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Transhiatal esophagectomy in children with corrosive esophageal stricture

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Summary

Ten children with corrosive esophageal strictures were referred for esophageal replacement. The children whose ages ranged between 2 and 6 years (mean 4.1 ± 1.4 years) had transhiatal esophagectomy (THE) and immediate posterior mediastinal transposition of their isoperistaltic stomach and cervical esophagogastrostomy. No patient had a gastric drainage procedure. All patients had nasogastric tube and a cervical perianastomotic drain until full oral intake resumed. Anastomotic leakages were managed by trans-oral irrigation (TOI) and postoperative feeding was through jejunostomy. Postoperative elective mechanical ventilation was for between 24 and 60 hours. Pleural entries were the commonest complication and they occurred in 6 patients (60%), unilateral in 2 patients, bilateral in 4 patients. Cervical anastomotic leaks and strictures occurred in 2 patients (20%) and 3 patients (30%), respectively, and the 2 patients (20%) who had anastomotic leaks and stricture had associated hoarseness. Though the incidence of complications was high, these responded well to appropriate treatment. There was no mortality in the series. THE and esophageal replacement with isoperistaltic stomach in the posterior mediastinum is a safe and useful procedure in the management of corrosive esophageal stricture in children.

Keywords: *Transhiatal, esophagectomy, corrosive stricture, children.*

Résumé

Dix enfants sonffrant des 'conosive esophageal strictures' ont ete referes on remplacement de l'esophageal? Les enfants don't l'age varie entre 2 et 6 aus (myenne 4.1 ± 1.4 ous) avaient esophagectomie transliatal (ETH) et la transposition mediastinale posterieure immediate de leur estomac isoperistaltique et esophagopastrotomie ceruircale (du con). Aucum patient n 'await la procedure d'imigation gastrique. Tous les patients sonffraient du tube masogastrique et du drainage perianastomique cervical jusqui au retour complet du traitement oral. masogastrique et du drainage perianastomique cervical juiqui au retour complet du traitement oral. jusqui au retour complet du traitement oral. masogastrique et du drainage perianastomique cervical juiqui au retour complet du traitement oral. Les fuites anastomotiques ont ete controllies par l'imigation trans – orale (ITO) et la nutrition portoperatoire etait par jejumostome. La ventilation mecharigue postoperatoire etait entre 24 et 60 heures. Les entrees pleurales etaaient la complication commune chez 6 patients (60%), unilaterale chez 2 patient (20%), bilatirale chez 4 patients. Les pertes anastomotiques cervicales et structures ont apparu chez 2 patients (20%) et 3 malades (30%) respeitirement et les deux malades sonffrants des pertes anastomotiques et structure avaient associe a cela l'enrovement Bien que l'incidence des

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complications etait eleve, celleci repondaient bien an traitement. If n'a pas eu de mort dans la serie. Le remplacement de ETH et l'esophageale avec estomach isoperitaltique dans le mediastinum posterior est securisant et est une procedure utili dans le traitement de la structure esophageale consive cheq les enfants.

Introduction

The problems associated with esophageal stricture and the attendant disruption of normal swallowing are nutritional, fluid and electrolyte derangement, pulmonary complications of aspiration and psychological complication of the disability [1,3]. The aim of surgical treatment is to restore continuity thus allowing normal feeding and swallowing.

In patients with undilatable fibrotic stricture, reconstruction of the esophagus or esophageal substitution is necessary [2,6]. Various organs are used as esophageal substitutes and the routes for this purpose have been discussed elsewhere [2,4]. The merits and demerits of the substitutes have also been well summarized [4,7].

Increasing experience with esophageal reconstructive techniques has improved the operative mortality and morbidity and the function of the esophageal substitutes [3,8]. In patients with benign esophageal strictures especially children, satisfactory long-term function of a visceral esophageal substitute is a prerequisite [3,5,9,10]. The colon and stomach are the most common organs used to replace the esophagus [8,11]. The significant morbidity associated with colonic interposition in several large series involving children [12-14] and adults [10] has informed the evaluation of isoperistaltic stomach as a replacement.

