Available online at www.sciencerepository.org

Science Repository

Review Article

What is the Best Choice for Esophageal Replacement in Children?

Ashjaei Bahar*, Movahedi Jadid Merisa, Parvizi Azita and Talebi Ali

Department of Pediatric Surgery, Children Medical Center of Excellence, Tehran University of Medical Sciences, Tehran, Iran

ARTICLE INFO

Article history:
Received: 19 May, 2020
Accepted: 10 June, 2020
Published: 29 June, 2020

Keywords:
Esophageal replacement
colon interposition
gastric pull up
colon patch
gastric tube
jejunal interposition

ABSTRACT

Esophageal replacement surgery is performed in children with either congenital long gap esophageal atresia or acquired esophageal damages such as caustic injury of the esophagus. although the left colon because of less variation in blood supply and suitable diameter in comparison with right colon is the better choice. A secured pedicled colon is mandatory for reducing the sever complications, such as leak and necrosis. Ileocolic conduit is an alternative method of colon interposition which has anti reflux effect and therefore with less complications related to gastroesophageal reflux. When we have a short segment esophageal stricture due to corrosive esophagitis or other causes of esophageal strictures which is refractory to repeated dilatations, it is advisable to perform colon patch esophagoplasty. Gastric transposition can produce a good way for gastrointestinal continuity with a perfect weight gain and oral feeding, therefor it can be a safe choice for esophageal replacement in children. Partial gastric pull-up is an alternative operation for esophageal replacement in children and infants with long gap esophageal atresia. Gastric conduit replacement is another alternative technique for esophageal replacement, in which a gastric tube is created in the abdomen and it is pulled to via thoracic cavity to the neck and is committed by cervical anastomosis. Antral patch esophagoplasty is used for benign and limited esophageal stricture due to gastroesophageal reflux. Usefulness of pedicled jejunum was under optimal results because of technical problems and high rate of necrosis and mortality for decades. Sternocleidomastoid myocutaneous esophagoplasty is a scarce method which is reported by some surgeons for limited cervical esophageal stricture repair. Free microvascular transfer of the reverse ileo-colon flap with ileocaecal valve valvuloplasty is used for reconstruction of a pharyngoesophageal defect, and Patch esophagoplasty by using of degradable bioscaffolds of extracellular matrix have shown good results in preclinical and clinical outcomes to prevent stenosis after endoscopic mucosectomy. We will explain the advantages and disadvantages of these different surgical methods in this review article.

Introduction

Esophageal replacement surgery is performed in children with either congenital long gap esophageal atresia or acquired esophageal damages such as caustic injury of the esophagus. The patient's esophagus should be the first priority for the child and all attempts must be tried for preserving the native esophagus [1]. Esophageal replacement techniques must have low incidence of mortality and morbidity such as graft necrosis, anastomosis leakage, stricture, poor feeding, Barret's esophagus, gastroesophageal reflux and tortuosity of the graft. There are different conduits which are recommended as esophageal replacement such as parts of colon, segments of small bowel, entire of stomach and gastric tube [2].

Colonic Interposition

However, the best priority for esophageal repair in children is the own patient's esophagus, sometimes we need to replace the esophagus with another organ to create a new pathway for continuity of the gastrointestinal tract [1]. Although colon is a good replacement for benign esophageal diseases, long segment colon interposition has its

**Correspondence to: Ashjaei Bahar, Associate Professor of Pediatric Surgery, Children Medical Center of Excellence, Tehran University of Medical Sciences, Tehran, Iran; Tel: 00989213805401; 00989123805401; E-mail: b_ashjaei@yahoo.com; ashjaei@tums.ac.ir*

http://dx.doi.org/10.31487/j.AJSCR.2020.02.10

own complications either functional or mechanical [3]. Colon interposition can be performed as right or left or transvers colon interposition based on vascular pedicle which is the most important technical consideration in the short-term complications of this method [4, 5]. Although the left colon because of less variation in blood supply and suitable diameter in comparison with right colon is the better choice [6]. Colon interposition can be performed retrosternal or from posterior mediastinum, isoperistaltic or non- isoperistaltic [6, 7]. Colon interposition can be performed as two kinds of long segment colon interposition and long segment colon interposition [3]. Whereas short segment colon interposition has some priorities both functional and mechanical to long segment colon interposition [3].

