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Original Article

DIGESTIVE TRACT RECONSTITUTION AFTER FAILED ESOPHAGO-GASTRO OR ESOPHAGO-COLOANASTOMOSIS

Reconstituição do trato digestivo após falha de esofagogastro ou esofagocolo anastomose

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ABSTRACT – ***Background*** - Severe dysphagia or even aphagia can occur after esophagectomy secondary to necrosis of the ascended organ with severe stricture or complete separation of the stumps. Catastrophic esophageal or gastric disruption drives the decision to "disconnect" the esophagus in order to prevent severe septic complications. The operations employed to re-establish esophageal discontinuity are not standardized and reoperations for re-establishment of the upper digestive transit are a real challenge. ***Methods*** - This is retrospective study collecting the authors experience during 17 years including 18 patients, 14 of them previously submitted to esophagectomy and four to esophagogastrectomy. They were operated on in order to re-establish the upper digestive tract. ***Results*** - Redo esophago-gastro-anastomosis was possible in 12 patients, 10 through cervical approach and combined with sternotomy in four in order to perform the new anastomosis. In five patients a new esophago-colo anastomosis was performed. Free jejunal graft interposition was performed in one patient. Complications occurred in ten patients (55.5 %): anastomotic leaks in three, strictures in four, sternal condritis in two and cervical abscess in one. No mortality was observed. ***Conclusion*** - There are different surgical options for the treatment of this difficult and risky clinical situation which must be treated with tailored procedures according to the anatomic segment available to be used, choosing the most conservative procedure.

HEADINGS - Gastrointestinal tract. Anastomosis, surgical. Esophagectomy. Treatment failure.

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RESUMO - ***Racional*** - Disfagia grave ou mesmo afagia pode ocorrer após esofagectomia secundária à necrose do órgão ascendido com estenose severa ou separação completa dos cotos. Ruptura catastrófica esofágica ou gástrica impulsiona a decisão de "desconectar" o esôfago, a fim de evitar graves complicações sépticas. As operações utilizadas para restabelecer a descontinuidade do esôfago não são padronizadas e reoperações para restabelecimento do trânsito digestivo superior são um verdadeiro desafio. ***Métodos*** - Este é estudo retrospectivo da experiência dos autores durante 17 anos incluindo 18 pacientes, 14 previamente submetidos à esofagectomia e quatro esofagogastrectomia. Eles foram operados com o fim de restabelecer o trato digestivo superior. ***Resultados*** - Refazer esofagogastro anastomose foi possível em 12 pacientes, 10 por meio da abordagem cervical e combinando esternotomia em quatro, a fim de realizar a nova anastomose. Em cinco pacientes esofagocolo anastomose foi novamente realizada. Interposição de enxerto livre de jejuno foi realizada em um paciente. As complicações ocorreram em 10 pacientes (55,5%): deiscência anastomótica em três, estenose em quatro, condrite esternal em dois e abscesso cervical em um. Não se observou mortalidade. ***Conclusão*** - Existem diferentes opções cirúrgicas para o tratamento desta situação clínica difícil e arriscada; deve ser tratada com procedimentos adaptados de acordo com o segmento anatômico disponível para ser usado, escolhendo o procedimento mais conservador.

DESCRITORES - Trato gastrointestinal. Anastomose cirúrgica. Esofagectomia. Falha de tratamento.

INTRODUCTION

The main reasons for esophagectomy are esophageal carcinoma, caustic ingestion and esophageal perforation. Esophageal replacement is a significant undertaking for both surgeon and patient[19].

Severe dysphagia or even aphagia can occur after esophago-gastro or esophago-colo anatomosis due to partial necrosis of the ascended organ and severe stricture. Catastrophic disruption of stumps drives the decision to "disconnect" the esophagus in order to prevent more severe septic

complications. The operations employed to re-establish esophageal discontinuity are not standardized and vary widely, because the surgeon is often focusing on saving the patient's life, and not on how alimentary continuity will ultimately be restored. Reoperations for re-establishment of the upper digestive tract are a real challenge when treating these very risky patients in order to allow them to eat normally[1,11,13,14,19,22,23,25]

In this paper is presented the authors experience in performing the different surgical options for re-establishment of the upper digestive tract.

