

Current Issues of Gastro-Oesophageal Reflux Disease Surgical Treatment in Children

Nurlan Nurkinovich Akhparov, Riza Boranbayeva¹, Saule Bakhtyarovna Suleimanova, Madina Temirkhanova¹

Departments of Surgery and ¹Pediatrics, The Scientific Center of Pediatrics and Pediatric Surgery, Almaty, Kazakhstan

Abstract

Gastro-oesophageal reflux (GER) disease is one of the most common diseases amongst a wide range of chronic inflammatory diseases of the gastrointestinal tract in children of all ages, significantly impairing the quality of life of the child and posing a serious threat to the health of the patient. From 2008 to 2019, 134 patients aging from 6 months to 12 years were hospitalised at the Scientific Center for Pediatrics and Pediatric Surgery including 69 (51%) infants. Of them, 51 (38%) were the patients with persistent manifestations of regurgitation, despite an outpatient course of conservative therapy; 29 (22%) patients with recurrent reflux-associated pneumonia; also, 35 (26%) children with GER in the structure of the main pathology of the central nervous system, as well as 19 (14%) patients after surgery of the anastomosis of the oesophagus with its atresia. One hundred and seven (79.8%) patients underwent surgery. Nissen oesophagofundoplication was traditionally performed in 41 (38%) patients, in combination with Stamm gastrotomy in 14 (34%), with Mikulich pyloroplasty in 9 (22%) and in combination with gastrotomy and pyloroplasty in 12 (29%) children. Laparoscopic Nissen oesophagofundoplication was used in 16 (15%) cases. Thall oesophagofundoplication was performed in 48 (45%) patients, while in two (2%) cases, Boerema gastropexy was conducted. The immediate results were studied in all 107 patients. Complications in the form of gastric distress syndrome were revealed in four (3.7%) patients who did not undergo pyloroplasty, which in two (1.9%) cases required additional surgery of the stomach draining, whereas in the other two (1.9%) patients, the distress syndrome was stopped conservatively. A dumping syndrome was identified in two (1.9%) patients. Timely recognition of the pathological process, its nature and prevalence determines the indications for the use of various methods of operation, which are based on an individual approach to each patient.

Keywords: Children, oesophagitis, oesophagofundoplication, gastro-oesophageal reflux

INTRODUCTION

The relevance of gastro-oesophageal reflux disease (GERD) in paediatrics is that it is a common disorder of the digestive system and usually precedes or accompanies such serious diseases as peptic ulcer, peptic stricture and Barrett's oesophagus with which it is pathogenically associated. Many authors consider that it as a pathological condition with a potential for cell transformation from metaplasia to adenocarcinoma.^[1] Therefore, the treatment of reflux oesophagitis should be assessed from the standpoint of oesophageal adenocarcinoma prevention.

Current methods of drug treatment of GERD can prolong clinical remission and shorten the healing time of focal oesophageal inflammatory injuries.^[2] However, despite the high level of

modern medical therapy, it has is only a short-term effect. The drug withdrawal is followed by the symptoms recurring in 50% of patients after 6 months and in 100% after 12 months.^[3] In this situation, surgery is an alternative solution to this problem.

The paper presents our experience in the surgical treatment of children with GERD.

MATERIALS AND METHODS

From 2008 to 2019, 134 patients aging from 6 months to 12 years were hospitalised at the Scientific Center for Pediatrics

Address for correspondence: Dr. Saule Bakhtyarovna Suleimanova, Department of Surgery, The Scientific Center of Pediatrics and Pediatric Surgery, Almaty 050040, Kazakhstan.
E-mail: saule_suleiman@mail.ru

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and Pediatric Surgery including 69 (51%) infants. Of them, 51 (38%) were the patients with persistent manifestations of regurgitation, despite an outpatient course of conservative therapy; 29 (22%) patients with recurrent reflux-associated pneumonia, repeatedly receiving inpatient treatment in the department of pulmonology; also, 35 (26%) children with gastro-oesophageal reflux (GER) in the structure of the main pathology of the central nervous system, as well as 19 (14%) patients with reflux after surgery of the anastomosis of the oesophagus with its atresia. The diagnostic complex included a general clinical examination as well as endoscopic study with a pinch biopsy of the oesophageal mucosa, ultrasonographic, X-ray studies, and 24-h pH monitoring.