However, the best choice for children is their own esophagus, in some patients' multiple attempts for esophageal elongation is more hazardous than colon interposition. Colon interposition provides good elongation in life long and good long terms results for children [1]. Colonic interposition is a suitable conduit for esophageal replacement and thoracic inlet enlargement reduces the risk of cervical leak which is the main complication of this surgery [8]. Colon interposition is a good alternative for esophageal replacement, but it has some early post-operative complications like cervical fistula, pneumonia and sepsis [9]. The most common long-term complication of colon interposition is redundancy of colon which is needed reoperation for reducing the symptoms of patient and correcting the quality of life [10]. Another long-term complication of colon interposition is stricter, which can be anastomotic and non-anastomotic type. Anastomotic type is located at the anastomosis site and it can be corrected by endoscopic dilation. Non-anastomotic type is longer than the first and is retractable to endoscopic dilation, therefore it is needs surgical intervention [11].

Despite the higher mortality rate in early post operation in comparison with gastric pull-up and three anastomosis sites, because of slight mesentery and long term excellent functional outcome this method is a recommended technique for esophageal replacement in many centers [6]. One rare late complication is tubular adenomatous polyp which is reported in a colon interposition case [12]. Although malignancy is rare in colonic portion with interposition, it must be considered in patients with the history of colon interposition especially due to benign diseases [13]. In summation early post-operative complication of colon interposition are cervical fistula, pneumothorax, pneumonia, graft necrosis, sepsis and death due to sepsis. Two other nonspecific complication which are reported in literatures are adhesion band and intussusception. These two last complications can occur after every kinds of abdominal surgery [9]. In submission, a secured pedicled colon is mandatory for reducing the sever complications, such as leak and necrosis [14].

Ileocolic Conduit

Ileocolic conduit is an alternative method of colon interposition which has anti reflux effect and therefore with less complications related to gastroesophageal reflux [7, 15]. In patients with hypo pharyngeal corrosive stricture the satisfactory results of reconstruction surgery are based on appropriate hypo pharyngeal opening and a good esophageal substitute [16]. Ileocolic segment is recommended when the substitution should be reached to high cervical portion and the stomach is scarred and is not suitable for esophageal replacement [17].

Colon Patch Esophagoplasty

We can use a vascularized colon patch for improving a limited segment of esophageal stenosis such as limited segment caustic injury of esophagus [18]. When we have a short segment esophageal stricture due to corrosive esophagitis or other causes of esophageal strictures which is refractory to repeated dilatations, it is advisable to perform colon patch esophagoplasty for reduction the complications of repeated esophageal dilations like mediastinitis, esophageal perforation, brain abscess formation and repeated general anaesthesia [19].

Gastric Transposition or Gastric Pull-Up

Gastric transposition can produce a good way for gastrointestinal continuity with a perfect weight gain and oral feeding, therefor it can be a safe choice for esophageal replacement in children [20]. Gastric transposition has a single anastomosis in the neck with rich blood supplied stomach, with less complications due to anastomosis leakage [21]. Gastric pull-up is so safe which some surgeons perform laparoscopic and thoracoscopic gastric pull-up as esophageal replacement operation in early infancy [22]. Gastric pull-up has very low mortality rate and self-limited or easy manageable early and late complications such as self-limited salivary fistula, anastomosis stricture with good response to endoscopic dilation. Most of patients have good results in follow up such as good oral feeding and weight gain with satisfactory lifestyle [23]. In retrospective study duration of intubation, a respiratory complication was less in children with the weight below 10 kg who underwent gastric pull-up [24]. Gastric pull-up because of obviation the need of thoracoscopy, lack of redundancy, single cervical anastomosis and use of natural esophageal bed seems to be a safe procedure which is recommended in many studies [21]. This procedure can be performed in early infancy [22].

Partial Gastric Pull-Up

Partial gastric pull-up is an alternative operation for esophageal replacement in children and infants with long gap esophageal atresia, but it is not recommended because of the high reported early complications like leakage and late complications such as gastroesophageal reflux, esophagitis and esophageal stricture [25].

Gastric Conduit or Gastric Tube Replacement

Gastric conduit replacement is another alternative technique for esophageal replacement, in which a gastric tube is created in the abdomen and it is pulled to via thoracic cavity to the neck and is committed by cervical anastomosis. Gastric conduit dehiscence is the most morbid complication of this procedure which needs to emergent operation [26]. It seems that its serious complications such as mediastinal leakage and stricture which are great challenge for surgeons, in contrast with its advantages such as excellent blood supply, suitable length and size, ruled out this method as the method of choice for esophageal reconstruction in children [27].