METHODS

A retrospective study was performed collecting the personal experience during the last 17 years concerning to reoperations for restoration of the upper digestive tract after failure of esophago-gastro or esophago-colo anastomosis, including 18 patients, 13 men and five women with a mean age of 57.4 years (range of 45 to 67.8 years). During this period, 332 esophagectomies with esophago-gastro anastomosis were performed, 321 for esophageal carcinoma, seven due to benign esophageal strictures and four due to type IV achalasia. The authors current mortality rate after esophagectomy for esophageal cancer is 5.3% mainly due to respiratory complications. No mortality has been observed in patients with benign diseases. Thirty seven esophagogastrectomies were performed and the mortality rate in this group was 8.8%. In four patients severe leaks and strictures occurred (three after esophago-gastro anastomosis and one after esophago-colo anastomosis) and they had to be submitted to revisional surgery for reconstitution of the digestive tract. The other 14 patients were initially operated in other institutions and were referred to us for the definitive management.

Patients included in this analysis corresponded to:

Group A

Fourteen patients were submitted to esophagectomy, 11 of them due to esophageal carcinoma, two patients presented long esophageal strictures six months after caustic ingestion and one patient due to a large perforation of the middle esophagus after extraction of a foreing body (bone) (Table 1).

None of the patients with esophageal carcinoma received neoadjuvant chemo or radiotherapy before surgery. For esophagectomy, a transthoracic approach was used and the initial organ for esophageal substitution was a gastric tube by retrosternal route in 11 patients and by posterior mediastinum route in three patients.

These 14 patients presented a complicated leak secondary to necrosis of the ascended gastric stump. Ten patients developed severe stricture which were submitted monthly to repeated endoscopic dilatation with Savary-Guillard bougies without improvement of strictures after 6-8 sessions of dilatations. Other four patients presented a long stricture with complete separation of both esophageal and gastric stumps which remained in the upper part of the anterior mediastinum

TABLE 1 - Causes of esophagectomy, location, severity and length of stricture after esophago-gastro or esophago-colo anastomosis

Causes	A) Esophago-gastro anastomosis (n=14)	B) Esophago-colo anastomosis(N=4)
Esophageal carcinoma	11	-
Caustic ingestion	2	4
Esophageal perforation	1	-
Location		
Cervical	10	1
Upper mediastium	4	3
Length		
< 3 cms	11	1
> 3,1 cms	3	2
Severity		
Stricture with continuity	8	1
Total separation	6	3

The segment of ascended stomach was left in situ in 13 patients. In only one patient with early leak of the esophagogastric anastomosis in the mediastinum, the anastomosis was undo and the stomach was taken down to the abdominal cavity and then relocated in the subcutaneous space over the sternum in order to be re-used later.

Removable stents were not used because they were not available, the strictures were very high or patients presented complete separation of the esophageal or gastric stump (Figure 1).

