ORIGINAL ARTICLE

COMPARISON OF POST-OPERATIVE COMPLICATIONS OF COLONIC INTERPOSITION AND GASTRIC PULL UP SURGERY AMONG CORROSIVE ESOPHAGEAL STRICTURE PATIENTS

Harshal G Mistry[1], Ronak Desai[1], Akash R Vagani[2], Kiran N Patki[3]

Author's Affiliations: [1]Resident; [2]Associate Professor; [3]Assistant Professor, Dept. of Surgery, SMIMER, Surat, Gujarat.
Correspondence: Dr Harshal G Mistry Email: hrshl_mistry@yahoo.com

ABSTRACT

Introduction: The objective of the study to compare outcome and complications of Colonic interposition and Gastric pull-up in treatment of corrosive esophageal stricture.

Methodology: This cohort study was conducted on the patients admitted in the surgical wards of SMIMER hospital, Surat with clinically diagnosed corrosive esophageal stricture. The cases were then followed for a period of 6 months from the date of commencement of surgical procedure.

Results: The study included 25 patients of corrosive oesophageal stricture, 12 were operated by colonic interposition and 13 were operated by gastric pull up method. Most common reason for indication of surgery was failure to dilatation. Mean duration of surgery of patients operated by colonic interposition method was 5.41 hours while it was 3.57 hours for patients operated by gastric pull-up method. Mean post-operative pain score of patients operated by colonic interposition method was 4 while it was 2.77 for patients operated by gastric pull-up method.

Conclusion: Gastric pull up was better method compared to colonic interposition in the management of corrosive oesophageal stricture due to the relative technical ease, excellent healing power of the anastomosis, wide anastomotic stoma at the neck and only one single anastomosis is required.

Key Words: Colonic interposition, Gastric pull-up, corrosive esophageal stricture

INTRODUCTION

Esophageal strictures are a problem frequentlyencountered by gastroenterologists, and they canbe subdivided into those with a malignant originand those with a benign origin. Malignantesophagealstrictures are mainly caused by primaryesophageal cancer. More than 50% of patientswith esophageal cancer have incurable diseaseat presentation.Most of these patients require palliative treatmentto relieve dysphagia.[1]In particular, strictures caused by radiation or caustic injury and anastomotic strictures are the most resistant to endoscopic dilation, which is the customary treatment modality.[2]Upper endoscopy is the diagnostic procedure of choice for the detection of an esophageal stricture and its underlying cause. Nevertheless, it is mandatory that biopsy samples are taken to confirm whether the stricture is benign or malignant in nature, particularly if the suspicion of malignancy is high. Most treatment options available for the relief or treatment of dysphagia can be performed endoscopically.[3]

Surgical management is indicated in patients with failed dilatation, patients with complications such as perforation after endoscopic dilatation and where the location of the stricture or length of the stricture makes endoscopic management impossible. Broadly, surgical management consists of either esophageal bypass with the esophagus left *in situ* or esophagect-

omy and replacement with a conduit. The routes of esophageal replacement could be anterior mediastinum, transpleural or posterior mediastinum.Several techniques have been used for esophageal replacement after corrosive esophageal injuries. The colon and stomach are the most commonly used conduit for esophageal substitution. In the present study, the patients were divided into two groups:first group were thosetreated with esophagectomy and colon interposition using isoperistalsis colonic segment through transhiatal approach and others were those who underwent gastric pull-up and pyloroplasty.

OBJECTIVES

This study was conducted to analyze which is the better surgical procedure between Colonic interposition and Gastric pull-up in treatment of corrosive esophageal stricture and also to find out the proportion of intra-operative and post-operative complications in both the groups.

METHODOLOGY

Study type and study setting: This was the cohort study conducted on the patients admitted in the surgical wards of all units of the SMIMER hospital, Surat with clinically diagnosed corrosive esophageal stricture.The duration of study was spread over two and half years. All the patients who were diagnosed with corrosive esophageal stricture from July 2012 up to March 2014 were enrolled in the study. The cases were then followed for a period of 6 months from the date of commencement of surgical procedure for the management of corrosive esophageal stricture. The last date for the follow-up of case was 30th September 2014 i.e. exactly six months after the last day of period of enrollment of the last case. The data entry was done simultaneously with the enrollment of the cases in the study. The data cleaning and the retrieval of the missing data were done over a period of one month after collection of data.