A general clinical study was to identify the following symptoms: oesophagus inflammation, malnutrition and respiratory disorders.

At the outpatient and inpatient level, anamnestic data were studied according to a developed map scheme including identifying possible causes of the disease (pregnancy and childbirth, hereditary factor, concomitant pathology of the central nervous system and factors of breast milk intolerance). A particular attention was paid to the patients' complaints: the nature of regurgitation and vomiting, their links to the start of feeding, anxiety during feeding, composition of regurgitate and a monthly weight gain. Prescription of clinical manifestations, methods of previous treatment and objective physical data (information about body type and body weight) were identified and the results of the 'pacifier test' were studied as well. This test is used as a method of early non-invasive diagnosis of GER, which aims to identify early clinical signs of the disease in infants on the primary outpatient level. Eighty-four (62.6%) children with GER were revealed thanks to the proposed method.

The method is used in the outpatient treatment conditions as follows: a child is fed (some milk or a mixture, half the volume of a singular feeding), then is held in an upright position for 20–30 min and after that is given a pacifier. Thus, with GER, the food masses are released from the stomach into the oesophagus and oral cavity. Without GER (when the cardiac sphincter is consistent), the test is negative – there is no reflux from the stomach into the oral cavity. With a positive pacifier test, a preliminary diagnosis of GERD can be made.

The children did not receive adequate nutrition due to their frequent regurgitation and vomiting, which led to a lag in physical development and a lack of body weight. Thus, hypotrophy of the 1st degree was diagnosed in 42 (33%) of our patients and was observed mainly in young children. The 2nd-degree hypotrophy was revealed in 54 (42%) children, while in 32 (25%) cases, the body mass deficit exceeded 20% (hypotrophy of 3rd degree). Sixty-eight (53.1%) children complained of constipation. The night regurgitation (a 'wet pillow symptom') was observed in 54 (42.1%) children, which posed a profound threat to a child's health due to the risk of aspiration. Twelve (9.3%) children, mostly older

ones, complained of chest pain. Pain sensations behind the breastbone correlate with the severity of reflux oesophagitis. Dysphagia was observed in 16 (12.5%) patients with reflux oesophagitis and peptic stenosis of the oesophagus, mainly in the group of older children.

Anaemic syndrome (predominantly iron deficiency anaemia) was caused by chronic bleeding from the oesophagus erosions or ulcers and by diapedesis bleeding during oesophagitis. Anaemia of the 1st degree was diagnosed in 26 (20.3%) patients and that of the 2nd degree in 14 (10.9%) cases.

Respiratory complications in the form of recurrent reflux-induced pneumonia were found in 37 (28.9%) children and a night cough in 41 (32%) children, while in most cases, these symptoms were combined. In 21 (16.4%) cases, an apnea was observed.

RESULTS

An ultrasound study revealed the distal oesophagus walls thickening in 54 (42%) children, and a pendulum-like turbulent movement of the contents from the stomach into the oesophagus was found under dynamic observation.

According to the Savary–Miller classification of the oesophagus severity, a fibroesofagoscopy revealed catarrhal oesophagitis in 84 (66%) patients, traces of erosion in 12 (9%) and fibrinous erosive oesophagitis in 18 (14%) children [Figure 1]. In 11 (9%) patients [Figure 2] who underwent a 'medical calibration gauge', peptic narrowing of the lumen, ulceration and increased contact bleeding were found.

