



## Surgical Technique

# Localized Esophageal Resection - The Best Surgical Technique

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## Abstract

In some situations, as cancer or stenosis when a resection has to be performed, or in others like long gap esophageal atresia, there is the need to substitute a segment of the esophagus. With the standard techniques using the colon there is usually marked redundancy and kinking, as all the "graft" has to be used. We present a modified technique in which only the required length of the interposed colon is used, the remaining segment being separated and having its mucosa removed, the muscular and peritoneal layers remaining as the support of the blood supply (so precluding an eventual kinking of the vessels, and resultant graft necrosis). It has also the advantage of being a one stage operation.

**Keywords:** Esophageal Stenosis; Esophageal cancer; Long gap esophageal atresia; Thoracotomy; Cervicotomy

## Introduction

The goal is to construct the graft using an iso-peristaltic segment of the transverse and right colon, based on the L colon vessels. This technique was first used for cases of long gap esophageal atresia, trying to avoid the colon redundancy and kinking resultant when using the classical Waterston's technique [1-3]. Later it was used for caustic stenosis of the esophagus e certainly it has its place when one needs to resect an esophageal lesion localized at any level, namely localized cancer [4,5].

## Surgical Technique

Under general endotracheal anesthesia, in long gap esophageal atresia, the surgical approach is made through a left sided thoraco-laparotomy. In those cases thoracoscopy correction is not adequate. In other esophageal lesions, a laparotomy associated either with a left cervicotomy or a thoracotomy (depending on extent and the level of the lesion may be a better choice). And obviously, for upper thoracic esophageal lesions, the right thoracotomy may be indicated (Figure 1) [6-9].

In the technique we are about to present the Right colon is used, based on the Left colonic vessels. After evaluating the required length, having localized the place of the upper esophageal required section, the ascending and proximal transverse colon is mobilized to reach the upper Esophageal segment, after ligating of the mid colic artery (Figure 2) [10,11].

Schemes showing the technique is a case of Long gap Esophageal atresia, but which is not restricted to it, as it is useful whenever a segmental portion of the esophagus as to be replaced, namely inn

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cancer surgery (Figures 3 and 4) [12].

The colon is sectioned exactly at the level where should be sutured to the lower esophageal segment, normally the main problem being due to its reduced dimensions [13-16]. In this way only the exact length of the colonic graft is used. One has to be particularly careful, not to damage the vascular arcade when sectioning at the level of the distal colonic tubular graft (Figure 5).

The remaining and more distal portion of the colon graft is opened at its anti-mesenteric border and denuded of mucosa, so that the muscular and serosal layers will remain to support the colonic vascular pedicle (artery and vein) on its way up to the chest through the esophageal hiatus, thus avoiding a dangerous twisting while the graft segment maintains its tubular structure [17]. We carefully try to avoid lesion to the vagal nerves at the time of dissection and distal anastomoses. A tunnel is dissected bluntly beneath the splenic vessels and the tail of the pancreas, behind the stomach, opening a hiatal tunnel through which the colon graft will later be transferred to the chest. The right and left colon segments are re-anastomosed in two layers of interrupted sutures, before the graft is transferred to the chest and placed in the posterior mediastinal bed (Figure 6) [18-20].

Then one proceeds with suturing the upper Esophageal stump to the colon graft by a two layers separate resorbable stitches closure (in long gap esophageal atresias at the mediastinal level and in other situations, like extensive stenosis or high or medially localized tumors), at cervical level [21-23].

The opening of the lower stump, in long gap esophageal atresias, usually involves the need to slightly enlarged it, by an oblique or a small complementary incision, so that a good end to end interrupted suturing can be accomplished (what is not the case in strictures or tumors). On the other end, in severe caustic burns, the lower esophageal end is usually preserved so that the distal anastomoses may have to be performed directly from the graft to the stomach.

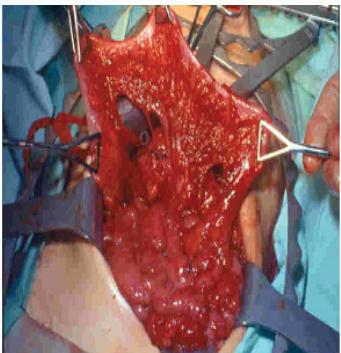
The mesenteric defect is closed over the vascular pedicle before the abdomen is closed at completion of the operation. Finally takes place the suture of the surgical wound in a routine fashion (Figure 7) [24].

## Discussion

The classical techniques used in esophageal surgery tend to have



**Figure 1:** Surgical approaches: Thoracolaparotomy in Long gap esophageal atresia.



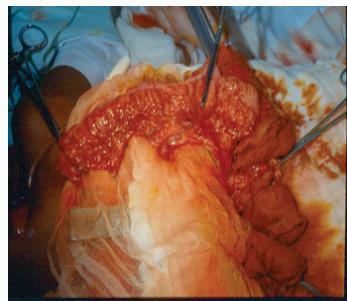
**Figure 2:** Ligation of the middle colic artery.