Sampling Method & Sample Size: All the patients who were diagnosed with corrosive esophageal stricture and in whom esophageal replacement was indicated due to failure of esophageal dilatation, multiple strictures, and long segment stricture, iatrogenic endoscopic perforation were included in the study. These patients were enrolled in the study after taking written informed voluntary consent and persuading patients with possible benefits/risks of study.

Inclusion criteria: Patients above 18 yearscoming to the institute with corrosive esophageal stricture withoutany underlying pathology like infection, immuno-suppression, anemiaand in whom esophageal replacement was indicated were included in this study.

Exclusion criteria: Patients with other intestinal pathologywhich can alter the results of the study, those below 18 years and those who were unfit for anesthesiawere excluded from the study.

Study Tools: The study was conducted by pretested semi-structured questionnaire. The information regarding clinical symptoms and signs like fever, dysphagia, bowel habits, vomiting, abdominal pain and regurgitation were collected on the questionnaire. Clinical parameters like blood pressure, pulse, respiratory rate, temperature and laboratory parameters like hemoglobin count and total count was collected.

The finding of the barium swallow was also noted with ultrasonography of esophagus and stomach to know the location of stricture. The intra-operative and immediate post-operative complication after the surgery was also noted on the data collection sheet. The first follow-up was done at the end of 3 months from date of surgery to know the outcome of cases in terms of survival. At 6 months again the patient was followed to know the survival status, any follow up complications like fistula and stricture or reoccurrence status.

The patients were randomly divided into two groups, group A includes all the patients operated by colonic interposition using iso-peristalsis colonic segment through transhiatal approach and group B consist of all the patients operated by gastric pull-up with pyloroplasty. Once patients undergo for surgery intra-operative stricture site, stomach and colon's conditions, total time taken for surgery (in hours) were noted. In the present study abdominal dissection was done first followed by transhiatal esophago-gastric or esophago-colic anastomosis done in neck with one drain was put in neck and other drain kept intra-abdominally and removed once output was considered insignificant from 2-6 days after surgery. Intra-operative complications like bleeding, pneomothorax, left recurrent laryngeal nerve injury or anything else were also recorded.

Postoperative period time required for ambulation (in no. of days), post-operative pain according to vas scale(1 to 10), illeus, seroma/hematoma formation,

cervical fistula formation, regurgitation, stricture and systemic complications like cardiopulmonary complication, UTI, DVT recorded and treatment taken for it also noted. Postoperative condition of patient –any wound infection, day on which suture removal done, condition of wound after suture removal, duration of hospital stay (no.of days), recurrence (in months after surgery) were also recorded.

Ethical Issues: Owing to ethical considerations, strict confidentiality of data has been maintained and permission has been obtained from Institutional Ethical Committee (IEC) of SMIMER before conducting the study.

Data analysis: Data management and analysis was done using Microsoft excel and Epi-info software. Double data entry procedure was adopted and digitized data were checked for completeness and consistency. The categorical variables were assessed using Pearson chi-square.

RESULTS

The study included 25 patients of corrosive oesophageal stricture, 12 were operated by colonic interposition and 13 were operated by gastric pull up method. Following table shows comparison of various pre-operative, intra operative and post-operative variables between two groups.

Table 1: Sex, Age & Duration of symptoms wise distribution of patients in both the groups

Variables	Colonic inter position	Gastric pull-up
Sex		
Male (%)	6 (50.0)	9 (69.2)
Female (%)	6 (50.0)	4 (30.8)
Age (Mean (SD))	41.6 (7.38)	47.8 (7.48)
Symptoms Duration (M (SD))	62.5 (4.48)	61.1 (6.19)

Mean age of patients operated by colonic interposition method was 41.58 year with standard deviation of 7.4 while it was 47.85 years with standard deviation of 7.5 for patients operated by gastric pull-up method.Mean duration of symptoms of patients operated by colonic interposition method was 62.50days with standard deviation of 4.4 while it was 61.08days with standard deviation of 6.1 for patients operated by gastric pull-up method.

Table 2: Diagnosis & Location of stricture wise distribution of patients in both the groups

Variables	Colonic Inter-position (%)	Gastric pull-up(%)
Diagnosis		
Multiple stricture	3 (25.0)	3 (23.1)
Long segment Stricture	3 (25.0)	3 (23.1)
Iatrogenic perforation	2 (16.7)	3 (23.1)
Failure to dilatation	4 (33.3)	4 (30.8)
Location of stricture		
Two Segment	3(25.0)	2(15.4)
Short Segment	3(25.0)	2(15.4)
Long Segment	6(50.0)	9(69.2)

Most common reason for indication of surgery was failure to dilatation in 33% cases in colonic interposition and 30.8% in gastric pull up method. Above table shows distribution of all causes in both groups. Stricture was present in long segment in 50% cases among patients operated by Colonic interposition while it was there in 60% cases among patients operated by Gastric pull-up. All patients in both methods were operated under general anaesthesia.