The 24-h pH monitoring revealed an acid reflux in 26 (20.3%) patients and combined acid-alkaline reflux in 20 (15.6%) cases, of which 6 (30%) children were with fibrinous-erosive and ulcerative oesophagitis, 11 (55%) with peptic stricture of the oesophagus and 3 (2%) children with oesophageal metaplasia.

As a result of the X-ray examination, a distortion in the ratio of the oesophageal-gastric junction elements and the change in the angle of his were diagnosed in 124 (97%) cases [Figure 3]. In the Trendelenburg position, barium was thrown from the stomach into the lumen of the oesophagus as 'a roaring elephant' symptom in all children. Thus, reflux throwing of the 1st degree was found in 52 (41%) children, of the 2nd degree in 44 (34%) patients and reflux-throwing of the 3rd degree in 32 (25%) kids. The forming peptic stenosis of the oesophagus with the preceding zone of suprastenotic expansion was observed in 11 (8.5%) patients [Figure 4].

With the pathology of the oesophagus and stomach, the gastroduodenal junction is also comprehensively examined in the pre-operative period. This allowed to identify a functional pylorospasm in 19 (14.8%) children, mainly in patients with neurological disorders, as well as single cases of its manifestation in early infancy in children with a previous history of oesophageal atresia, in whom dysfunction of

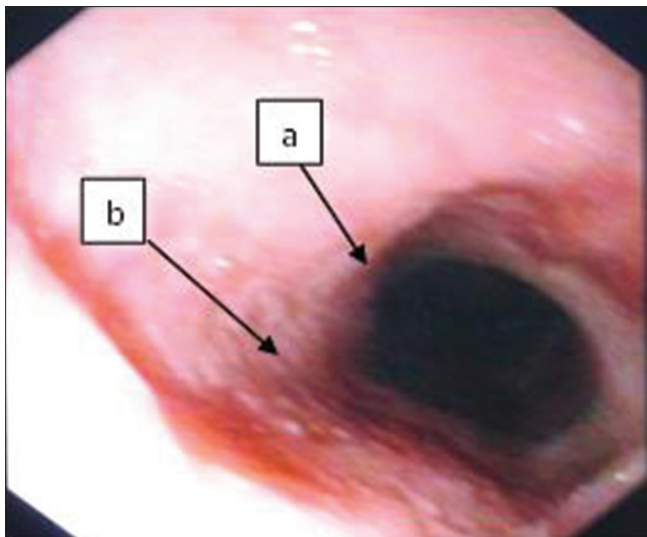


Figure 1: Erosive oesophagitis fibroesophagoscopy: (a) Expansion of the cardiac outlet zone (b) Traces of erosion

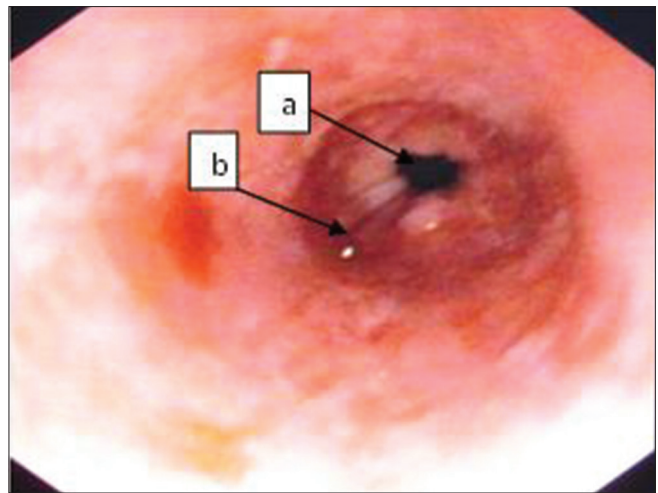


Figure 2: Peptic stricture of the oesophagus. Fibroesophagoscopy: (a) Zone of peptic constriction at the level of the lower/third of the oesophagus; (b) erosive and ulcerative oesophagitis