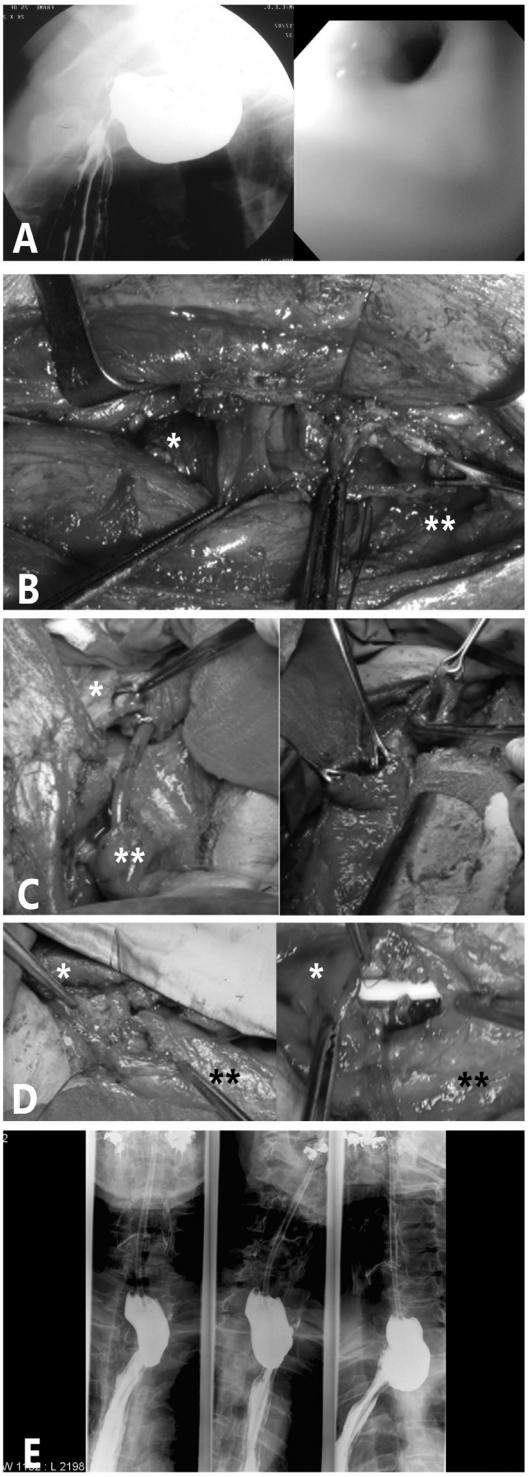
Group B

Four patients were submitted to esophago-gastrectomy and colon interposition with cervical esophago-colo anastomosis secondary to caustic ingestion. These patients, developed a severe stricture due to ischemia of the ascended colon. In two cases the ascended colon remained plicated in the retrosternal space, separated more than 6 cm from the proximal esophageal stump and one patient presented severe stricture 2 cm length located at the supraclavicular space (Figure 2).

Esophago-gastro or esophago-colo anastomosis were performed using one layer 000 Monocril® end to side interrupted suture.

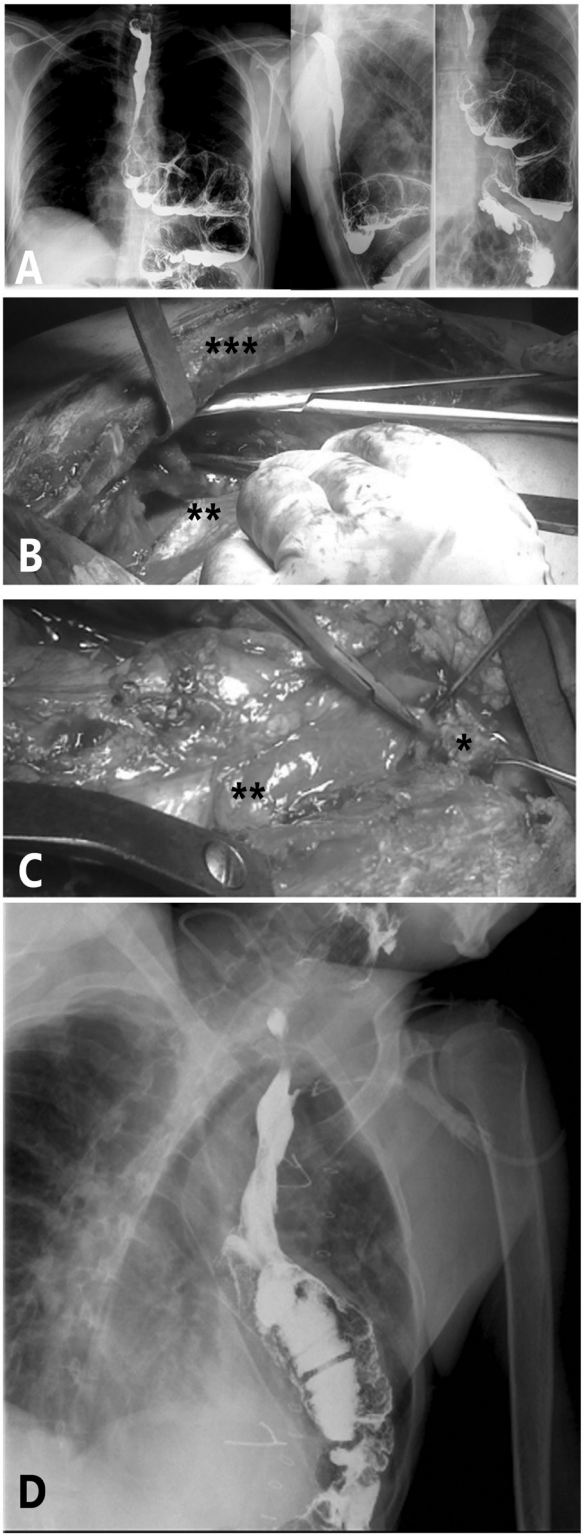
The factors involved for the appearance of these complications were insufficient blood supply in seven patients and in 11, probably, the lack of surgical experience. In this group no preoperative angiogram was performed.