Mean duration of surgery of patients operated by colonic interposition method was 5.41 hours with standard deviation of 1.63 while it was 3.57 hours with standard deviation of 0.49 for patients operated by gastric pull-up method. This difference was statistically significant indicating that duration of surgery is less in gastric pull up method. Mean post-operative pain score of patients operated by colonic interposition method was 4 with standard deviation of 1.7 while it was 2.77 with standard deviation of 1.3 for patients operated by gastric pull-up method. This difference was statistically significant indicating that post-operative pain was less in gastric pull up method.

Mean duration of drain removal of patients operated by colonic interposition method was 26days with standard deviation of 3.17 while it was 14.23 days with standard deviation of 2.3 for patients operated by gastric pull-up method. This difference was statistically significant indicating that drain can be removed early in gastric pull up method. Mean Days of starting oral feed of patients operated by colonic interposition method was 28.42 days with standard deviation of 3.18 while it was 15.69 days with standard deviation of 2.25 for patients operated by gastric pull-up method. This difference was statistically significant indicating that oral feed started early in gastric pull up method.

Mean post op Wellbeing score of patients operated by colonic interposition method was 2.62 with standard deviation of 0.87 while it was 3.50 with standard deviation of 0.90 for patients operated by gastric pull-up method. This difference was statistically significant indicating that post op wellbeing score is better in gastric pull up method. Mean Hospital stay after surgery of patients operated by colonic interposition method was 29.25days with standard deviation of 3.04 while it was 22.92 days with standard deviation of 4.11 for patients operated by gastric pull-up method. This difference was statistically significant indicating that post op hospital stay is less in gastric pull up method.

Table 3: Duration of surgery, Post-operative pain score, Day of drain removal and Hospital stay wise distribution of patients in both the groups

Variables	Colonic interposition [Mean (SD)]	Gastric pull-up [Mean (SD)]	P value
Duration of surgery	5.417 (1.6337)	3.57 (0.4935)	.000
Post-operative pain Score	4.00 (1.706)	2.77 (1.301)	.043
Day of drain removal	26.08 (3.175)	14.23 (2.351)	.000
Days of starting oral feed	28.42 (3.118)	15.69 (2.250)	0.001
Post-operative Wellbeing score	2.62 (.870)	3.50 (.905)	.020
Hospital stay after surgery	29.25 (3.049)	22.92 (4.112)	.000

Table 4: Post-operative complications wise distribution of patients in both the groups

Post-operative Complication	Coloniciterposition (%)	Gastric pull-up (%)	P value
Bleeding	3 (25.0)	1 (7.7)	0.16
Cervical fistula	4 (33.3)	2 (15.4)	0.202
Pneumothorax	2 (16.7)	3 (23.1)	1
Haemothorax	2 (16.7)	1 (7.7)	0.322
Wound infection	3 (25.0)	1 (7.7)	0.16
Chest infection	3 (25.0)	2 (15.4)	0.378
Vomiting	2 (16.7)	2 (15.4)	0.645
Fever	4 (33.3)	2 (15.4)	0.378

Bleeding was found in 3 cases among patients operated by Colonic interposition while it was found in 1 case among patients operated by Gastric pull-up. This difference was statistically not significant.Cervical fistula was found in 4 cases among patients operated by Colonic interposition while it was found in 2 cases among patients operated by Gastric pull-up. This difference was statistically not significant.Pneumothorax was normal in 2 cases among patients operated by Colonic interposition while it was normal in 3 cases among patients operated by Gastric pull-up. This difference was statistically not significant.Hemothorax was normal in 2 cases among patients operated by Colonic interposition while it was normal in 1 case among patients operated by Gastric pull-up. Wound infection was normal in 3 cases among patients operated by Colonic interposition while it was normal in 3 cases among patients operated by Gastric pull-up. This difference was statistically not significant.Chest infection was found in 3 cases among patients operated by Colonic interposition while it was 2 cases among patients operated by Gastric pull-up. This difference was statistically not significant.Vomiting was found in 2 cases among patients operated by Colonic interposition while it was 2 cases among patients operated by Gastric pull-up. This difference was statistically not significant.Fever was found in 4 cases among patients operated by Colonic interposition while it was 2 cases among patients operated by Gastric pull-up. This difference was statistically not significant. In the follow up at 3 months fistula was present in 3 cases among patients operated by Colonic interposition while it was there in 1 case among patients operated by Gastric pull-up. This difference was statistically not significant.In the follow up at 3 months 2 patients were expired among patients operated by Colonic interposition while it was all were survived among patients operated by Gastric pull-up. This difference was statistically not significant.In the follow up at 6 months fistula was present in 4 cases among patients operated by Colonic interposition while it was there in 1 case among patients operated by Gastric pull-up. This difference was statistically