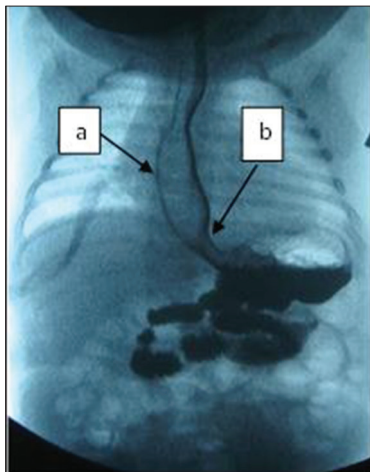


Figure 3: Oesophagography: (a) expansion of the lumen of the lower/ third of the oesophagus; (b) change of his angle (110°)

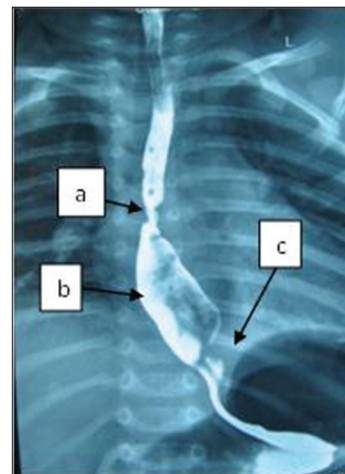


Figure 4: Oesophagography: (a) zone of peptic narrowing of the middle/ third of the esophagus; (b) expansion of the lumen of the lower/ third of the esophagus; (c) change of his angle (110°)

motility, in our opinion, was a consequence of functional immaturity.

After the diagnosis, all patients underwent a complex of conservative antireflux therapy for 3–6 months.

When choosing the method of oesophagofunduplications, an algorithm was proposed, which in our opinion, optimally reflects the choice of antireflux protection in children with GERD and with different somatic backgrounds [Figure 5].

Based on our research, we have proposed a diagnostic algorithm that consistently includes measures necessary for verification of GERD in children, which allows us to correct the actions of the doctor for timely diagnosis [Figure 6].

One hundred and seven (79.8%) patients underwent surgery following the results of treatment. Nissen oesophagofundoplication was traditionally performed in 41 (38%) patients, of which in 14 (34%) patients, it was

combined with Stamm gastrostomy, mainly due to concomitant pseudobulbar disorders, as well as in children with peptic oesophageal stricture for subsequent calibrating dilatation of the stricture zone; combined with Mikulich pyloroplasty in 9 (22%), mainly in children with neurological disorders; and in combination with gastrostomy and pyloroplasty in 12 (29%) children. Nissen oesophagofundoplication was made laparoscopically (without gastrostomy and pyloroplasty) in 16 (15%) children, Thall oesophagofundoplication was performed in 48 (45%) patients and Boerema gastropexy was performed in 2 (2%) cases.

Immediate results were studied in all the 107 patients. Complications in the form of gastric distress syndrome were detected in four (3.7%) patients who did not undergo pyloroplasty, which in two (1.9%) cases required additional stomach draining surgery, while in the other two (1.9%) cases, the distress syndrome was stopped conservatively.