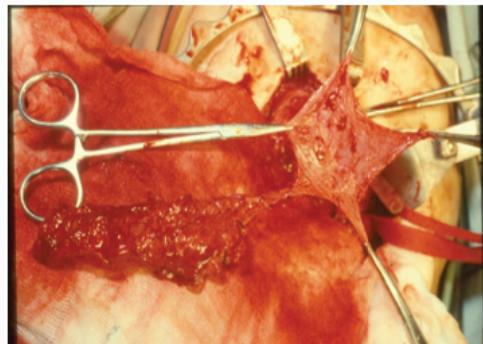
**Figure 3:** Schemes showing the technique is a case of Long gap Esophageal atresia.



**Figure 4:** Schemes showing the technique is a case of Long gap Esophageal atresia.



**Figure 5:** The colon is sectioned exactly at the level where should be sutured the lower esophageal segment. In this way only the exact length of the colonic graft is used. The area between forceps is the one to be striped of the mucosa.



**Figure 6:** Striping of the mucosa completed and showing the colon segment to be used for esophageal replacement.



**Figure 7:** Radiological picture: Esophageal atresia patient.

Also no "artificial" anastomoses are made between esophagus and stomach, thus preventing cardio-esophageal reflux. We do not advise "elongation" trials as good solutions in esophageal atresias. Also we contraindicate Ivor Lewis esophagogastrectomy in esophageal cancer (with the stomach being used for replacement), tube gastrostomy (as in Dan Gavrilu's technique) or the use of a jejunal loop in lower esophageal lesions [26,27]. We know that about 40% of oesophageal cancers are located in the thoracic esophagus: it is in fact in those patients that we believe our method is particularly useful, and not so much for the other 50% localized at the lower esophagus or esophago-gastric junction [28,29].

It is true that the colon is known to be a frequent site of diverticula or intestinal polyps in old age, but we do not believe it to be a reasonable contraindication as, at least polyps, can certainly be easily removed through esophagostomy and diverticula are certainly extremely infrequent [30-33]. Also eventual arteriosclerosis of the vascular pedicle is, for us, not a reasonable reason to be afraid of the long run results (as some seem to feel). In colonic transposition we do not use the retrosternal approach. Also we never perform gastrostomy, another significant advantage of our one-stage technique [34-36].

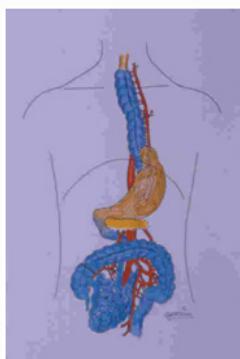
A similar approach can be used for other esophageal problems, like extensive stenosis or tumors, as we have already stated (Figures 8-10) [37,38].

## Conclusion

With this technique, which has the enormous advantage of being just a one-stage technique, we can avoid the kinking of the classical Waterston's technique or the problems of the gastric tubes. On the



**Figure 8:** Stricture of the colon.



**Figure 9:** Scheme showing the technique (joining esophagus to stomach).



**Figure 10:** Radiological picture: caustic stenosis patient.

other end we use only the required segment of an iso-peristaltic colon loop to maintain a straight esophageal tube in all cases in which esophageal replacement, either partial or even total, is required.

## References

- Anderson KD, Holder TM, Ashcraft KW. Esophageal substitution Rev Stintelor Med (Bucharest). 1955;3(33):284-91.
- Azar H, Crispin AR, Waterston DJ. Esophageal replacement with transverse colon in infants and children. J Pediatr Surg. 1971;6(1):3-9.
- Belsey R. Reconstruction of the esophagus with left colon. J Thorac Cardiovasc Surg. 1965;49(1):33-55.
- Blesa Sanchez E 59-54, Reconstrucción del esófago Monereo J 95-106 Atresia de Esófago - Mod G T 4444 Mati-Rafi Madrid 1973.
- Burrington JD, Stephens CA. Esophageal replacement with a gastric tube in infants and children. J Pediatr Surg. 1968;3(2):246-52.
- German JC, Waterston DJ. Colon interposition for the replacement of the esophagus in children. J Pediatr Surg. 1976;11(2):227-34.
- Cohen DH, Middleton AW, Fletcher J. Gastric Tube esophagoplasty. J Pediatr Surg. 1974;9(4):451-60.
- Dale WA, Sherman CD. Late reconstruction of congenital esophageal atresia by intrathoracic colon transplantation. J Thorac Surg. 1955;29(4):344-56.
- Daum R. Postoperative complications following operation for Esophageal atresia and Tracheoesophageal fistula. Prog Pediatr Surg. 1970;1:209-37.
- De Boer A. The Retrosternal Colonic Esophageal Substitute in Children. Surg Clin North Am. 1964;44(6):1449-57.
- Devin R Lataste J Maillet P. Les gastrectomies avec interposition colique Nouveau traité de Technique Chirurgicale Tome X Masson et Cie Editeurs 1968. p. 187-9.
- Ein SH, Shandling B, Simpson JS, Stephens CA. A further look at the gastric tube as an esophageal replacement in infants and children. J Pediatr Surg. 1973;8(6):859-68.
- Francelina Lopes M, Reis A, Coutinho S, Pires A. Very long gap esophageal atresia successfully treated by esophageal lengthening using external traction sutures. J Pediatr Surg. 2004;39(8):1286-7.
- Anderson KD, Randolph JG. The Gastric tube for esophageal replacement in children. J Thorac Cardiovasc Surg. 1973;66(3):333-42.
- Gavrilu D. Geroescue Esophagocoloplastie direction a material gastric L Pediatric Surgery. USA: WB Saunders Company; 1980.
- Gentil Martins A. Pediatría Quirúrgica Panamericana Vol XVI nº1-4 Transposição Cólica no Recém-Nascido. 1988.
- Gross RE. Colonic reconstruction of the esophagus in infants and children. Surgery. 1967;61(6):955-64.
- Hands LJ, Dudley NE. A comparison between Gap-length and Waterston classification as guides to mortality and morbidity after surgery of esophageal atresia. J Pediatr Surg.