Antral Patch Esophagoplasty

Antral patch esophagoplasty is used for benign and limited esophageal stricture due to gastroesophageal reflux. In this method an antral patch based on left gastroepiploic vessels is inserted at the opened surface of the distal esophageal stricture and then a fundoplication procedure is done to improve the acid peptic reflux disease [28]. Some limited case reports are about using this method in patient with corrosive esophagitis due to lye ingestion [29]. This method and its indications are so rare that we have no enough documents and cases to discuss about its complications and benefits in children.

Pedicled Jejunum

Usefulness of pedicled jejunum was under optimal results because of technical problems and high rate of necrosis and mortality for decades. However, recent advantages in microvascular surgery and jejunal vessels anastomosis to internal thoracic vessels has made this method to an appropriate method with satisfactory results in expert hand [30]. Limited studies reported better long-term results in jejunal interposition in compared to colon interposition [31]. However, there is no RCT for comparing different type of conduit, some investigators recommend this method as the first choice [32].

Sternocleidomastoid Myocutaneous Esophagoplasty

Sternocleidomastoid myocutaneous esophagoplasty is a scarce method which is reported by some surgeons for limited cervical esophageal stricture repair [33]. This technique can be used in patients with limited damage of cervical esophagus which needs noncircumferential patch esophagoplasty [34]. This method has been used in adults yet and its indications is so rare that we have no enough documents and cases to discuss about its complications and benefits in children.

Free Microvascular Transverse of the Reverse Ileocolon Flap with Ileocecal Valvuloplasty

Free microvascular transfer of the reverse ileocolon flap with ileocecal valve valvuloplasty is used for reconstruction of a pharyngoesophageal defect. We can use this method for esophagoplasty in high pharyngeal and esophageal damage because of size discrepancy of the pharynx as proximal end and esophagus as distal end of the defect. We can use the caecum portion for pharyngeal anastomosis and ileal end for esophageal anastomosis [35]. This method and its indications are so rare that we have no enough documents and cases to discuss about its complications and benefits in children.

Patch Esophagoplasty with Biological Scaffold

Patch esophagoplasty by using of degradable bio scaffolds of extracellular matrix have shown good results in preclinical and clinical outcomes to prevent stenosis after endoscopic mucosectomy, therefore esophageal reconstruction surgery with ECM scaffold or extracellular matrix scaffold for augmentation of esophageal diameter is a novel surgical technique which is done in small experiences with good results. It needs so much time and more operations for evaluating the outcome and advantages and disadvantages of this method [36].

Discussion

The two common causes for esophageal replacement surgery in children are esophageal atresia and caustic injury of the esophagus [37, 38]. Complicated acid peptic reflux esophagitis and perforation at the time of endoscopic dilatation are other causes of esophageal replacement surgeries [39, 40]. As we know the best esophagus for patients is their own native esophagus but in some patients the native esophagus should be abandoned and esophageal replacement is needed for GI tract continuity [41]. In the cases of caustic injury of the esophagus the all primary attempts should be done for esophageal saving by repeated dilatation [42]. Preserving the native esophagus is so important which different dilatation methods such as endoscopic dilatation, stenting, chemotherapeutic agents and magnetic compression anastomosis are used for repair of anastomosis stricture in children with esophageal atresia [43].

Esophageal replacement in absent or damaged esophagus in children in a formidable challenge for pediatric surgeons. It seems the method selection depends on the geographic distribution and experience of surgical teams not to the discernible data. The two most common techniques are gastric pull-up and colon interposition. There is no randomized clinical trial for evaluation of these two methods. It seems that there is no significant differences between early complications such as anastomosis leakage and graft necrosis between these two methods in several studies and no differences is seen in late complications such as gastroesophageal reflux, poor feeding, tortuosity of the graft, stenosis and Barret's esophagus between these two methods. Differences are seen in small groups and large groups of studies; therefore, it seems it is related to the surgeon's experience than the kind of methods. Long term follows up for evaluation of late complications such as stricture, Barret's esophagus and tortuosity of the graft is needed until adulthood [44, 45].

