Esophageal caustic injuries and colon interposition in children: Long-term follow-up

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ABSTRACT  

Background: As sodium hydroxide (NaOH) is frequently used as a cleaning agent for air conditioners in southern Iran, caustic esophageal injuries happen frequently especially in children. After undergoing several dilatation procedures of the esophagus, a number of these patients eventually require colon interposition, an operation by which the esophagus is replaced by a segment of colon. Colon interposition is a surgical treatment modality for patients with severe caustic injuries in the esophagus. This study describes the technique and results of colon interposition in patients who had undergone this operation.  

Materials and Methods: All patients who underwent colon interposition in Nemazee Hospital affiliated to Shiraz University of Medical Sciences in southern Iran from April 1990 to April 2005, were enrolled in our study. Medical records of these patients were reviewed and they were called for a follow-up examination. Out of 18 patients, only eight patients responded. They underwent clinical examination, laboratory tests, imaging and endoscopy. Results: Growth retardation was seen in all cases. All radiographs of the chest revealed peribronchial thickening. Redundancy was seen in 60% of the patients. Lower junction stenosis, diverticulum and dilatation of the esophagus were commonly visible. Epigastric fullness (85%), dysphagia (57%), halitosis (45%), heartburn (45%), vomiting (45%), odynophagia (28%) and abdominal pain (28%) were the most common complications. There were no mortalities in our series. Conclusions: As growth retardation was the most common complication of colon interposition in children, an appropriate nutritional support seems to be necessary after the operation.  

Key words: Caustic injury, children, colon interposition, complications, esophagus  

Injuries due to caustic substances are still a worldwide problem in pediatric surgery. Children under the age of five years form the highest risk group for accidental injuries, as they are able to find and drink fluids without paying attention to their toxic effects. The severity of the injury may depend on the characteristics of the caustic substance such as concentration, pH and amount of fluid swallowed and duration of contact with the mucosa. Since alkaline substances penetrate rapidly and cause liquified necrosis, they result in more extensive damage than acidic substances. When children swallow caustic substances, there is a broad range of clinical manifestations from mild to very severe injuries. One of the complications of swallowing caustic substances is esophageal burn that can result in esophageal stricture. Since 1981, balloon dilatation under fluoroscopy has been recognized as a suitable method for patients with more than one stricture. In patients who require recurrent dilatation of the esophagus, operations such as colonic or jejunal interposition can be used. In the USA, the right colon is most commonly used in such operations, but in the UK, it is the left colon. The segment of the colon can be used in either an
isoperistaltic or an antiperistaltic manner.

MATERIALS AND METHODS

All patients who underwent colon interposition for esophagus in Nemazee Hospital affiliated to Shiraz University of Medical Sciences in southern Iran from April 1990 to April 2005 and in whom the primary cause of esophageal injury was caustic substances, were enrolled in our study. Medical records of all these patients were reviewed and these patients were all called again to the hospital. They were interviewed and underwent laboratory tests and imaging including complete blood counts, stool exams, serum iron and serum iron binding capacity, chest X-ray, barium swallow (and in some cases, upper gastrointestinal barium study) and endoscopy. All the films were viewed by one radiologist. Finally, the patients were informed about the necessity of continuous follow-ups, the benefits of recurrent referrals to the clinic and the importance of a nutritionist consult.

RESULTS

Among 18 patients who underwent colon interposition from 1990 to 2005, the transverse colon was used in 12 cases, left colon in two cases and transverse plus right colon in one case. In the three remaining cases, the type of colon was not mentioned in the operation notes. Colon interposition was done in an antiperistaltic manner in four patients and in isoperistaltic manner in the other four, there being no clear detail for the remaining ten patients. The age range of subjects was 11 months to 12 years with a mean age of 2.7 years. Esophageal biopsies did not show any malignant changes. There was only one case of metaplasia and four patients had no pathology report in their files. Among 18 patients, only two cases needed esophageal dilation after colon interposition whereas the rest required several esophageal dilations before their operation (mean = 6.65 times). In 12 subjects, the colon segment was anastomosed to the stomach, in three cases to the esophagus and in the other three, there being no clear detail for the site of anastomosis, which were associated with pseudodiverticulum.