not significant.In the follow up at 6 months 2 patients were expired among patients operated by Colonic interposition while only one case died among patients operated by Gastric pull-up. This difference was statistically not significant.

DISSCUSSION

Mean age of patients operated by colonic interposition method was 41.58 year with standard deviation of 7.4 while it was 47.85 years with standard deviation of 7.5 for patients operated by gastric pull-up method. In the study conducted by Yong Han et al[4], mean age of the cases were 20.8 ± 2.5 years. In the study conducted by Eze JC[5] median 26 years with the age range of 14 - 45 years. Most common reason for indication of surgery was failure to dilatation in 33% cases in colonic interposition and 30.8% in gastric pull up method. In the study conducted by *Amel Hashishet et al*[6], indication of esophageal replacement was failure of dilatation (50%), multiple stricture (20%), Long segment stricture (16.6%) and iatrogenic perforation (13.3%). In the study conducted by Eze JC[5], long/segment multiple strictures 82.3%, undilatable strictures 11.8% and instrumental perforation 5.9%.

Mean duration of surgery of patients operated by colonic interposition method was 2.41 hours with standard deviation of 0.63 while it was 3.57 hours with standard deviation of 0.49 for patients operated by gastric pull-up method. This difference was statistically significant indicating that duration of surgery is less in gastric pull up method. In the study conducted by Amel Hashishet et al[6], the average duration of surgery for Colonic interposition was 2.75-3.5 hours while it was 2.0 – 2.5 hours in gastric pull up type. In the study conducted by Eze JC[5], mean time spent in colonic interposition was 306.8 ± 54.6 min. Mean post op pain score of patients operated by colonic interposition method was 4 with standard deviation of 1.7 while it was 2.77 with standard deviation of 1.3 for patients operated by gastric pull-up method. This difference was statistically significant indicating that post-operative pain was less in gastric pull up method.

In the current study, cervical fistula occurred in 33.3% of cases after colon interposition and in 15.4% after gastric pull up. This is similar to those results reported by Freeman 1982[7], and Stone et al 1986[8]. In most of the cases cervical fistula healed spontaneously. Ragab et al 1976 reported that the incidence of cervical leakage was 66.6%. They suggested that the fistula could be due to local causes in the wall of the esophagus because of corrosive or inadequate vascularity particularly venous stasis. All of their fistulae healed spontaneously after using the gastrostomy tube for feeding, and they have recommended that this is the advantage of having gastrostomy as part of colon transplant operation.[9]

Erdogan et al[10] reported 11 cervical leaks in 18 patients underwent esophageal replacement using the colon. They also reported 4 redundancies, 3 gastrocolic reflux and cervical anastomotic stenosis. Comparable findings were reported by Bassiouny and Bahnassy.[11] No significant redundancy or gastrocolic reflux has been noticed in our patients during the follow up period.

In the study conducted by Yong Han[4], cervical anastomotic leakage was found in 52.9% cases, cervical wound infection in 11.7%, anastomotic stenosis in 17.6%, intestinal obstruction in 5.8% and pneumothorax and aspiration pneumonitis in 5.8%. Efficient nutritional support is an integral part in the overall management with post corrosive esophageal stricture at pre and postoperative course. Gerndit and Orringer[12] used Robinson catheter for tube jejunostomy in 523 patients and recorded complications related to their jejunostomy in 11 patients (2.1%). Small bowel obstruction due to torsion at jejunostomy site in 5 patients, intraperitoneal leak of jejunal content in 2 patients, tube dislodgement in one patient, intraabdominal abscess in one patient and cutaneous stitch abscess at the jejunostomy tube site in 2 patients. To avoid these complications T-tube jejunostomy was used in our patients. T-tube has the advantage of being easy for application with fewer incidences of spontaneous extraction. In the present study, mean duration of drain removal of patients operated by colonic interposition method was 26 days with standard deviation of 3.17 while it was 14.23days with standard deviation of 2.3 for patients operated by gastric pull-up method. This difference was statistically significant indicating that drain can be removed early in gastric pull up method.