Colon interposition has is a current procedure with minimal serious long-term complications such as colonic segment dilatation and redundancy, acid peptic reflux, halitosis and anastomosis stricture which may need to surgical intervention specially for reflux and colonic redundancy. Gastric pull-up is easier in technique with single anastomosis in the neck and it can be done in emergency and new-borns, but it has long term less serious complications such as decreased pulmonary function test, bile reflux, stasis and growth retardation. Gastric tube has serious early post operation complication such as neck and mediastinal leakage necrosis of graft and stenosis. Free jejunal graft interposition is a rare method of esophageal replacement because of technical difficulties such as short mesentery but it has good results in expert hands [46].

Gastric pull-up and colon interposition can be used in long gap esophageal atresia, esophageal burn and complicated acid peptic reflux esophagitis whit the most complication of stricture and leak [39]. It seems gastric pull-up and colon interposition are the most common esophageal replacement techniques which are used in long gap esophageal atresia with good early and long-term results. Gastric tube and jejunal interposition have not enough evidence for evaluating the true outcomes and are needed more cases for evaluation and decision making [47].

Mediastinal Routh is used for immediate esophageal replacement after esophagectomy and substernal pathway is used for delayed esophageal replacement after esophagectomy. Dilatation of thoracic inlet by resection of left half of manubrium and internal third of clavicle reduces the risk of cervical anastomosis leakage [48]. Because the lack of long-term comparative study about the advantages and disadvantages of different types of esophageal replacement, and proper prospective comparative studies are absent, it seems we cannot significantly introduce the method of choice in patients and it mostly depends on the surgeon's skills and selections [49]. Further studies are needs for this decision making [50]. Long term follow-up is recommended until adulthood for evaluating the late outcome of these different procedures [51]. Pulmonary complications, graft necrosis a leak are the most important leading causes of post-operative mortality, therefor pre-operative evaluation of respiratory system is mandatory without considering the type of selected conduit [52].