Our experience with transhiatal esophagectomy (THE) and the isoperistaltic stomach as an esophageal substitute in adults with benign esophageal strictures and carcinoma [15], corroborated by experience of others in larger series [5,10] has strengthened our interest in applying this technique to children. We present a preliminary report of the use of (THE) in children with corrosive esophageal strictures.

Materials and methods

Between June 1992 and May 1998 ten children with corrosive esophageal stricture were referred to the Cardiothoracic Surgical Unit of the University College Hospital, Ibadan, for esophageal replacement. On admission, plain chest X-ray and barium study of the esophagus and stomach were done in all cases followed by esophagoscopy. Other investigations included packed cell volume, full blood count, serum electrolytes and urea, blood glucose and liver function test. All these patients had corrosive strictures limited to the thoracic esophagus.

Preoperative care included rehydration, correction of biochemical deficiencies and anaemia. The majority of patients had preoperative feeding jejunostomy to correct severe undernourishment. They were fed on high calorie, high protein liquids and vitamin supplements.

Surgical technique

Our technique of esophagectomy was patterned essentially after that described by Orringer and Sloan [16], and Szentpetary, Wolfgang and Lower [17]. It is a two team approach. The patient is placed supine with the face turned to the right side. The neck is maintained in slight hyperextension with a sand bag between the scapulae and a roll of towel behind the neck. The head is held in a head ring at the occiput.

Incision

The esophagus is exposed through a left oblique incision along the anterior sternomastoid muscle. The abdomen is entered through an upper midline incision. The alternative is an oblique left upper abdominal muscle cutting incision.

Procedure

Isolating the esophagus at the cervical end is enhanced by an intraesophageal tube. The dissection is done with care to avoid damage to the recurrent laryngeal nerves. Where there is extensive paraesophageal adhesion, the dissection is kept close to the wall of the esophagus to avoid injury to the nerve.

The dissection of the esophagus is further enhanced by a sling of Paul's tubing around it for traction. A plane of dissection between the membranous posterior surface of the trachea and anterior surface of the esophagus is continued distally to the level of the carina.

The stomach is mobilized with a kocker's manoeuvre performed, in order to obtain an appropriate length. The left gastric vessels and left gastro-epiploic vessels are ligated and divided. The right gastric and the right gastroepiploic vessels are preserved. As the short gastric vessels are ligated and dived, care is taken to avoid injury to the spleen.

The lower esophagus is exposed by dividing the phrenoesophageal membrane and the margins of the esophageal hiatus in the diaphragm are defined. The esophagogastric junction is encircled with a soft rubber tube (Paul's tubing). With downward traction, on the enercircling tube held in the left hand, the fingers of the right hand inserted through the diaphragmatic hiatus are employed in blunt dissection of the esophagus cephalad as far as the carina.

Traction on the freed esophagus at the cervical end can be applied to achieve posterior mediastinal placement of the freed stomach. Alternatively, the distal esophagus is transected distal to a ligature at the cardia and the esophagogastric junction is closed in two layers using 3/0 polyglycolic acid sutures (dexon). A heavy linen or silk suture is attached to the highest point on the gastric fundus and used to guide the stomach through the posterior mediastinum. Either way, rotation of the stomach around a longitudinal axis is prevented by careful attention to details.

A two year cervical esophagogastic anastomosis is done with interrupted 3/0 silk or dexon after fixation of the stomach to the prevertebral fascia. A form of telescoping of the esophagus into the stomach and fundopilcation is thus performed. A large caliber nasogastric tube is inserted during the anastomosis to act both as a stent and to decompress the stomach during the early post operative period. The pylorus is palpated between thumb and index finger for patency. No pyloromyotomy or pyloroplasty was done in this series. A soft rubber drain is placed at the site of the anastomosis and all wounds are closed in anatomical layers.