Mean post operation Wellbeing score of patients operated by colonic interposition method was 2.62 with standard deviation of 0.87 while it was 3.50 with standard deviation of 0.90 for patients operated by gastric pull-up method. This difference was statistically significant indicating that post op Wellbeing

score is better in gastric pull up method. The organs used for esophageal replacement in patients after caustic injuries included stomach, jejunum and colon in previous studies.[13] Stomach has the disadvantages of long-term gastro esophageal reflux, possible ulceration, anastomotic stenosis and progressive dysfunctional propulsion.[13]The stomach is always not long enough to reestablish a continuity of esophagus when anastomosis had to be performed in the neck because the diffused injuries of esophagus, when patients had to be given partial gastrectomy after caustic injuries. In our study partial esophagectomy and esophagogastrostomy were performed on the condition that strictures were located in the lower segment of esophagus. Jejunal interposition is seldom used because of the difficulty for operation since blood vessels of jejunum are too thin and easier to be affected after anastomosis. Furthermore, the jejunum is fragile to the erosion of acid in a long run, so the jejunum should not be the first choice. With good blood supply and improved somatic growth, colon is long enough for esophageal replacement, and it causes fewer late complications of esophagitis and stricture because of the resistance to acid. So colon could offer potential advantages over other organs[14], and is believed to be an ideal organ for the replacement.

Choice of colon segment as a graft is also a key point for reconstruction of esophagus. The left colon has been considered by many surgeons to be a preferable conduit for several reasons. But left colon interposition could always be used in an antiperistalic fashion, which may cause inflammation of the anatomosis, and affect the healing process. The choice of a colon segment for substitution in our study was also affected by the supply of blood vessels during operation, and the color of intestine, and pulsation of marginal arteries after the supplying artery of colon was clamped. The mortality and morbidity in the literature after colonic interposition was very high.[15] The most severe complication was complete necrosis of the transplanted colon. When it happened, a more complex reconstruction procedure should be considered. We had no experience in facing such a catastrophy. In 1 case, local necrosis in the proximal end of transplanted colon was observed when anastomotic leakage was diagnosed 3 d after the procedure. Considering the fact that most patients in whom esophageal disease was caused by caustic injury accompanied with bad nutritional status, this rate of postoperative complication after colon interposition is acceptable. Anastomotic leakage of the patients was managed by opening the cervical wound, and it seemed to have no effect on the late swallow ability of patients after anastomotic leakage compared with the patients without leakage in the follow up interviews. There was no death in the group. The outcome was favorable when compared with published literature.[15]

Mean Hospital stay after surgery of patients operated by colonic interposition method was 29.25days with standard deviation of 3.04 while it was 22.92 days with standard deviation of 4.11 for patients operated by gastric pull-up method. This difference was statistically significant indicating that post op hospital stay is less in gastric pull up method. In the present study, follow up at 3 months fistula was present in 3 cases among patients operated by Colonic interposition while it was there in 1 case among patients operated by Gastric pull-up. This difference was statistically not significant. During the same phase, patients were expired among patients operated by Colonic interposition while it was all were survived among patients operated by Gastric pull-up. This difference was statistically not significant.

In the follow up at 6 months fistula was present in 3 cases among patients operated by Colonic interposition while it was there in 1 case among patients operated by Gastric pull-up. This difference was statistically not significant. In the follow up at 6 months 2 patients were expired among patients operated by Colonic interposition while only one case died among patients operated by Gastric pull-up. This difference was statistically not significant. The results with respect to complications and survival are far better in gastric pull-up surgery as compared to colonic interposition.

