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Comparative study of thal's and nissen's fundoplication in preventing gastroesophageal reflux in achalasia of oesophagus in children

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ABSTRACT

Aim and Objectives: To study the comparative efficacy of Thal's fundoplication and Nissen's fundoplication done to prevent gastroesophageal reflux (GER) after esophagocardiomyotomy for achalasia of the esophagus in children.

Materials and Methods: This study was done over a period of seven years at the Niloufer Institute of Women and Children, Red Hills, Hyderabad. 12 cases of achalasia cardia were admitted to our institution. All cases underwent laparotomies and modified Heller's esophago-cardiomyotomies.

Results: There were 7 males and 5 females, with a male-female ratio of 1.4:1. The age at presentation is between 5 months and 11 years, with 11 or 12 patients presenting at less than 5 years of age. There were three patients who have been symptomatic since birth. A small accidental mucosal perforation occurred in one of the patients who underwent Nissen's fundoplication. The perforation was closed with Vicryl. On the 3rd POD, the patient developed an intraperitoneal leak and was taken up for an immediate laparotomy. The fundoplication was dismantled, the perforation was repaired, and Thal's procedure was done. The postoperative recovery was uneventful. In another patient who underwent Thal's fundoplication had an accidental mucosal perforation, which was uneventful. In 1 patient, relaparotomy was done, Nissen's wrap was dismantled, and Thal's wrap was applied. The other patient did not come for a follow-up. The other 2 patients with Nissen's procedure showed symptomatic relief in the long-term follow-up. All the cases who underwent Thal's procedure have shown relief of symptoms within the first 3 months of follow-up, with good weight gain without reflux. A barium oesophagogram done 6 months after the procedure showed a decrease in the size of the lower end of the oesophagus with no evidence of GER. No mortality was recorded.

Conclusion: Thal's fundoplication shows 100% efficacy in preventing GERD and relieving symptoms following Heller's esophagocardiomyotomy and proved to be an effective procedure in comparison with Nissen's fundoplication. In cases of accidental mucosal perforation, Thal's wrap is a better procedure for preventing leaks.

Key words: esophagocardiomyotomy, Thal's procedure, Nissen's fundoplication, Gastroesophageal reflux, children

INTRODUCTION

Achalasia of the esophagus is defined as a disease characterized by failure of coordinated relaxation of the lower oesophageal sphincter (LES) and ineffective peristalsis, resulting in functional obstruction of the esophagus.^{1,2,3} A rare disease in the pediatric age group and more a disease of adulthood, the cause of which is still unknown. But most studies point to a primary neurogenic abnormality with a lack of inhibitory innervations and progressive degeneration or loss of ganglion cells in the myenteric plexus. It was first described by Willis in 1672.⁴ In 1914, Heller, for the first time, described a successful surgical procedure by doing a cardiomyotomy. Later non-operative procedures were described by various investigators, but cardiomyotomy still has the highest success rate. The aim of the study is to study the comparative efficacy of Thal's fundoplication and Nissen's fundoplication to prevent gastroesophageal reflux (GER) after esophago-cardiomyotomy for achalasia of the esophagus in children.⁵

This study was done between March 2015 and March 2022, over a period of seven years. 12 cases of achalasia cardia were admitted to our institution, the Niloufer Institute of Women and Children, Red Hills, Hyderabad. All cases underwent laparotomies and modified Heller's esophago-cardiomyotomies. In 7 cases, Thal's fundoplication and in 5 cases, Nissen's fundoplication were done to prevent postoperative GER. There were 7 males and 5 females. The age at presentation ranged between 5 months and 11 years, and the duration of symptoms was between 4 months and 1 year. None of the patients were subjected to nonoperative modalities to relieve the symptoms. The diagnosis was suspected based on clinical presentation and confirmed by a barium oesophagogram. In all the patients, regurgitation, or non-projectile vomiting, was the common denominator. Loss of weight and failure to thrive were observed in 10 patients. Five patients had signs and symptoms of aspiration pneumonitis. Constipation was observed in 6 patients. Dysphagia was recorded in two patients.

Investigations: In a plain X-ray of the chest, upper lobe pneumonitis was noted in 5 patients. Air fluid levels were noted in six patients. The barium oesophagogram and diagnosis confirmed the findings: Dilatation of the lower half of the oesophagus, smooth tapering of the lower end with characteristic bird beak appearance, delayed passage of dye into the stomach, and upper GI endoscopy were done in 2 patients with recurrent symptoms. There is no evidence of esophagitis, ulceration, or organic lesion. Before subjecting the patients to a surgical procedure, four patients needed improvement of their nutritional status by gavage feeds for 7–14 days. Preoperative blood transfusions were given to two patients.