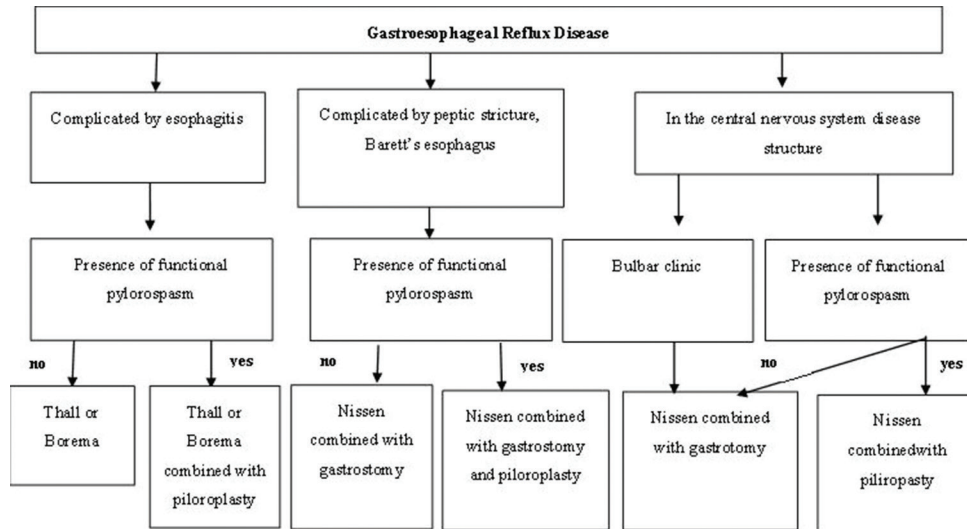


Figure 5: Algorithm for choosing the method of oesophagofundoplication

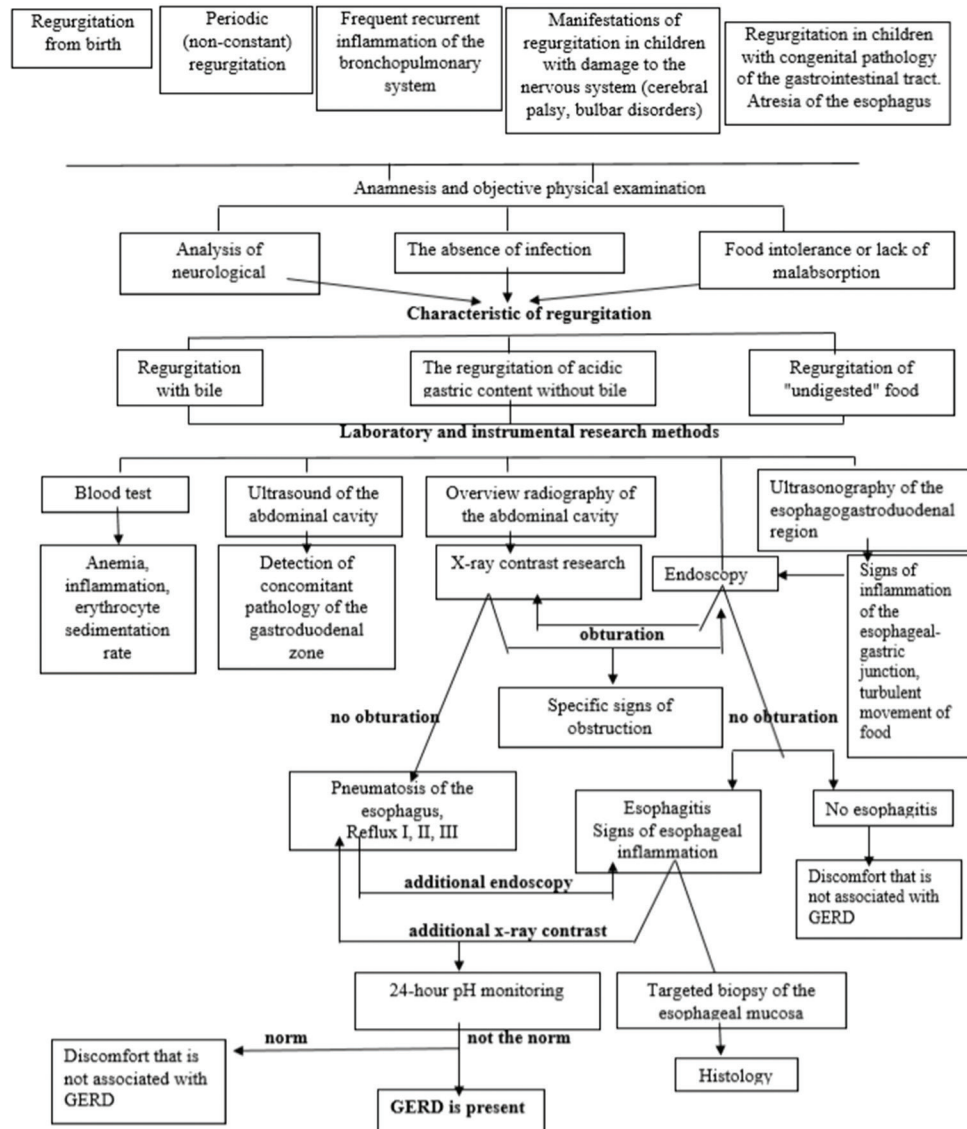


Figure 6: Algorithm for diagnostic research of children with regurgitations

The dumping syndrome was observed in two (1.9%) patients.

Long-term results were studied in 96 children from 6 months to 2 years after surgery. In our opinion, this period is sufficient to assess the effectiveness of surgical treatment. A relapse of GERD was diagnosed in three (2.8%) patients who were re-operated. Reflux oesophagitis was preserved in six (5.6%) children with varying severity, of which three (2.8%) patients with recurrent GERD were re-operated. The rest of the children have no particular complaints; they develop satisfactorily.

DISCUSSION

Interpretation of the literature on the surgical correction of GER has certain difficulties that arise when choosing the method of oesophagofundoplasty as well.

To date, antireflux surgery is the most frequently performed surgical intervention on most children in all paediatric surgical services in Europe and the USA. Data from the United States national study show that 45% of antireflux procedures are performed on children under the age of 1 year.^[4] The profile of patients in this age group consists mainly of infants with impaired swallowing and aspiration with nervous system disorders background, as well as newborns with a previous history of oesophageal atresia. The risk of GER in these infants is due to the pathological motility of the gastrointestinal tract, the increase in intra-abdominal pressure and the immaturity of the gastro-oesophageal junction.

