that the wrap was not too tight, and the second because of exposure problems due to a dilated transverse colon.

There was one early postoperative death. This NI child died 20 days postoperatively of aspiration pneumonia. Another patient died 9 months after the operation because of his progressive neurological disease.

Two patients presented with early recurrence. One was reoperated by laparoscopy and was included, and one by laparotomy. Three children did not appear for follow-up.

Finally, a total of 45 patients (15 NI) were included in the study. Mean follow-up was 4.5 years, with a range from 2 years to 7 years.

Nine patients (20%) had a follow-up of more than 5 years. At clinical evaluation, we found 6 patients (13%) that had postoperative symptoms due to the operation (4 patients) or due to recurrence (2 patients) (Table 1). These 2 patients were found to have clear reflux with parahiatal hernia at barium meal (one of them is NI). None had an abnormal pHmetry. The normal child is on prokinetic drugs and waiting for reoperation; the NI was recently reoperated by laparoscopy. Two other children were found to have slight episode of reflux in the inferior part of the esophagus (one is NI) and were asymptomatic. pHmetry was abnormal in 1 case. Finally, 3 of our patients (6.6%) were diagnosed to have recurrence: 2 because of symptoms and presence of a parahiatal hernia at barium meal, and 1 due to an abnormal pHmetry.

Since weight is something objective, we stress it in our study during clinical evaluation of the patients. There was an obvious increase in the children's weight, especially in the NI patients, who had tremendous improvement. Table 2 shows the weight gain in relation to the growth charts in both NI and normal children.

Discussion

Minimally invasive surgery has become the standard operative choice in performing most surgical procedures in adults as well as in children. Fundoplication for GERD is one of the most commonly performed operations in children. Several reports indicate that antireflux surgery can be successfully performed laparoscopically even in children or babies [11, 21]. After a short learning curve, the operative time and the perioperative complication rate become likely the same as for open surgery, as shown by some recent reports in the literature [11, 21, 24]. As documented, there are several advantages of laparoscopic antireflux surgery, such as less pain, shortened hospital stay, decreased pulmonary complications, and less postoperative adhesion formation [18]. But long-term results are still few in children. In this study, the late recurrence was 3 out of 45 patients (2 symptomatic and 1 asymptomatic) (6.6%). One of them is NI out of 18 patients. These results are in accordance with the recent series. Rothenberg et al. [21]

reported a recurrence of 3.2% in their large series of 220 patients, and they considered the recurrence which occurred early to be due to technical problems. Georgeson et al. [11], in their report of 113 NI patients, reported a 1.8% recurrence rate over 17 months. However, this follow-up is considered to be short in comparison with Rothenberg (mean 4.5 years) and with ours. Most of the recent reports showed almost the same results of recurrence varying from 2% to 8% [20, 21]. In conventional antireflux surgery, many reports showed a higher late recurrence rate between 10% and 16% [6, 10, 23]. Recurrence with the presence of a hernia caused by partial disruption of the wrap as in our series is the most frequent cause of redo fundoplication [10, 13]. An interesting matter in our study is that there was no difference in terms of recurrence failure between normal and NI children. This is different from what had been thought, that the recurrence is increased in the NI patients. Pearl et al. [20], Kimber et al. [13], Dedinsky et al. [8], and others all found that NI children are most likely to develop recurrence (up to 20%). In particular, Turnage et al. [23] in their report of late results, revealed 17% long-term recurrence. The reasons why our results are comparable to those in normal children are not clear. Probably magnification and perfect position even in severe scoliotic patients improved the results. Fewer postoperative respiratory problems, which is already documented, may be another reason [18]. A decrease in cough crisis may avoid episodes of high pressure in the lower esophagus and protect the sutures. Limited dissection of the hiatal area and less manipulation of the esophagus and the stomach may be another important reason. We noticed that none of our NI patients had delayed gastric emptying and no pyloroplasty was done. More, in our study we found that there was an appreciable increase in weight of the patients, particularly in NI children, which is a good indication of the success of an antireflux surgery even if combined with gastrostomy tube placement in the NI group. The type of the wrap seems to be of less importance; the Toupet operation offers possible slight advantages [16]. Bliss et al. [3] reported that the anterior wrap was comparable in therapeutic efficacy and safety to the Nissen wrap. Bensoussan et al. [2] in their series used a Toupet partial wrap with a recurrence rate of 10% in NI patients. This results seemed more favorable in comparison with the Nissen wrap. Georgeson reported the opposite [11]. We found no difference in long-term results between our Nissen and Toupet operations. The Toupet wrap needs more knots and is probably not so easy in a beginning experience [22]. After the learning curve, the best wrap is certainly the one most often made by each team. With the appearence of new agents to treat GERD the question of the cost effectiveness of an operation is still open [9]. Minimally invasive surgery, with better immediate results as in this study, even good late results in normal children, and better results in NI children, in comparison with open surgery, has been confirmed to be a good therapeutic option. Indeed, side effects of some medical treatments after long utilization are potentially very high [5, 19]. This type of managment, certainly in children, has to be honestly compared to that of laparoscopic surgery.

In conclusion, the complications due to surgery and the recurrence rate after laparoscopic surgery for GERD in children are, after 4 years follow-up, comparable with those of laparotomy. Laparoscopy is a good approach with better early results (less pain, fewer adhesions, etc.) and long-term results comparable to those of open surgery. In our series the benefit in NI patients was high. There is no difference between normal and NI children. The reasons are probably the use of same operative position even in scoliotic patients, the magnification, and the minimal dissection of the hiatal area. Laparoscopic antireflux surgery is probably cost-effective in comparison with long-duration medical therapy, particularly in children and NI patients.

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