REFERENCES

1. Stone MM, Fonkalsrud EW, Mahour GH, Weitzman JJ, Takiff H (1986) Esophageal Replacement with Colon Interposition in Children. *Ann Surg* 203: 346-351. [Crossref]
2. Reinberg O (2016) Esophageal replacements in children. *Ann N Y Acad Sci* 1381: 104-112. [Crossref]
3. Jeyasingham K, Lerut T, Belsey RH (1999) Functional and mechanical sequelae of colon interposition for benign oesophageal disease. *Eur J Cardiothorac Surg* 15: 327-331. [Crossref]
4. Eze JC, Onyekwulu FA, Nwafor IA, Etukokwn K, Orakwe O (2014) Right colon interposition in corrosive esophageal long segment stricture: Our local experience. *Niger J Clin Pract* 17: 314-319. [Crossref]
5. Sadanaga N, Morinaga K, Matsuura H (2015) Secondary reconstruction with a transverse colon covered with a pectoralis major muscle flap and split thickness skin grafts for an esophageal defect and wide skin defects of the anterior chest wall. *Surg Case Rep* 1: 22. [Crossref]
6. Boukerrouche A (2016) Colon Reconstruction and Esophageal Reconstructive Surgery. *Med Clin Rev* 2.
7. Touloukian RJ, Tellides G (1994) Retrosternal ileocolic esophageal replacement in children revisited. *J Thorac Cardiovasc Surg* 107: 1067-1072. [Crossref]
8. Boukerrouche A (2014) Colonic Esophageal Reconstruction by Substernal Approach for Caustic Stricture: What is the Impact of the Enlargement of the Thoracic Inlet on Cervical Anastomotic Complications? *Jurnalul de Chirurgie* 10.
9. Chávez Aguilar AH, Silva Báez H, Sánchez Rodríguez YB, Esparza Ponce C, Zatarain Ontiveros MÁ et al. (2015) Early complications with colon esophageal substitution for children via retrosternal. *Gac Med Mex* 151: 323-328. [Crossref]
10. Boukerrouche A (2017) Surgical Management of Graft Redundancy after Colon Interposition for Esophageal Reconstruction. *Med Clin Rev* 3.
11. Li DX, Levine MS, Rubesin SE, Laufer I (2007) Nonanastomotic strictures after colonic interposition. *AJR Am J Roentgenol* 189: 30-34. [Crossref]
12. Yacoub A, Bank L, Sidhu JS (2015) Tubular Adenomatous Polyp in a Colon Interposition: A Case Report and Review of Literature. *J Med Cases* 6: 188-193.
13. Ng DW, Ching Tan GH, Teo MC (2016) Malignancy arising in a 41-year-old colonic interposition graft. *Asian J Surg* 39: 45-47. [Crossref]
14. Eze JC, Onyekwulu FA, Nwafor IA, Etukokwn K, Orakwe O (2014) Right colon interposition in corrosive esophageal long segment stricture: our local experience. *Niger J Clin Pract* 17: 314-319. [Crossref]
15. Yakoub D, Ruiz G, Ng J, Paulus E, Picado O et al. (2017) Complex esophageal reconstruction after esophagogastrectomy with non-supercharged right colon interposition for the treatment of lye ingestion. *Int J Case Rep Images* 8.
16. Wu MH, Tseng YT, Lin MY, Lai WW (2001) Esophageal reconstruction for hypopharyngoesophageal strictures after corrosive injury. *Eur J Cardiothorac Surg* 19: 400-405. [Crossref]
17. Bal HS, Sen S (2016) The use of ileocolic segment for esophageal replacement in children. *J Indian Assoc Pediatr Surg* 21: 116-119. [Crossref]
18. Luoma R, Raboei E (2000) Colon-patch oesophagoplasty. *Eur J Pediatr Surg* 10: 194-196. [Crossref]
19. Hourang VM (2002) Colon Patch Esophagoplasty: A Clinical Study For Chemical Burn Esophageal Stricture. *Int J Surg* 5: 1-6.
20. Hirschl RB, Yardeni D, Oldham K, Sherman N, Siplovich L et al. (2002) Gastric Transposition for Esophageal Replacement in Children: Experience With 41 Consecutive Cases With Special Emphasis on Esophageal Atresia. *Ann Surg* 236: 531-541. [Crossref]
21. Cowles RA, Coran AG (2010) Gastric transposition in infants and children. *Pediatr Surg Int* 26: 1129-1134. [Crossref]
22. Kandpal DK, Prasad A, Chowdhary SK (2013) Laparoscopic and thoracoscopic gastric pull-up for pure esophageal atresia in early infancy. J Indian Assoc Pediatr Surg 18: 27-30. [Crossref]
23. Angotti R, Molinaro F, Noviello C, Cobellis G, Martino A et al. (2017) Gastric transposition as a valid surgical option for esophageal replacement in pediatric patients: experience from three Italian medical centers. *Gastroenterol Rep (Oxf)* 5: 47-51. [Crossref]
24. Fathi M, Bagheri B, Razavi S, Mahdavi A, Salarian S (2015) Duration of Intubation After Gastric Pull up Operation in Young Children. *Arch Pediatr Infect Dis* 3.
25. Reismann M, Granholm T, Ehren H (2015) Partial gastric pull-up in the treatment of patients with long-gap esophageal atresia. *World J Pediatr* 11: 267-271. [Crossref]
26. Liang DH, Meisenbach LM, Kim MP, Chan EY, Khaitan PG (2017) Management of gastric conduit dehiscence with self-expanding metal stents: a case report on salvaging the gastric conduit. *J Cardiothorac Surg* 12: 4. [Crossref]
27. Tabari AK, Tabari KN (2015) Gastric Tube Interposition for Esophageal Replacement in Children, Is it the best option? *Iranian J Pediatr Surg* 1: 58-62.
28. Hugh TB, Lusby RJ, Coleman MJ (1979) Antral Patch Esophagoplasty. A New Procedure for Acid-Peptic Esophageal Stricture. *Am J Surg* 137: 221-225. [Crossref]
29. Hugh TB, Meagher AP, Li B (1991) Gastric antral patch esophagoplasty for extensive corrosive stricture of the esophagus. *World J Surg* 15: 299-303. [Crossref]