- 1986;21(5):404-6.
19. Hecker W, Holmann G. Correction of Long segment Oesophageal stenosis by a colonic patch. *Prog Pediatr Surg*. 1975.
20. Hecher W, Hopner F. Oesophagogastronomy By-Pass operation as an alternative to Resection for Undilatable Peptic Oesophageal Stenoses. *Prog Pediatr Surg*. 1974.
21. Heimlich HJ. Esophagoplasty with reversed gastric tube. Review of fifty three cases. *Am J Surg*. 1972;123(1):80-92.
22. Hutson JM. A Esophageal atresia and trachea-esophageal fistula. In: Hutson JM, Beasley W, Woodward A, editors. *Jone's Pediatric Surgery*. Cambridge: Blackwell Scientific Publications; 1992.
23. Lynn HB. Simple method of elongating a colonic segment for esophageal replacement. *J Pediatr Surg*. 1973;8(3):391-3.
24. Koop E, CVerhagen AD. Early management of atresia of the esophagus *Surgery, Gynecology and Obstetrics*. 1961;113:103-12.
25. Koop E. Recent - Advances in the Surgery of Esophageal Atresia. *Prog Pediatr Surg*. 1971.
26. Longino LA, Woolley MM, Gross RE. Esophageal replacement in infants and children with use of a segment of colon. *J AM Med Assoc*. 1959;171:1187-92.
27. Mahoney EB, Sherman CD. Total esophagoplasty using intrathoracic right colon. 1954;35(6):937-46.
28. McKenna RJ, Murphy GP. 13-628 Fundamentals of Surgical Oncology. New York: Mac Millan Publishing Company; 1986. p. 613-28.
29. Myers NA, Aberdeen E. Lesions of the esophagus. The esophagus Congenital Esophageal atresia and trachea-esophageal Fistula. Swenson O *Pediatric Surgery*. 3rd ed. New York: Appleton Century Crofts, Inc; 1958.
30. Nicks R. Colonic replacement of the esophagus. Some observations on infarction and wound leakage. *Br J Surg*. 1967;54(2):124-8.
31. Ombredanne L. *Precis Clinique et Operatoire de Chirurgie Infantile*. Paris: Masson & Cie; 1944.
32. Othersen HB, Clatworthy HW. Functional evaluation of esophageal replacement in children. *J Thorac Cardiovasc Surg*. 1967;53(1):55-63.
33. Raia A, Gama AH, Pinotti HW, Rodriguez JJ. Diverticular disease in the transposed colon used for esophagoplasty. *Ann Surg*. 1973;177(1):70-4.
34. Sweet RH. Transthoracic resection of the esophagus and stomach for carcinoma. Analysis of the Postoperative Complications, Causes of Death, and Late Results of Operation. *Ann Surg*. 1945;121(3):272-84.
35. Soave F. Intrathoracic transposition of the transverse colon in complicated esophageal atresia. *Prog Pediatr Surg*. 1972;4:91-109.
36. Villa N, Potter RT, Kottmeier PK. The secondary repair of the partially infarcted colonic interposition. *J Thorac Cardiovasc Surg*. 1969;58(2):186-8.
37. Azizkhan RG. Esophageal Replacement. In: Ziegler MM, Azizkhan RG, Allmen D, Weber TR, editors. *Operative Pediatric Surgery*. New York: McGraw-Hill Publishers; 2003.
38. Yudin SS. The surgical construction of 80m cases of artificial esophagus. *Surg Gynecol Obst*. 1944.