All patients were studied with general and nutritional evaluation, cardiovascular, respiratory function tests, barium swallow and CT scan in order to evaluate the anatomy of the stricture, esophageal stump



* Esophagus; ** stomach

FIGURE 1 - Severe strictures secondary to necrosis of distal stump of gastric tube or with complete separation of the esophageal or gastric stump: A) preoperative severe strictures with separation of the esophageal and gastric stumps; B) re-esophagogastric anastomosis through cervical approach; C) identification of complete separation of esophageal and gastric stumps approached by sternotomy; D) redo-esophagogastro anastomosis through cervicotomy and sternotomy; E) radiological control after reconstruction with a new esofagogastro anastomosis



* Esophagus; ** colon; *** sternotomy

FIGURE 2 - A) Long stricture after esophago-colo anastomosis using an injured esophageal stump; colon remained plicated into the anterior mediastinum; B) dissection of the colon through sternotomy; C) redo esophago-colo-anastomosis; D) radiological control of the new esophago-colo anastomosis

and organ available to be used for upper digestive transit reconstitution. Fifteen patients were submitted to enteral nutrition with naso-jejunal tube passing through the gastric ascensus or colon interposition to the proximal jejunum and in three patients nutritional support was done by jejunostomy. In the majority of patients the preoperative preparation, planning and performance of the reoperation was done by the main author (IB). All patients were followed-up monthly during the first six months and later at least once yearly. These are very special patients and therefore return easily to medical control.

Quality of life after the revisional surgery was catalogued as good, fair or unsatisfactory

RESULTS

Reconstruction of the upper digestive transit in these patients occurred among 4-11 months after the first operation.

Group A

Among the 14 patients with failure after esophago-gastro anastomosis, the ascended stomach was feasible to use it for the digestive transit reconstruction in all of them. In 10 patients it was possible to dissect both esophageal and gastric stumps through cervical approach in order to approximate them and to perform the new anastomosis (Figure 1). In the patient in whom the stomach was left in the subcutaneous space for the later re-anastomosis, this was performed easily through cervical approach without postoperative complications. In two cases the ascended stomach was intact in the retrosternal space and through a cervical approach plus sternotomy it was dissected carefully for preservation of blood supply and therefore performing a new esophago-gastro anastomosis (Figure 1c,d,e) (Table 2). In the last two patients gastric tube was unfeasible to use due to partial or complete necrosis, and therefore right colon interposition was performed.

TABLE 2 - Failures after surgery, approach and type of reconstitution

	Acesso		Reconstitution	
A) Post esophago-gastro anastomosis (n = 14)	Cervical	10	Redo E-G anastomosis	10
	Cervical + sternotomy	4	Redo E-G anastomosis	2
			Colon interposition	2
B) Post esophago-colo anastomosis (n = 4)	Cervical	1	Redo E-C anastomosis	1
	Cervical + sternotomy	3	Colon interposition	2
			Free jejunum loop	1

E-G: Esophago-gastro / E-C: Esophago-colo

Group B

In the present series, four patients were submitted to colon interposition for reconstruction of the upper digestive tract. Among these patients, three of them with caustic ingestion were submitted to esophago-gastrectomy with colon interposition, two of them presented a 6-8 cm longer stricture. Other very young patient with caustic pharyngo-esophageal injury developed a stricture due to ischemia of the upper segment of the ascended colon. The digestive tract transit was reconstructed with one free jejunal graft performing microvascular anastomosis for blood supply, anastomosing the lateral wall of pharynx with the remnant segment of the ascended colon (Figure 2).

Table 3 shows the complications observed after the revisional surgery. After redo esophago-gastro anastomosis via cervical approach performed in 12 patients, three presented leaks which were treated only with drainage. Three patients developed strictures secondary to mild leaks which were managed with endoscopic dilatation allowing normal oral food ingestion after two sessions during the first months after surgery. In patients approached via cervical combined with sternotomy two patients developed a sternal infection which needed long-term therapy with antibiotics in order to treat fungal infection.