30. Yasuda T, Shiozaki H (2011) Esophageal Reconstruction Using a Pedicled Jejunum with Microvascular Augmentation. *Ann Thorac Cardiovasc Surg* 17: 103-109. [Crossref]
31. Kaminski A, Broniszczak D, Nachulewicz P, Kalicinski P, Milnerowicz S et al. (2003) Esophageal Reconstruction with Jejunum or Colon. *J Indian Assoc Pediatr Surg* 8: 91-95.
32. Molinaro F, Bindi E, Pellegrino C, Casini L, Messina M et al. (2017) Bianchi A8 an-european-multicentric-study-of-esophageal-replacements-gastric-pullup-jejunal-interposition-colonic-interposition. *Allied J Clinicl Path* 1: 9-12.
33. Cunningham DK, Stern SJ, Burnett HF (2005) Sternocleidomastoid Myocutaneous Esophagoplasty for Benign Cervical Stricture. *Ann Thorac Surg* 79: 1406-1407. [Crossref]
34. Noland SS, Ingraham JM, Lee GK (2011) The sternocleidomastoid myocutaneous "patch esophagoplasty" for cervical esophageal stricture. *Microsurgery* 31: 318-322. [Crossref]
35. Mardini S, Chen HC, Salgado CJ, Özkan Ö, Cigna E et al. (2006) Free Microvascular Transfer of the Reverse Ileo-Colon Flap With Ileocaecal Valve Valvuloplasty for Reconstruction of a Pharyngoesophageal Defect: Indication and Usage of the 'Funnel Flap'. *J Plast Reconstr Aesthet Surg* 59: 1241-1246. [Crossref]
36. Nieponice A, Ciotola FF, Nachman F, Jobe BA, Hoppo T et al. (2014) Patch Esophagoplasty: Esophageal Reconstruction Using Biologic Scaffolds. *Ann Thorac Surg* 97: 283-288. [Crossref]
37. Molinaro F, Angotti R, Bindi E, Pellegrino C, Casini L et al. (2017) An European multicentric study of esophageal replacements: gastric pullup, jejunal interposition, colonic interposition. *Allied J Clinicl Pat* 1.
38. Menon P, Rao KLN (2008) Esophageal Surgery in Newborns, Infants and Children. *Indian J Pediatr* 75: 939-943. [Crossref]
39. Delshad S, Farhood P, Nasiri SJ (2007) Esophageal replacement in children: presentation of 18 cases and results of theirsurgical procedure. *Med J Islamic Repub Iran* 21: 139-144.
40. de Aquino JL, de Camargo JG, Cecchino GN, Pereira DA, Bento CA et al. (2014) Evaluation of urgent esophagectomy in esophageal perforation. *Arq Bras Cir Dig* 27: 247-250. [Crossref]
41. Kunisaki SM, Coran AG (2017) Esophageal replacement. *Semin Pediatr Surg* 26: 105-115. [Crossref]
42. Boume MA, Ka AKA, Amavi TBK, Kam A (2017) Management of the Caustic Strictures of the Esophagus in Children: Six Years' Experience in a Developing Country (Togo). *SMJ Pediatr Surg Int* 3.
43. Woo R, Wong CM, Trimble Z, Puapong D, Koehler S et al. (2017) Magnetic Compression Stricturoplasty For Treatment of Refractory Esophageal Strictures in Children: Technique and Lessons Learned. *Surg Innov* 24: 432-439. [Crossref]
44. Soccorso G, Parikh DH (2016) Esophageal replacement in children: Challenges and long-term outcomes. *J Indian Assoc Pediatr Surg* 21: 98-105. [Crossref]
45. Arul GS, Parikh D (2008) Oesophageal Replacement in Children. *Ann R Coll Surg Engl* 90: 7-12. [Crossref]
46. Sharma S, Gupta DK (2017) Surgical techniques for esophageal replacement in children. *Pediatr Surg Int* 33: 527-550. [Crossref]
47. Liu J, Yang Y, Zheng C, Dong R, Zheng S (2017) Surgical outcomes of different approaches to esophageal replacement in long-gap esophageal atresia: A systematic review. *Medicine (Baltimore)* 96: e6942. [Crossref]
48. Abdelkader B (2016) Esophageal Reconstruction by Substernal Route: Impact of the Thoracic Inlet Enlargement on Cervical Anastomotic Complications: Leak and Stricture. *Gastroenterol Hepatol* 5.
49. Gallo G, Zwaveling S, Groen H, Van der Zee D, Hulscher J (2012) Long-gap esophageal atresia: a meta-analysis of jejunal interposition, colon interposition, and gastric pull-up. *Eur J Pediatr Surg* 22: 420-425. [Crossref]
50. Arul GS, Parikh D (2008) Oesophageal replacement in children. *Ann R Coll Surg Engl* 90:7-12. [Crossref]
51. Soccorso G, Parikh DH (2016) Esophageal replacement in children: Challenges and long-term outcomes. *J Indian Assoc Pediatr Surg* 21: 98-105. [Crossref]
52. Flanagan JC, Batz R, Saboo SS, Nordeck SM, Abbara S et al. (2016) Esophagectomy and Gastric Pullthrough Procedures: Surgical Techniques, Imaging Features, and Potential Complications. *Radiographics* 36: 107-121. [Crossref]