Early Complications of Gastric Transposition Operation

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Abstract

Gastric transposition was performed in 100 children as a definitive procedure for oesophageal replacement between 1982 and 1997 for 69 oesophageal atresia (41 with distal tracheooesophageal fistula, 20 isolated oesophageal atresia and 8 with proximal tracheooesophageal fistula), 16 severe caustic stricture, 7 intractable peptic reflux stricture and 8 miscellaneous causes. Six mortalities were recorded. Sixty-five patients had complications postoperatively and respiratory complication was the most common complication especially in oesophageal atresia patients. Swallowing difficulty, particularly in oesophageal atresia, occurred in 21 per cent of the patients. Ten patients developed cervical leakage with spontaneous closure and 8 patients suffered from anastomosis stricture. Six jejunostomy revisions were required. Three of five pyloromyotomy obtained inadequate gastric drainage post gastric transposition and required the conversion to pyloroplasty. Because of the distinctive low major life-threatening morbidity and low mortality, we concluded that gastric transposition was a safe, easy and preferable procedure for oesophageal replacement in children.

Key word : Adolescence, Anastomosis, Surgical, Child, Preschool, Deglutition/psysiology, Esophageal Atresia/surgery, Esophageal Substitute, Esophageal Diseases/surgery, Esophagectomy/methods, Complication, Follow-Up Studies, Gastric Emptying/physiology, Human, Infant, Stomach/surgery, Survival Rate, Weight Gain

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Although it is generally accepted that the child's own oesophagus is the best[1], when the oesophagus has been irretrievably damaged, the oesophageal substitution operation becomes necessary. The best method for oesophageal replacement in children remains controversial. The four options currently in use are jejunal interposition, gastric tube oesophagoplasty, colonic interposition and gastric transposition. Colonic interposition is currently the most favoured method for oesophageal replacement

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and gastric tube has been used frequently as well. Spitz, et al[2], proposed gastric transposition for oesophageal replacement and emphasised its role [3-5]. The advantages of gastric transposition are the technical ease of the procedure, the excellent blood supply of the stomach, the fact that adequate length can almost invariably be attained and the requirement of a single anastomosis.

The ideal oesophageal substitution procedure should be attended by a low complication rate. Although the complication rates of colonic interposition and gastric tube oesophagoplasty have been published in many big series, the complication rate of gastric transposition is unknown. Therefore, we retrospectively studied the outcome of this operation and the results of gastric transposition will be compared to the other oesophageal conduits.

MATERIAL AND METHOD

We retrospectively studied 100 patients who received gastric transposition procedures from a single surgeon in the Hospital for Sick Children, Great Ormond Street, London, UK between November 1982 and February 1997. The information of indication, pre-operative condition, technique of operation, postoperative complications during admission were collected from the medical records.

RESULTS

One hundred patients (male 64, female 36) received gastric transposition for oesophageal replacement for 69 oesophageal atresia (41 with distal tracheooesophageal fistula, 20 without fistula and 8 with proximal tracheooesophageal fistula), 16 severe caustic stricture, 7 for intractable peptic stricture, 2 each for intractable pain following cardiomyotomy for achalasia, congenital oesophageal stenosis, 1 each for prolonged oesophageal foreign body impaction, liomyoma and inflammatory pseudotumour, and one unknown-cause oesophageal fistula and stricture. The preoperative conditions are revealed in Table 1.

Most patients received multiple operations before proceeding to gastric transposition, i.e. 69 primary surgery for oesophageal atresia, 14 Nissen fundoplication, 13 colonic interposition, 7 oesophageal abandon (cervical oesophagostomy and ligate distal oesophagus), 7 repair recurrent TOF operation, 3 oesophageal stricture resection, 1 gastric tube interposition, 1 jejunal interposition and 1 decortication, etc.

The technique of gastric transposition has been described elsewhere[2-4]. The average age at operation was 3.25 years (range 0.33 to 17 years). The majority were paralysed and mechanically ventilated postoperatively (mean = 7.48 days and range 0 to 120 days). Postoperative ventilation and length of hospital stay are described in Table 2.

Six postoperative mortalities were recorded. Three intra-admission mortalities, in 2 oesophageal atresia and 1 reflux stricture patients, occurred because of 2 respiratory failure postoperatively and 1 intractable heart failure from severe pulmonary hypertension. There were 3 extra-admission mortalities but the causes of death could not be obtained.