In a study of 100 children with intractable caustic stricture, Bassiouny et al[16] concluded that isoperistaltic left colon, based on both ascending and descending branches of the left colic vessels with simultaneous esophagectomy utilizing the transhiatal approach is the best substitute for a scarred esophagus in those patients.[16] On the other hand, esophageal replacement with isoperistaltic stomach in the posterior mediastinum has been considered a safe and useful procedure in the management of corrosive esophageal stricture in children.[17] Thomas and Dedeo (1977) reported that gastric pull-up is more preferable than colon interposition, because of the privilege of having a single anastomosis with no thoracic or

abdominal anastomosis, excellent blood supply and good healing power of the anastomosis, which has a lager anastomotic stoma with minimal peptic ulcer complication.[18] The gastric pull-up has a lower morbidity with a fewer cervical anastomotic leaks (12.9% versus 48% in cases of colon interposition) and stricture (9.3% versus 30%).[19]

CONCLUSION

Our study concluded that gastric pull up is better method compared to colonic interposition in the management of corrosive oesophageal stricture due to the relative technical ease, adequate length can almost invariably be attained, excellent healing power of the anastomosis, wide anastomotic stoma at the neck, only one single anastomosis is required, and the robust blood supply of stomach and rich plexus of sub-mucosal arteriole ensure against the complications from ischemic necrosis.

REFERENCES

1. Siersema PD (2006) New developments in palliative therapy. Best Pract Res Clin Gastroenterol 20: 959–978.
2. Lew RJ et al. (2002) A review of endoscopic methods of esophageal dilation. J Clin Gastroenterol 35: 117–126.
3. Sandeep Mukherjee. Esophageal Stricture Clinical Presentation. Medscape available on http://emedicine.medscape.com/article/175098-clinical dated 12/12/2014.
4. Yong Han, Qing-Shu Cheng, Xiao-Fei Li, Xiao-Ping Wang. Surgical management of esophageal strictures after caustic burns: A 30 years of experience World J Gastroenterol 2004;10(19):2846-2849.
5. Eze JC, Ezemba N, Onyekwulu FA, Nwafor IA, Etukokwn K, Orakwe O. Right colon interposition in corrosive esophageal long segment stricture: Our local experience. Niger J Clin Pract 2014;17:314-9.
6. Amel Hashish, Khalid Ismail, Mohamed F Metwally, Essam Elhalaby, Hassan Abd Elaty, Ali Torky. GASTRIC PULL-UP VERSUS COLON INTERPOSITION IN TREATMENT OF CORROSIVE ESOPHAGEAL STRICTURE. Egyptian Journal of Surgery Vol. (22), No. (3), July, 2003
7. Freeman NV, Cass DT: Colon interposition. A modification of the Waterson technique using the normal esophageal route. J Pediatr Surg 17: 17, 1982
8. Stone MM, Mahour Gh, Weitzmann JJ, Fankalsurd EW and Takiff H: Esophageal replacement with colon interposition. Ann Surg 203: 346, 1986.
9. Ragaeb MI, Ramadan AA, Khalia MA: Management of corrosive esophagitis. Surgery 79: 494, 1976
10. Erdogan E, Emir H, Eroglu E, Danismend N, Yeker D: Esophageal replacement using the colon: A 15- year review. Pediatr Surg Int, 16: 456-459, 2000.
11. Bassiouny IE, Bahnassy AF: Transhiatal esophagectomy and colon interposition for caustic esophageal stricture. J Pediatr Surg 27: 1091, 1992.
12. Gerndt SJ, Orringer MB: Tube jejunostomy as an adjunct to esophagectomy. Surgery, 115:164, 1994.
13. Hirschl RB, Yardeni D, Oldham K, Sherman N, Siplovich L, Gross E, Udassin R, Cohen Z, Nagar H, Geiger JD, Coran AG. Gastric transposition for esophageal replacement in children: experience with 41 consecutive cases with special emphasis on esophageal atresia. Ann Surg 2002; 236: 531-539.
14. Deschamps C. History of esophageal surgery for benign disease. Chest Surg Clin N Am 2000; 10: 135-144.
15. Ma QF, Liu K, Wang YJ, Cheng QS, Wang XP, Zhou YA. Colonic interposition for 40 patients with benign esophageal disease. Disi Junyi Daxue Xuebao 2001; 22: 708-713.
16. Bassiouny IE, Ramadan SA, Al-Nady A Long-term functional results of transhiatal qesophagectomy and colonic interposition for caustic oesophageal stricture. Eur J Pediatr Surg 243: 247, 2002.
17. Adegboye VO, Brimmo A, Adebo OA: Transhiatal esophagectomy in children with corrosive stricture. Afr J Med Sci 223-226, 2000.
18. Thomas AN, Dedo HH: Pharengeogastrostomy for treatment of severe caustic stricture of pharynx and esophagus. J Thoracic, Cardiac Surg 73: 817, 1977.
19. Spitz L: Gastric transposition as esophageal replacement in children. Ann Surg 206: 69, 1987.