Surgical Procedure: Under general endotracheal anesthesia, the patient is kept in a supine position and approached by an upper midline incision extending from the xiphisternum to the umbilicus. The left triangular ligament is cut, and the left lobe of the liver is pushed medially. The short gastric vessels are ligated, and the spleen is separated from the stomach. The phrenoesophageal membrane is stretched and cut, exposing the lower end of the esophagus. The lower end of the esophagus is mobilized by dissecting all around, safely guarding both vagi. The lower 5–8 cm of esophagus is cleared and exposed, and a myotomy incision is given for about 5–6 cm on the esophagus, extending 1–2 cm over the cardia. The muscle layer is gently dissected and separated from the underlying mucosa up to 50% of the circumference, allowing the mucosa to bulge through the myotomy. The esophageal hiatus is narrowed by a figure-eight suture or an interrupted mattress suture with an adequate gap. Thal's 270-degree or Nissen's 360-degree fundoplication is done. Postoperatively, nasogastric was continued for up to 3 days, and gradually, oral feeds were started. All the cases were discharged between 7 and 14 days. The postoperative follow-up period was 6 months to 2 years. Cases were followed up with respect to the history of symptoms, clinical examination, and barium esophagogram

done after 6 months of surgery. The parameters taken up for assessment of results were prompt relief of symptoms, weight gain, and improvement of nutrition. The barium esophagogram showed a decreased size of the lower end of the oesophagus.

Results and Discussion

There were 7 males and 5 females, with a male-female ratio of 1.4:1. The age at presentation is between 5 months and 11 years, with 11 or 12 patients presenting at less than 5 years of age. There were three patients who had been symptomatic since birth. A small accidental mucosal perforation occurred in one of the patients who underwent Nissen's fundoplication. The perforation was closed with Vicryl. On the 3rd POD, the patient developed an intraperitoneal leak and was taken up for an immediate laparotomy. The fundoplication was dismantled, the perforation was repaired, and Thal's procedure was done. The postoperative recovery was uneventful. Another patient who underwent Thal's procedure also had an accidental perforation of the mucosa during the procedure, but the patient went on without any complications. In the long-term follow-up, 2 patients with Nissen's procedure could not get relief of symptoms of dysphagia and persistent regurgitation after 6 months. In 1 patient, relaparotomy was done, Nissen's wrap was dismantled, and Thal's wrap was applied. The other patient did not come for a follow-up. The other 2 patients with Nissen's procedure showed symptomatic relief in the long-term follow-up. All the cases who underwent Thal's procedure have shown relief of symptoms within the first 3 months of follow-up, with good weight gain without reflux. A barium oesophagogram done 6 months after the procedure showed a decrease in the size of the lower end of the oesophagus with no evidence of GER. No mortality was recorded.

Table-1: Shows sex and age distribution.

Sex	Age	Duration of symptoms	Vomitings	Weight loss	Dysphagia	Aspiration	Constipation
M	1year	6months	+	+	-	-	+
M	11yrs	6months	+	-	+	-	-
F	5mnths	5months	+	-	-	+	+
M	1year	1year	+	-	-	+	+
F	7mnths	7months	+	-	-	-	+
M	4mnths	4months	+	+	-	+	-
M	6mnths	6months	+	+	-	-	-
F	5mnths	5months	+	+	-	-	+
M	6mnths	6months	+	+	-	-	-
M	6mnths	6months	+	+	-	+	-
F	8mnths	8months	+	+	+	-	+
F	1year	1year	+	+	-	+	-

Table2: shows PO(post-operative)complications, relief of symptoms.

Procedure	No. Of cases	PO complications		Relief of symptoms	Redo procedure
		Immediate	Delayed		
Nissen's	5	1	2	40	None
Thal's	7	Nil	Nil	100	2cases

In our study of 12 cases, 11 presented at less than 3 years of age, with 50% of patients presenting in infancy (Table 1). This has an unusually high incidence in a lower age group when compared to other international series. Three cases had symptoms since birth,

supporting the theory of acquired achalasia due to gastroesophageal reflux in the neonatal period, leading to chronic inflammation and stricture formation. Our mainstay of diagnosis was a barium esophagogram, which has proved to be 100% reliable, as evidenced by the operative findings and relief of symptoms following myotomy. We have followed the standard surgical procedure of modified Hellers esophagocardiomyotomy and fundoplication for the correction of pathology. None of our cases have received nonoperative procedures like medical modalities. Balloon dilatation or local botulinum toxin infiltration. Most of the international series claim a success rate of up to 60% and GERD of up to 30% following balloon dilatation. The rate of repeat procedures is also very high, requiring up to three dilatation sessions, with each sitting subjecting the child to the risks of general anesthesia. When compared to adults, children pose a different problem in the form of chronic malnutrition and a failure to thrive with a small safety margin. Hence, these patients demand prompt and immediate relief of symptoms following the procedure, which can be best achieved by operative intervention. In the present series of twelve cases, 7 cases underwent Thal's procedure for the first time, and 2 cases underwent a redo procedure (Table 2). Apart from two accidental mucosal perforations, no intraoperative or postoperative catastrophes have occurred. In one of the two perforations where Thal's procedure was done, a leak has occurred. In the other case of perforation with Nissen's procedure, an intraperitoneal leak occurred, which was re-explored, and Thal's fundoplication was done, which also did well postoperatively. Hence, out of 3 operations for 2 perforation sites, along with preventing GER, the reason for this could be that the wrap in Thal's procedure, which completely covers the raw area created up to the level of the diaphragm over the myotomy, gives effective protection for the prolapsing mucosa. Whereas in Nissen's procedure, though the wrap covers the raw area to a certain extent, it cannot provide complete protection and coverage for the defect. There were two patients who had persistent symptoms following Nissen's procedure, one of whom underwent Thal's procedure. The other case was lost for follow-up. The other two patients with Nissen's fundoplication showed equally good results as those with Thal's procedure.