In the literary review, Rintala 'Fundoplication in Patients with Oesophageal Atresia: Patient selection, indications and outcomes', referring to literature sources, summarises the frequency of fundoplication in children with oesophageal atresia in the range of 10%–45%. It should be noted that most patients need fundoplication before the age of 1 year. Amongst the symptomatic manifestations, anastomosis strictures requiring dilation occur in 30%–60% of patients. For patients suffering from recalcitrant structures, there is a significant GER that contributes to the formation of refractory stenosis. Up to 74% of patients suffer from chronic or recurrent respiratory symptoms. After fundoplication, most patients have excellent relief of their symptoms.^[5]

Despite its prevalence, information about the effectiveness of certain methods of antireflux protection of the oesophagus is contradictory. Kubiak *et al.* noted a significantly higher percentage of relapses after Toupet (10% vs. 5%) and Thall surgeries (15% vs. 5%) compared with Nissen modification, especially in the group of children with neurological pathology.^[6]

A rare number of scientific works K. U. Ashcraft, T. M. Holder to a certain extent reflects the basic technical principles of the Nissen operation and its wider application; however, in some cases, it also completely eliminates the physiological reflux and consequently, the possibility of saving an opportunity of emptying by vomiting for the patient (if any is needed).

Fein and Seyfried compared laparoscopically performed Nissen oesophagofundoplication and partial oesophagofundoplication and agreed that the personal experience of the surgeon was the most important factor in choosing the antireflux protection method.^[7]

Technically, the Toupet partial 'wrapping' requires a greater number of stitches, compared to a full 'wrapping' by Nissen, which helps to prevent inconsistency, slipping and divergence of the stitches. However, there is a theoretical risk of perforations with additional suturing by a less experienced surgeon.