Post-operative pleural tap is done routinely and prophylactic intercostal pleural space drainage is done some-times because of the frequent occurrence of pleural entry. All patients had their preoperative feeding jejunostomy tube intact after surgery.

Post-operative care

The patient had elective endotracheal intubation with or without assisted ventilation for the first few days to reduce the incidence of respiratory distress. Endotracheal tube patency was ensured by regular suctioning using aseptic techniques. Pleural space drainage tubes were removed as soon as drainage was minimal.

All the patients had feeding via the jejunostomy tube as soon as bowel function returned and this was delivered by means of an intravenous giving set as a slow continuous infusion. Oral feeding was started on the tenth postoperative day while nasogastric tube and neck drain remained in situ and a drink of methylene blue was given to detect anastomotic leak.

When there was no anastomotic leak, the nasogastric tube was removed and a barium swallow was done to document the status of the anastomosis. The neck drain was subsequently removed when oral feeding was established.

In case of anastomotic leak, the nasogastric tube was left in-situ and trans-oral irrigation (TOI) with water was done after every trans-oral fluid or soft feeds. The nasogastric tube and neck drain were removed when documented healing had occurred. When anastomotic stricture occurred, healing was allowed for two weeks and the first dilatation was done. Three subsequent dilatations are done every 2 weeks and subsequently every month.

Results

The ten children had THE and immediate posterior mediastinal transposition of their isoperistaltic stomach as esophageal substitute and cervical esophagogastrostomy. The age of the patients ranged between 2 and 6 years (mean 4.1 _ 1.4 years). There were 7 males and 3 females.

Two of the patients had difficult cervical dissection especially at the level of the thoracic inlet due to extensive paraesophageal mediastinal adhesion. Two patients had unilateral and four had bilateral pleural enteries and were appropriately treated. There were no postoperative deaths in this series. Three patients were managed without mechanical ventilation in the first postoperative day but subsequently developed difficulty with ventilation which informed our policy of elective ventilation. The period of postoperative mechanical ventilation care ranged between 24–60 hours. Cervical anastomotic leak occurred in the two patient who had extensive paraesophageal adhesion. They were 3 and 6 years old. These patients responded to trans-oral irrigation and eating around the nasogastric tubes. The anastomotic leaks were clinically sealed within 5 days.

There were anastomotic strictures in 3 patients which included the 2 patients who had anastomotic leaks. All these responded to esophageal dilatations. Two patients had vocal cord paresis which had improved considerably. The complications of surgery are indicated in the table.

The period of postoperative hospitalization ranged between 18 and 30 days. Patients were initially seen every two weeks when frequent esophageal dilation became necessary in three patients. The remaining seven patients were seen monthly in the first 6 months and every three month till date. Only one patient needed dilatation of the

Table: Complication of surgery

Complications	No. of patientSpace (n)	%
Pleural entries	6	60
Unilateral	2	
Bilateral	4	
Anastomotic strictures	3	30
Cervical anastomotic leak	2	20
Vocal cord paresis	2	20

esophagus at 9 months post-operative. No stricture was demonstrable at bouginage. The patient has not complained of difficulty in swallowing in subsequent visits. There were no difficulties establishing full oral feeding. None of the patients in this series developed delayed gastric emptying. The period of follow up has ranged between 2 and 7 years.

Discussion

Transhiatal esophagectomy (THE), the use of isoperistaltic stomach via the posterior mediastinum as esophageal substitute and cervical esophagogastrostomy has become a safe and efficient procedure in our hands in the management of benign and malignant esophageal disease [15].

The esophagus may be replaced or by-passed by means of the antethoracic (subcutaneous), substernal (or retrosternal) or posterior mediastinal routes [3,8]. The posterior mediastinal route is the most direct and natural compartment between the mouth and the stomach[3] and also the shortest [8].