The major intra-admission morbidities occurred in 65 per cent of cases and these morbidities are described in Table 3.

The minor morbidities included 6 operations for jejunostomy complications, 4 wound infection, 4 pneumothorax, 3 vocal cord paralysis, 3 chylothorax, 3 cardiac arrest, 2 tracheomalasia required aortopexy, one each for adhesion gut obstruc-

Table 1. Preoperative condition.

	Oesophageal atresia			Caustic stricture + Foreign body	Reflux stricture	Miscellaneous
	Distal TOF (n = 41)	No TOF (n = 20)	Proximal TOF (n = 8)	(n = 17)	(n = 7)	(n = 7)
M/F	22/19	15/5	6/2	13/4	5/2	3/4
Average age (year)	3.08	1.25	0.97	6.04	6.20	8.12
(range of age)	0.42-16	0.33-5.67	0.42-5	3.75-12	5.50-17	2.33-15.88
Average weight (kg)	10.4	8.7	8.6	17.2	12.5	23.3
(range of weight)	4.1-59	6.8-19.7	7.6-10.2	9.5-47.2	5.4-22	12.4-48

Table 2. Postoperative ventilation and hospital staying length.

	Oesophageal atresia			Caustic stricture + Foreign body	Reflux stricture	Miscellaneous
	Distal TOF (n = 41)	No TOF (n = 20)	Proximal TOF (n = 8)	(n = 17)	(n = 7)	(n = 7)
Thoracotomy	48.8%	20.0%	37.5%	41.2%	71.4%	43.0%
Average ventilation (days)	11.6	3.9	4.3	2.8	7.7	4
(range of ventilation)	2-120	0-10	2-8	0-8	2-28	1-7
Average admission (days)	53.3	46.1	24	18.7*	25.6	27.2
(range of admission)	3-270	3-180	11-49	13-750	9-28	7-120

* = exclude one patient who stayed 750 days in the hospital

Table 3. The major morbidities.

	Oesophageal atresia (n = 69)		Caustic stricture + Foreign body (n = 17)		Reflux stricture (n = 7)		Miscellaneous (n = 7)		All (n = 100)	
	%		%		%		%		%	
Complication	75.4	52	41.2	7	28.6	2	57.1	4	65.0	65
Swallow difficulty	24.6	17	17.6	3	0.0	0	14.3	1	21.0	21
Respiratory	26.1	18	0.0	0	14.3	1	0.0	0	19.0	19
Anastomosis leak*	13	9	0.0	0	14.3	1	0.0	0	10.0	10
Stricture	2.9	2	23.5	4	0.0	0	28.6	2	8.0	8
Dumping	4.3	3	0.0	0	0.0	0	14.3	1	4.0	4
Delay gastric emptying**	4.3	3	0.0	0	0.0	0	0.0	0	3.0	3

* need no operation
** need operation

tion, intussusception, aortic haemorrhage need cardiopulmonary by-pass, diaphragm paralysis, Horner's syndrome, bronchopleural fistula needed thoracotomy& drainage, SVC obstruction. One laryngotracheoesophageal cleft patient needed multiple revision operations and 1 caustic stricture developed severe scar in the laryngophalynx and needed multiple laser treatments.

DISCUSSION

Among the four options of oesophageal replacement, gastric transposition has advantages of the excellent blood supply, the technical ease of the procedure, the adequate length and the requirement of a single anastomosis. Colonic interposition has technical difficulties which hinder their use including two anastomosis requirements, precarious blood supply, high incidence of leak and stricture, recurrent peptic ulceration and has redundant tendency[4]. Moreover, it frequently requires re-operation in 50 per cent[6] and might develop colonic dysplasia[7] and carcinoma[8]. Although gastric tube oesophagoplasty has a good blood supply of the conduit, it contains a long suture line, high incidence of leak and stricture, peptic ulceration[4], Barrett's oesophagitis[9] and requires re-operation in 30 per cent of cases[6]. Oesophageal replacements by using jejunal and ileal segment are technically difficult because of precarious blood supply and the difficulty to obtain adequate length[4]. Complication rates for the various types of oesophageal replacement procedures are described in Table 4.