Koch *et al.* in their randomised examinations of 125 patients assessed the effectiveness of the quality of life of patients after Nissen and Toupet oesophagofundoplication and defined the gastro-oesophageal quality of life index and oesophageal symptom by 24-h pH monitoring before surgery and 1 year after surgery. In both groups, the DeMeester index was equally reduced, and the symptoms of GERD were stopped with equal efficiency.^[8]

Authors Mauritz *et al.* studied the effect of laparoscopic antireflux surgery on the initial impedance as a reflection of the integrity of the mucosa in 25 children with GERD and concluded that surgical antireflux protection performed laparoscopically reduces the time of acid exposure from 8.5% (6.0%–16.2%) to 0.8% (0.2%–2.8%), $P < 0.001$, respectively, increases the distal resistance, resulting in restoration of the base impedance, reduction of reflux symptoms and restoration of the integrity of the oesophageal mucosa.^[9]

The scientific retrospective review of Rosales *et al.* analysed the results of antireflux surgery in children under 2 years of age who underwent laparoscopic Nissen fundoplication. The study included 106 patients; the average gestational age at birth was 32.50 weeks \pm 6.35; 64 (59.4%) children were premature. The average body weight during the operation was 4.81 \pm 2.10 kg. In the post-operative period, symptoms were resolved in 93 (87.7%) children. The authors believe that relieving GERD symptoms, no relapses and a low incidence of complications is safe and acceptable in the high-risk group of children under 2 years of age. The procedure has a low incidence and mortality in this population.^[10]

According to the result of our wholesale, it follows that timely recognition of the pathological process, its nature and prevalence identifies the indications for the use of various methods of operation, which are based on an individual approach to each patient. The proposed algorithm for selecting the method of antireflux surgery, taking into account the background and neurological symptoms, will allow the surgeon to select the optimally reasonable antireflux surgery. The combination of fundoplication with pyloroplasty, especially in patients with concomitant neurological symptoms, will prevent gastric distress syndrome, helping to restore the motility of the gastrointestinal tract and provide the best long-term result.

CONCLUSION

The study of long-term results suggests that the choice of a pathogenetically substantiated method of treatment of GERD helps to reduce the incidence of post-operative complications and improve the patient's quality of life.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Altorki NK, Skinner DB, Segalin A, Stephens JK, Ferguson MK, Little AG. Indications for esophagectomy in nonmalignant Barrett's esophagus: A 10-year experience. *Ann Thorac Surg* 1990;49:724-6.
2. Hassall E. Decisions in diagnosing and managing chronic gastroesophageal reflux disease in children. *J Pediatr* 2005;146:S3-12.
3. Guimaraes E, Marguet C, Camargos P. Treatment of gastroesophageal reflux disease. *J Pediatr* 2006;82:133-45.
4. Lasser MS, Liao JG, Burd RS. National trends in the use of antireflux procedures for children. *Pediatrics* 2006;118:1828-35.
5. Rintala RJ. Fundoplication in patients with esophageal atresia: Patient selection, indications, and outcomes. *Front Pediatr* 2017;5:109.
6. Kubiak R, Andrews J, Grant HW. Long-term outcome of laparoscopic nissen fundoplication compared with laparoscopic thal fundoplication in children: A prospective, randomized study. *Ann Surg* 2011;253:44-9.
7. Fein M, Seyfried F. Is there a role for anything other than a Nissen's operation? *J Gastrointest Surg* 2010;14 Suppl 1:S67-74.
8. Koch OO, Kaindlstorfer A, Antoniou SA, Luketina RR, Emmanuel K, Pointner R. Comparison of results from a randomized trial 1 year after laparoscopic nissen and toupet fundoplications. *Surg Endosc* 2013;27:2383-90.
9. Mauritz FA, Rinsma NF, van Heurn EL, Sloots CEJ, Siersema PD, Houwen RH, *et al.* Esophageal mucosal integrity improves after laparoscopic antireflux surgery in children with gastroesophageal reflux disease. *Surg Endosc* 2017;31:2910-7.
10. Rosales A, Whitehouse J, Laituri C, Herbello G, Long J. Outcomes of laparoscopic nissen fundoplications in children younger than 2-years: Single institution experience. *Pediatr Surg Int* 2018;34:749-54.