In five patients submitted to redo esophago-colo anastomosis, in one of them cervicotomy alone was used. The postoperative evolution was uneventful. In other four patients cervicotomy+sternotomy was employed, one patient developed a mild stricture which was managed with two sessions of endoscopic dilatation and the other patients presented a small cervical collection, managed with drain. In one patient was employed a free jejunal loop with microvascular anastomosis (Figure 3). No complications was observed after this procedure (Table 3).

FIGURE 3 - Interposition of a free jejunal graft between the pharynx and interposed colon

TABLE 3 - Complications observed after revisional surgery and management

	Approach	N	Complication	N	Management
Redo esophago-gastro anastomosis (n = 12)	Cervical alone	10	Leaks	3	Drainage
			Stricture	3	Endoscopic dilatation
	Cervical+ sternotomy	4	Condritis	2	Antibiotic or antifungal treatment
Redo esophago-colo anastomosis (n = 5)	Cervical	1	---		---
	Cervical + sternotomy	4	Stricture	1	Dilatation
			Cervical	1	
			Abscess	1	Drainage
Free jejunal loop (n = 1)	Cervical+ sternotomy	1	---		---

During the first year after the revisional surgery patients were submitted to a close clinical, nutritional, endoscopic and radiological evaluation and some patients had more than five years follow-up. Was observed that all patients were capable to have oral ingestion almost normally; one submitted to colon interposition developed chronic steatorrhea which was managed with Creon® and dietetic instructions. The quality of life improved enormously. Twelve patients have expressed a very good quality of life presenting normal deglutition, while six had fair evolution due to the presence of foregut symptoms mainly distention or frequent diarrhea and some food restrictions, but, all patients were happy for the successful solution offered to them.

DISCUSSION

Complications following gastric ascensus or colon interposition may be often devastating. Creative strategies are needed in order to preserve the conduit or to develop alternatives when the conduit cannot be saved.

These patients must be deeply evaluated in order to establish very precisely their nutritional, cardiovascular and respiratory functions. In addition, it is necessary to know the anatomic characteristics of the available organs for the new procedure for reconstruction.

Necrosis with severe stricture of esophageal conduit after gastric ascensus or colon interposition is an unfrequent complication[25] but its represents a real challenge for surgeons because: 1) often these patients are submitted to reoperations due to septic complications and most of time they must be managed in intensive care units; 2) often the re-operations are performed by surgeons without special expertise in performing ostomies adequately in consideration for subsequent operations which will reconstruct the upper digestive tract; 3) the different surgical options for approach and reconstruction are difficult and could present complications due to intra-operative difficulties secondary to adhesions or anatomic distortions of the vascular supply after the prior surgeries .

Obviously there is not an unique surgical alternative for treating these patients and final correction must be tailored according to each particular case. That is why there are few papers focused in the topic exposed in the present experience[22].

For most surgeons failure after gastric ascensus means the necessity to indicate colon interposition, but the authors have performed re–esophago-gastro anastomosis because was considered possible to reconnect both stumps which are very close and easily approached through cervical incision.

When neither the esophagus nor the stomach is possible to be used, the indication is to perform colon interposition. Retrosternal coloplasty is the gold standard for esophageal reconstruction after caustic injury of the digestive tract. In the absence of controlled studies, the choice between the right and the left colon graft relies on the anatomy of the blood supply to the colon and on the individual surgeon's preference. In experienced hands mortality rates are 2-5% but postoperative complications (as graft necrosis, leakage, and anastomotic stricture) are high and require reoperation in 30% to 50% of patients[13,14,23,25]. The more critical situation is the failure after colon interposition due to insufficient vascular supply of the interposed segment. In this case it is possible to consider: a) still try to get some elevation of the remaining colon and interpose a free jejunal segment between colon and esophageal stump[17]; b) resect the colon interposition and renew it with the right or left hemicolon using the available blood supply[3,20]; c) gastric ascensus with whole stomach. However in most cases the stomach is not possible to employ because it has been used before or it is injuried previously.

Free jejunal graft needs a good vascular connection (carotid artery and jugularis vein) and will have two anastomosis at the neck and in the chest. The interposition of small bowel from the stomach to the neck is probably the last successful approach.