During intra-admission and the early postoperative period, difficulty in establishing oral feeding was the most common problem postoperatively (21.0%), but this problem was equivalent to those achieved with colonic interposition but with a remarkably lower morbidity[20]. It mainly effected children with oesophageal atresia[4,15,21]

Table 4. Complication rates for the various types of oesophageal replacement procedures.

Type	Reference	Number	Mortality	Leak	Stricture	Necrosis
Gastric	Spitz (this series)	100	6	10	8	0
Gastric	Spitz[4]	54	5	7	5	0
Colon	Ahmed et al[10]	112	15	54	34	9
Colon	Mitchell et al[11]	76	8	23	17	8
Colon	Raffensperger et al[12]	59	2	12	13	3
Colon	Gundogdu et al[13]	50	1	25	22	1
Colon	Rode et al[14]	38	4	8	5	3
Colon	Stone et al[15]	37	1	12	14	0
Colon	West et al[16]	25	0	10	3	0
Colon	Campbell et al[17]	21	1	8	4	4
Gastric tube	Anderson et al[18]	15	1	5	5	0
Jejunum	Saeki et al[19]	19	2	1	2	1

(24.6%) due to some degrees of foregut dysmotility before gastric transposition. This foregut dysmotility may have contributed to the abnormal gastric emptying time as well. Eighteen per cent of caustic stricture who received gastric transposition, suffered swallowing difficulty and the reason for this was the pharyngeal and upper oesophageal scar created from caustic material impeding the child's rapid swallowing and making the anastomosis contract from the scar. The patients with peptic stricture recovered more rapidly and less than the others due to the least degree of oesophageal dysmotility. The importance of sham feeding for infants with cervical oesophagostomy in the period prior to the oesophageal replacement cannot be underestimated. Poor sham feeding took much longer to acquire oral feeding than children who had previously learned the physiology of swallowing[4].

Respiratory complication was the second most common complication postoperatively especially in the oesophageal atresia group (26.1%). There were many reasons for lung damage especially oesophageal atresia patients before gastric transposition. More than half had had at least one previous thoracotomy, most also had had multiple endoscopies for dilatation or removal of a reconstructed colon substitute and had multiple underlying lung problems from repeated aspiration pneumonia and chronic lung disease from respiratory distress syndrome.

In this series, the incidence of anastomosis leakage was very low (10%) and this cervical leakage often healed rapidly and easily and responded to bouginage dilatation without the need for revision surgery. This low incidence of anastomosis leakage belonged to the good blood supply of the stomach and the ease to obtain the adequate length of the conduit. When we compared the incidence of cervical anastomosis leakage with the other types of oesophageal replacement (Table 4), the gastric transposition had the least incidence of leakage. Moreover, no patient has yet developed problems with ischaemia to the interposed stomach.

The anastomosis stricture was the result of anastomosis leakage, minor degree ischaemia to the interposed stomach and gastrooesophageal reflux. Gastric transposition for caustic stricture suffered from anastomosis stricture postoperatively in 23.5 per cent because of the scar created after caustic ingestion. In order to reduce the incidence of gastrooesophageal reflux, the anastomosis should be constructed above the aortic arch[4]. The distal oesophageal stump should be excised and not used for anastomosis with the cervical oesophagus because it was not the highest point of the transposed stomach and it had a tendency to reflux and created eventual stricture formation[22] and had a definite risk of malignant change and cyst formation[23].

Dumping, as manifested by excessive sweating, abdominal cramps, diarrhoea, and/or dizziness, occurred 4 per cent in this series. The relation between these symptoms and rapid gastric emptying is still controversial[24]. Some studies showed that after vagotomy, gastric emptying time of liquid was usually accelerated, whereas, emptying of solids was delayed[25]. The children had a tendency to adapt themselves by food selection, small amounts but frequent eating and liquid refraining during eating. The symptoms generally

improved with time, mostly in 2-4 years, although some patients still suffer from these symptoms.

A few studies have investigated the necessity for drainage procedure on the transposed stomach. The fact that the intrathoracic stomach must be vagotomized and no attempt has been made to create an antireflux valve at the site of the oesophagogastric anastomosis. Several competing phenomena were anticipated between the vagotomy complications, i.e. gastric stasis, hypochlorhydria, and subsequent atrophic gastritis[26] and the complications of pyloroplasty, i.e. rapid gastric emptying, dumping, and bile reflux in to the transposed stomach[24]. On the basis of our experience, we would recommend pyloroplasty in all patients undergoing gastric transposition despite the increased dumping incidence[4]. Although some have achieved good results with a pyloromyotomy for gastric drainage in gastric transposition[27], in our series, 3 from 5 pyloromyotomy had to be converted to pyloroplasty due to the profound gastric stasis symptoms and because the role of pyloromyotomy for gastric drainage was questionable.