DISCUSSION

Numerous studies have been conducted on achalasia, with different approaches to surgical treatment being explored. In a study by Constantine T. Frantzides et al., they found that minimally invasive esophagomyotomy has become the preferred surgical treatment for achalasia⁶. However, the use of a concomitant fundoplication with the myotomy remains controversial. The study involved a retrospective analysis of 53 patients with achalasia who underwent laparoscopic Heller myotomies. Fundoplication was performed in all patients except one, with 48 of them receiving a complete fundoplication known as "floppy Nissen." The study reported no deaths or reoperations, and only minor complications occurred in three patients. The long-term results were considered good to excellent in 92% of the subjects, with a median follow-up of 3 years. Only two cases (4%) of persistent postoperative dysphagia were documented, one of which was successfully treated with dilatation. Postoperative reflux occurred in five patients, four of whom did not receive a complete fundoplication. However, these patients were effectively managed with medical therapy. Based on their findings, the authors suggest that laparoscopic Heller myotomy and floppy Nissen fundoplication can be a successful treatment option for esophageal achalasia, with an acceptable rate of postoperative dysphagia.

In another study by Christopher D. Wells et al., they highlight the rarity of coexistent Barrett's esophagus (BE) and achalasia in patients who have not undergone prior surgical myotomies or pneumatic dilation. The study reports the case of a 65-year-old female who was diagnosed with achalasia in June 2002. Initial endoscopy showed normal esophageal mucosa, but subsequent trials of botox injection led to worsening dysphagia. A repeat endoscopy two years later

revealed a short segment of salmon-colored mucosa in the distal esophagus, which was confirmed to be Barrett's epithelium with no dysplasia. Eventually, the patient underwent a laparoscopic Heller myotomy and Toupet fundoplication. This case highlights the unique coexistence of achalasia and Barrett's esophagus and the importance of appropriate surgical intervention in such cases⁷. After the surgery, she had a smooth recovery and experienced significant improvement in her difficulty swallowing. This research examines documented cases of both achalasia and Barrett's esophagus (BE) occurring together and explores potential causes for the coexistence of these conditions and the implications for treatment.

In a study conducted by Surinder Singh Rana et al., an alcoholic male patient, aged 63, presented with progressively worsening dysphagia over a period of 6 months. An upper gastrointestinal endoscopy revealed an enlarged esophagus with food residue as well as esophageal varices. Esophageal manometry confirmed the presence of classic achalasia cardia. Further examination using endoscopic ultrasound (EUS) showed collateral blood vessels around the esophagus and prominent blood vessels at the lower end of the esophagus. The combination of varices and achalasia is extremely rare, and this particular case presented a challenging treatment dilemma due to the risk of bleeding from the varices, which limited the available treatment options. However, the patient was successfully treated with an EUS-guided botulinum toxin injection⁸.

In another study by Julpikar Sarkavas et al., a 35-year-old non-smoking male patient presented with a history of recurrent respiratory tract infections, along with intermittent coughing up of blood and vomiting of blood since childhood. The patient's vital signs were normal, with a pulse oximetry saturation level of 97% on room air. A physical examination revealed clubbing of the fingers. Chest auscultation detected tubular bronchial breath sounds over the right half of the chest⁹.

In this investigation, Sanjay Rajput and colleagues examined 25 patients with achalasia cardia who had previously undergone esophageal manometry before balloon dilatation (Group-A) and were later called back for clinical assessment. Another set of 25 consecutive patients with newly diagnosed achalasia (Group B) underwent esophageal manometry and isotope transit studies both before and after dilatation. The findings revealed that the overall symptom response to dilation among the 50 patients, with a median follow-up of 26 (1–60) months, was 64%. Pre-dilatation clinical and laboratory parameters did not serve as predictors for the outcomes. Patients who exhibited lower esophageal sphincter basal pressure of 10 mm Hg or less and residual pressure of less than 6 mm Hg one week after dilatation were asymptomatic during follow-up. The study concluded that post-dilatation LES basal pressure and residual pressure could be used as indicators for symptom response to balloon dilatation in patients with achalasia cardia¹⁰.

CONCLUSION

Achalasia is seen relatively with increased incidence in younger age groups, like infants. The barium esophagogram shows 100% accuracy in diagnosing the achalasia of the esophagus. Thal's fundoplication shows 100% efficacy in preventing GERD and relieving symptoms following Heller's esophagocardiomyotomy and proved to be an effective procedure in comparison with Nissen's fundoplication. In cases of accidental mucosal perforation, Thal's wrap is a better procedure for preventing leaks. Thal's fundoplication is efficacious in preventing gastro-esophageal disease in children. After mucosal perforation and leaks, Thal's wrap is a better procedure.

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