Of course it must be considered the overall performance status of the patient. Whatever is done, it needs a patient in a fairly good condition with a strong wish to undergo surgery.

Regarding the approach for reconstruction, it could be by cervical approach or by performing sternotomy in order to re use the gastric or colon segment employed initially. Some authors are afraid of the too limited space in the retrosternal route, especially in the neck (passage behind the manubrium sterni) when using the stomach or colon due to venous stasis at the cervical part of the gastric or colon segment followed by massive edema and leakage. The authors prevent this complication by performing a large communication between the neck and retrosternal space and only in few cases had to resect the sternoclavicular articulation.

During 40 years Delva et al.[16] recollected colon interposition in 35 patients who underwent 48 operative revisions. Nineteen patients underwent one operation; nine required multiple operations to manage one problem and seven developed more than one distinct problem requiring several operative interventions. The

indications for revisional surgery, the most common revisional operations and results were very similar to this experience, improving the capacity of swallow in more than 90% of cases[20] Okasaki[21] presented his experience reporting the results in 17 patients, the majority of them treated with free jejunal graft also with successful restoration of the oral feeding in 16/17 patients.

Theile[24], after necrosis of retrosternal colon interposition used the same approach employed here in two cases through sternotomy. Reconstruction using skin and/or musculocutaneous flap is the final option, but unsuccessful results have been observed due to stricture and complications[2,12,24]. Other report from Michigan University including 40 patients who had esophageal discontinuity after different esophageal surgery for different causes, were submitted to reoperation in order to re-establish the upper digestive tract, performing almost the same surgical procedures, developing 68.3% of postoperative complications without hospital deaths, with very satisfactory late functional results in 70% of patients[2]. Similar outcome was observed here in the present experience.

The results of redo procedures for reconstruction of the upper digestive tract compared to historical results of primary esophagectomy with gastric ascensus and primary colon interposition demonstrated that morbidity is very similar to our primary esophagectomy or after esophagogastrectomy either for benign or malignant disease[4,5,6,7,8,9,10,18]. In the present experience no postoperative mortality occurred, probably because these patients were very selected, well prepared and operated by a specialized surgical team.

CONCLUSION

Successful reversal of esophageal discontinuity requires individualized assessment. There are different surgical options for the treatment of this difficult and risky clinical situation which must be treated with tailored procedures according to the anatomic segment available to be used choosing the most conservative procedure. Despite the high morbidity, functional late results are very satisfactory, improving quality of life of patients.