The provision of enteral nutrition *via* the jejunostomy tube simplified the postoperative management until oral feeding was finally established. Although major jejunostomy complications that required reoperations, occurred 6 per cent in this series, this complication could be prevented by reassuring the firmed attachment between the stomach and the anterior abdominal wall.

The mortality in this series (6%) was not inconsiderable. No death was directly related to the operative procedure. Two died from respiratory failure at 38 and 40 days postoperatively and one expired from intractable heart failure and severe pulmonary hypertension from underlying congenital heart disease. There were 3 extra-admission mortalities but the causes of death could not be obtained.

In conclusion, the remarkably low major operative morbidity and mortality indicated that gastric transposition is an easy technique, safe, and has satisfactory outcome and it is the preferable surgical procedure for oesophageal replacement in children.

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ผลแทรกซ้อนในระยะแรกหลังการผ่าตัดแกสติคทรานโพสิชัน

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ผู้ป่วยเด็ก 100 คน ได้รับการผ่าตัด Oesophageal replacement โดยวิธี Gastric transposition ในช่วงระหว่างปี 2525 ถึงปี 2540 ข้อบ่งชี้ในการผ่าตัดคือ Oesophageal atresia 69 ราย (ซึ่งในจำนวนนี้เป็นแบบที่มี Distal tracheooesophageal fistula 41 ราย, ไม่มี fistula เลย 20 ราย และมี Proximal tracheooesophageal fistula อีก 8 ราย), Caustic stricture อย่างรุนแรง 16 ราย, Peptic reflux stricture 7 ราย และจากสาเหตุอื่น ๆ 8 ราย ผู้ป่วย 6 ราย เสียชีวิตหลังการผ่าตัด ผู้ป่วย 65 รายมีผลแทรกซ้อนหลังการผ่าตัด และผลแทรกซ้อนทางระบบทางเดินหายใจ เป็นผลแทรกซ้อนที่พบได้บ่อยที่สุด และพบได้บ่อยในผู้ป่วย Oesophageal atresia การกลืนอาหารลำบากพบได้ 21% ของผู้ป่วยทั้งหมด และพบมากโดยเฉพาะอย่างยิ่งในผู้ป่วย Oesophageal atresia ภาวะรั่วจากรอยต่อของหลอดอาหาร บริเวณคอเกิดขึ้นในผู้ป่วย 10 ราย แต่ภาวะรั่วจากรอยต่อนี้สามารถหายได้เองในระยะต่อมา ภาวะรอยต่อตีบเกิดขึ้นในผู้ป่วย 8 ราย ผลแทรกซ้อนที่ต้องการการผ่าตัดแก้ไขของ Jejunostomy พบได้ในผู้ป่วย 6 ราย ในผู้ป่วย 5 ราย ที่ได้รับการผ่าตัด Pyloromyotomy, มีผู้ป่วย 3 ราย ที่มีปัญหาการ Drain ของกระเพาะอาหารและจำเป็นต้องได้รับการแก้ไขโดยการผ่าตัด Pyloroplasty ผู้เขียนขอสรุปว่า Gastric transposition เป็นการผ่าตัดที่ง่าย, ปลอดภัยและเหมาะสมในการเปลี่ยน หลอดอาหารในผู้ป่วยเด็ก เนื่องจากว่าการผ่าตัดนี้มีอัตราผลแทรกซ้อนและมีอัตราการเสียชีวิตที่ต่ำเป็นที่ยอมรับได้

คำสำคัญ : เด็ก, ทารก, การตัดต่อลำไส้, ผ่าตัด, การกลืน, หลอดอาหาร, หลอดอาหารตีบตัน, การแทนที่, โรคของหลอดอาหาร, การตัดหลอดอาหาร, ผลแทรกซ้อน, โรคแทรกซ้อน, การติดตามผล, กระเพาะอาหาร, การผ่าตัดกระเพาะอาหาร, อัตราการอยู่รอด

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