While esophageal substitution with the colon involves three anastomoses, that with isoperistaltic stomach is completed with only one anastomosis [8] and isoperistaltic stomach is long enough to reach the hypopharynx [18, 19]

The long segment colon interposition has been said to be the best and most natural esophageal replacement after thoracic esophagectomy for benign disease because it preserves the gastric resevoir [20]. The long-term functional results and associated morbidity in various large series have informed the change towards the use of stomach in adults [3,2] and children [4,5,14] with benign esophageal diseases.

A very high incidence (25% to 40%) of gastroesophageal reflux occurs in patients with an intrathoracic esophagogastric anastomosis [22]. It is therefore advisable that intrathoracic anastomosis be avoided for benign disease because the attendant reflux esophagitis would produce recurrent esophageal obstruction [10]. Orringer believes [10] that clinically significant gastroesophageal reflux with a cervical esophagogastric anastomosis is rare, so long as the cricopharyngeous sphinter is intact.

We did not perform pyloromyotomy nor pyloroplasty in this series because of the experience we had in two patients who had dumping syndrome in a previous series consisting of retrosternal esophageal bypass using the isoperistaltic stomach. The dumping in these patients resulted in significant morbidity. Intrathoracic stomach does not contribute actively to the propulsion of food into the upper digestive tract [22]. Our experience with omission of pyloromyotomy or pyloroplasty so far is that an intact pylorus at surgery did not result in gastric retention. We agree with Wolfe [23] that the use of a drainage procedure should be reserved for patients who deserve it. Additionally, other studies have documented an accelerated emptying time for a semisolid meal from an intrathoracic stomach in the absence of pyloroplasty [24, 25].

The policy of routine postoperative thoracocentesis and immediate insertion of intercostals tube connected to pleural drainage system as practiced in this study, coupled with elective mechanical ventilation, limited the usual early respiratory problems.

The nasogastric tube sutured to the anterior aspect of the nasal septum acted both as a stent and to decompress the stomach. The importance of the nasogasric tube for gastric decompression to improve ventilation after THE has been emphasised [5].

Although the absolute number of post-operative complications is high, the relative significance of these complications are inconsequential with respect to outcome. The most frequent of these is pleural entry and haemothorax. They were easily treated by the insertion of a chest tube. Anastomotic leakage, anastomotic stenosis and hoarseness of voice occurred in the two patients who had extensive paraesophageal adhesion which rendered the esophageal dissection difficult. The paraesophageal adhension also significantly compromises the local blood supply, further hindering the healing process. The process of trans-oral irrigation is a modification of transesophageal irrigation employed for management of esophageal perforation and mediastinitis [27]. We have employed this technique to manage various severity of cervical esophageal-gastric anastomotic dehiscence. Many methods have been described [28,29,30] to enhance healing of anastomotic dehiscence, we believe trans-oral irrigation (TOI) has a definite place in the rapidity of the healing we had in these patients. The nasogastric tube we employed preserved a lumen enhancing distal flow of oral intake and a lumen for subsequent dilatation. The para-anastomotic drain exteriorised the flow of leaked material and irrigant. This procedure (TOI) also helps in detoxification of the patients [1].

All our patients were discharged within four weeks of the procedure with minimal morbidity. The most frequent of which is anastomotic stricture that responded to outpatient bouginage. In the period of follow up which ranged between 2 and 7 years only one patient required dilatation at 9 months post-operatively and the anastomotic site at bouginage was easily dilated to size 38-39 FG. Two types of post-operative dysphagia are described in the literature. The dyshagia consequent upon anastomotic stricture and the dysphagia related to the patient's awareness of the transition between his peristaltic esophagus and the more passive esophageal subtitute even though there is no anastomotic narrowing [10]. Orringer described this phenomenon to be more prominent the higher the anastomosis. This was probably the cause of the disphagia in the patient dilated at 9 months postoperative.

Exercise tolarance which was reduced initially in these patients improved with increase in muscle bulk.

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