REFERENCES

1. Andres AM, Burgos AL, Encinas JL, Suárez O, Murcia J, Olivares P, Martínez L, Lassaletta L, Tovar JA. What can we do when a esophagocoloplasty fails? Cir Pediatr. 2007; 20:39-43.
2. Barkley C., Orringer MB., Iannettoni MD., Yee J. Challenges in reversing esophageal discontinuity operations. Ann.Thorac. Surg. 2003;76:989-94.
3. Bhathena HM. Free jejunal transfer for pharyngo-esophageal reconstruction. Acta Chir Plast. 2002; 44:120-3.
4. Braghetto I, A. Csendes, G. Cardemil, P. Burdiles, O. Korn, H. Valladares. Open transthoracic or transhiatal esophagectomy versus minimally invasive esophagectomy in terms of morbidity, mortality and survival. Surg. Endosc, 2006:20:1681-
5. Braghetto I, Csendes A, Burdiles P, Korn O, Compan A, Guerra JF. Barrett's esophagus complicated with stricture: correlation between classification and the results of the different therapeutic options. World J Surg. 2002;26:1228-33.
6. Braghetto I., Csendes A., Amat J., Cardemil G., Burdiles P., Blacud R., Ferrario M., De la Cuadra R., Días J. JC. Resección esofágica por cáncer: resultados finales. Rev. Chil. Cir. 48: 214-24, 1996.
7. Braghetto I., Csendes A., Amat J., Parada M., Schutte H., Lizana C., Sepúlveda A., Rappoport J., De la Cuadra R. Reconstrucción del tránsito esofágico con interposición de colon. Rev. Chil. Cir. 1994;46:477-84.
8. Braghetto M., Italo; Cardemil H., Gonzalo; Burdiles P., Patricio; Korn B., Owen; Ramírez, C. Esofagectomía por cirugía mini-invasiva vía toracoscópica o laparoscópica: indicaciones y resultados / Esophagectomy by mini-invasive surgery via thoracoscopy or laparoscopy: indications and results. Rev. Chil. Cir; 2005;57:118-126.
9. Braghetto M., Italo; Csendes J., Attila; Cardemil H., Gonzalo; Burdiles P., Patricio; Korn B., Owen; Díaz, Juan Carlos; Ramírez, Claudia; Puchi, Alexa; Ramírez, Carlos. Cirugía mínimamente invasiva en cáncer de esófago/ Minimally invasive esophageal surgery. Gastroenterol. Latinoam; 2005;16:164-169.
10. Braghetto Miranda, Italo; Csendes Juhasz, Attila; Burdiles Pinto, Patricio; Korn Bruzzone, Owen; Valera M., Miguel. Manejo actual de la acalasia del esófago: revisión crítica y experiencia clínica / Current management of achalasia of the esophagus Rev. Méd. Chil. 2002;130:1055-1066.
11. Briel JW, Tamhankar AP, Hagen JA, DeMeester SR, Johansson J, Choustoulakis E, Peters JH, Bremner CG, DeMeester TR. Prevalence and risk factors for ischemia, leak, and stricture of esophageal anastomosis: gastric pull-up versus colon interposition. J Am Coll Surg. 2004; 198:536-41; discussion 541-2.
12. Cassivi SD. Leaks, strictures and necrosis: a review of anastomotic complications following esophagectomy. Seminar in Thoracic and cardiovasc. Surgery 2004; 16:124-13.
13. Chirica M, de Chaisemartin C, Goasguen N, Munoz-Bongrand N, Zohar S, Cattan P, Brette MD, Sarfati E. Colopharyngoplasty for the treatment of severe pharyngoesophageal caustic injuries: an audit of 58 patients. Ann Surg. 2007; 246:721-7.
14. Chirica M, de Chaisemartin C, Munoz-Bongrand N, Halimi B, Celerier M, Cattan P, Sarfati E. Colonic interposition for esophageal replacement after caustic ingestion. J Chir (Paris). 2009; 146:240-9.
15. Coleman JJ 3rd Reconstruction of the pharynx and cervical esophagus. Semin Surg Oncol. 1995;11:208-20.
16. De Delva PE, Morse CR, Austen WG Jr, Gaissert HA, Lanuti M, Wain JC, Wright CD, Mathisen DJ. Surgical management of failed colon interposition. Eur J Cardiothorac Surg. 2008; 34:432-7; discussion 437.
17. Francioni F, De Giacomo T, Jo Filice M, Anile M, Diso D, Venuta F, Coloni GF. Surgical treatment of redundancy after retrosternal esophagocoloplasty. Minerva Chir. 2009; 64:317-9.
18. Korn O., Braghetto I., Burdiles P., Csendes A., Cardiomyotomy in achalasia: which fibers do we cut? Dis. Esoph. 13:104, 2000.
19. Maish MS, DeMeester SR. Indications and technique of colon and jejunal interpositions for esophageal disease. Surg Clin North Am. 2005; 85:505-14.
20. Metzger J, Degen L, Beglinger C, von Flüe M, Harder F. Clinical outcome and quality of life after gastric and distal esophagus replacement with an ileocolon interposition. J Gastrointest Surg. 1999; 3:383-8.
21. Okazaki M, Asato H, Takushima A, Nakatsuka T, Ueda K, Harii K. Secondary reconstruction of failed esophageal reconstruction. Ann Plast Surg. 2005;54:530-7
22. Orringer MB. Reversing esophageal discontinuity. Semin Thorac Cardiovasc Surg. 2007; 19:47-55.
23. Strauss DC, Forshaw MJ, Tandon RC, Mason RC Surgical management of colonic redundancy following esophageal replacement. Dis Esophagus. 2008; 21:E1-5.
24. Theile DE, Robinson DW. Microvascular salvage for failed colonic interposition. Aust N Z J Surg. 1987 ; 57:749-52.
25. Wormuth JK, Heitmiller RF Esophageal conduit necrosis.Thorac Surg Clin. 2006;16:11-22.