Abdominal pain. All patients had abnormal growth and their weights were under the 10th percentile for age (three patients were under the 5th percentile). None of the subjects reported fistula or oozing from the site of operation. Among the eight patients of our center, seven subjects underwent barium swallow and seven cases underwent endoscopy. Barium swallow showed colon segment redundancy in three (dilatation of the tract in three and strictures in two cases). Another two cases had strictures based on endoscopy as the 6 mm scope did not pass through. Two subjects had extrathoracic segments. In one patient, no stricture or dilation was seen in barium swallow but endoscopy clearly showed a stricture through which the endoscope could not pass. In upper endoscopy, two patients had normal findings and two had pseudodiverticulum. Out of three patients with abnormal findings in endoscopy, one had upper esophageal stricture and two had stricture at the site of lower anastomosis, which were associated with pseudodiverticulum.

DISCUSSION

Esophageal injuries due to alkaline caustic substances such as NaOH is common because NaOH is a colorless substance without any smell. As it can easily be mistaken for water, a small amount of the material may cause severe burns. Taiwan is similar to our country with respect to esophageal injuries with caustic substances. Dumpling oil, a food preservative used in Taiwan, is an alkaline substance like NaOH but there are no obvious warning signs on the bottle. A practical solution is for the factories to use additives with strong tastes and smell. However, labeling seems to be the cheapest and most practical way to prevent esophageal injuries. Flashy colors and simple pictures can be used on the labels to make the children understand. Studies in Taiwan showed that most patients (88%) with second-degree burns had a lower functional recovery than normal, and undergoing operation and dilation procedures did not change the prognosis. Endoscopy within the first 48 hours is valuable in determining prognosis. There was a difference between our country and Taiwan with regards to cases under the age of 18 years. There were four cases of suicide among the 24 patients in the study in Taiwan, whereas none of the esophageal injuries in our study was due to suicide.

Growth retardation was a common finding in patients who had undergone colon interposition. Besides a decrease in weight and height, the patients looked significantly thinner and shorter than normal people of similar age and in some cases, dorsal interosseous atrophy of the hands was observed. Therefore, a nutritionist consult before, during and after the operation is important for these patients.

The patients differed in complaining of odynophagia
and dysphagia. Some of them reported mild symptoms in spite of significant radiographic and endoscopic strictures. They “had learnt” how to eat and had adapted themselves with the complications. The highest level of adaptation was seen in a person who had undergone operation a long time ago (more than ten years). Routine laboratory tests did not help in predicting complications and screening the patients. Progressive tortuosity and redundancy of the replaced colonic segment, observed in 60% of the patients, is due to faster growth of the colon as compared to the rib cage which leads to stasis, inflammation, obstruction and aspiration.[13] Therefore, postponing the operation as long as possible may reduce growth differences and tortuosity of the segment. In spite of a poor general condition with regards to odynophagia, dysphagia, reflux and other complications, one patient had adapted well and had not sought medical attention. In this patient, the endoscope did not pass through the lower anastomosis but a pseudodiverticulum was observed. The endoscopist might not have found the opening of colon. Therefore, barium swallow and endoscopy were complementary to each other for patient follow-up. Another common complication of colon interposition includes dilatations and strictures. The anastomosed colon segment, which is a functionless tube and has no peristalsis, starts to dilate and after a while, stricture occurs due to inflammation and scarring. Although barium swallow studies showed a higher prevalence of dilatation than stricture, endoscopic studies demonstrated the reverse results. But, the difficulty of endoscopy of the anastomosed colon segment due to tortuosity should be taken into consideration. Strictures of inferior anastomosis were more prevalent than those of the superior and both were associated with pseudodiverticulum. This might be due to longer duration and larger amount of food stasis in the inferior strictures.

ACKNOWLEDGMENTS

The authors would like to thank the Office of Vice Chancellor for Research of Shiraz University of Medical Sciences for financial support of this study and the Center for Development of Clinical Research of Nemazee Hospital for editorial and typing assistance.

REFERENCES