Late follow-up after esophageal replacement

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Presentation Overview

• Esofageal replacement – when and why?
• Types of esophageal replacement
• Experience and results
• Follow up
• Case report
• Conclusions
• Discussions & perspectives
Esofageal replacement

Requirements for the ideal replacement conduit\(^{(1)}\):

- Allows normal feeding
- Does not cause respiratory compromise
- Does not become tortuos or redundant
- Gastric reflux should be minimal
- Does not increase malignant risk
- Should function normal for the lifetime

& ER in oesofageal atresia to be performed in children after they start walking\(^{(2)}\)


Esofageal replacement – principles

- Esofageal replacement in children is a major surgical – thoracic and abdominal surgery, implying a graft - challenge
- is mainly performed for benign pathology

Lifetime normal function

- The patient’s own esophagus is the best esophagus
**Esofageal replacement – indications 1**

- **Long gap esophageal atresia**
  Incidence decreasing because of better surgical procedures

- **Caustic strictures** - Ingestion of substances with pH >12 or 1,5

<table>
<thead>
<tr>
<th>Sulfuric acid</th>
<th>Oxalic acid</th>
<th>Hydrochloric acid</th>
<th>Phosphoric acid</th>
</tr>
</thead>
<tbody>
<tr>
<td>industrial clining agents, metal planting</td>
<td>paint thinners, metal cleaners</td>
<td>solvents, drain cleaners, antirust compounds</td>
<td>toilet cleaners</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sodium hydroxide</th>
<th>Potassium hydroxide</th>
<th>Sodium carbonate</th>
<th>Amonnia</th>
</tr>
</thead>
<tbody>
<tr>
<td>drain cleaners</td>
<td>oven cleaners, washing powders</td>
<td>soap manufacturing, fruit drying on farms</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sodium hipochlorite</th>
<th>Sodium polyphosphate</th>
<th>Potassium permanganate</th>
</tr>
</thead>
<tbody>
<tr>
<td>household cleaners</td>
<td>industrial detergents</td>
<td>disinfectants, hair dies</td>
</tr>
</tbody>
</table>
Esofageal replacement – indications 2

• **Tumors of the esophagus**
  – leiomyoma, inflammatory pseudotumor
  – leiomyosarcoma, teratoma

• **Peptic strictures / Barret esophagus**
  a small percentage of children does not respond to antireflux medication, surgery, dilatation and ‘sleeve’ resection and will need esophageal replacement
Esofageal replacement – indications 3

- Intractable achalasia
- Scleroderma
- Epidermolysis bullosa

Unusual indications

+/- Almost ablolete indications: severe esophageal candidiasis in immunocompromised children, esophageal varices

Types of esophageal replacement

- **Gastric transposition (pull-up)** \(^1\) 1985
  - high rate of postoperative complications
  - difficulties in the initiation of oral feeding \(^2\)
  - gastroesophageal bleeding
  - gastroesophageal reflux
  - aspiration pneumonia

1. **Gastric Transposition for Esophageal Replacement in Children** Experience With 41 Consecutive Cases With Special Emphasis on Esophageal Atresia - Ronald B. Hirschl, \(^*\) and Arnold G. Coran, \(^1\)


Types of esophageal replacement 2

- **Gastric tube** – from the great gastric curvature 
  - long suture line
  - high incidence of leaks and strictures

1) Oesophageal replacement in children, GS Arul, D Parikh, Ann R Coll Surg Engl 2008; 90: 7–12,
Types of esophageal replacement 3

• **Jejunal interposition/ free graft** — precarious blood supply, prolonged operation time, microvascular anastomosis

• **Colon interposition**
  – Left colon
  – Right colon

• **Colon patch**

• **Tissue engineering**

The esophageal substitute can be placed through different routes, each with its own advantages and disadvantages:

<table>
<thead>
<tr>
<th>route</th>
<th>advantages</th>
<th>disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retrosternal</td>
<td>- Ease procedure</td>
<td>- Longest route from neck to abdomen</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Angulation of the graft</td>
</tr>
<tr>
<td>Transpleural</td>
<td></td>
<td>- Displacement of the lung</td>
</tr>
<tr>
<td>Posterior mediastine</td>
<td>- Most direct route</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Organ contained in the mediastinum</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Thoracotomy not always required</td>
<td></td>
</tr>
</tbody>
</table>

533 patients - *Esophageal Replacement* using transverse colon graft / gastric tube

465 post-caustic esophageal stenosis

67 LG esophageal atresia

1 leiomyoma
TYPE OF GRAFT – review group

- Transverse colon graft: 85%
- Gastric tube: 6%
- Left colon graft: 9%

Long follow-up
365 (68.48%) patients ➔ 4 - 46 years
FOLLOW-UP INTERVAL

• once every **3 months** in the first year
• once every few **years** depending on patient compliance and incidence of complications
EVALUATED PARAMETERS

- Early postoperatory complications
  - Hospital stay
  - Mortality
  - Strictures formation
  - Leak of the anastomosis
  - Disphagia
  - Endoscopic aspect
- Staturo ponderal development
- HRQoL questionnaire

NOTE: Documentation of GER by means of pH metry was abandoned in the patients with gastric tube esofagoplasty due to very high acidity found in the first few patients tested.

As seen on contrast swallow
Early complications

- Pneumothorax: 20.5%
- Anastomotic leak: 24.85% colon / 32.25% gastric
- Intestinal intussusceptions: 4%
- Suppuration of the esophageal stump: 4%
- Elongation of the brachial plexus: 3%
- Gastric bleeding: 2%
- Early intestinal obstruction: 1.5%
- Douglas abscess: 0.5%
- Colic graft perforation: 0.5%
Hospital length stay / number of operations / year

Colon interposition

- number of operations per period of 10 years
- length of hospital stay

<table>
<thead>
<tr>
<th>Year</th>
<th>Operations</th>
<th>Stay</th>
</tr>
</thead>
<tbody>
<tr>
<td>1964</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>1974</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>1984</td>
<td>70</td>
<td>79</td>
</tr>
<tr>
<td>1994</td>
<td>66</td>
<td>83</td>
</tr>
<tr>
<td>2004</td>
<td>58</td>
<td>53</td>
</tr>
<tr>
<td>2010</td>
<td>52</td>
<td>28</td>
</tr>
</tbody>
</table>
Hospital length stay / number of operations / year

Gastric tube

- Number of operations per year
- Length of hospital stay


- Number of operations: 2, 3, 12, 5, 4, 5
Leak incidence

Decrease leak incidence in the last 5 years

- Colon transposition: 334, 24.85%
- Gastric tube: 32, 32.25%
Stricture formation

- **stricture**: 16.16% of patients with colon interposition
  - 25.8% in those with gastric tube
Types of stenosis

Complete stenosis
Types of stenosis

- Storied stenosis
- Pseudo-diverticular
- High esophageal stenosis
Gastroesophageal reflux followed patients gastroesophageal reflux
Endoscopic examination

ID. No.:  
Sex:  
D. O. Birth:  
01/01/2000  
00:42:31
CVP:
D. F:
Pump
Gr: N

Name:

Physician:
Comment:
Staturo ponderal developpement

- Colon transposition:
  - Normal: 255 (76.34%)
  - Hipotrophy: 79

- Gastric tube:
  - Normal: 23
  - Hipotrophy: 8 (74.19%)
Late complications – colon transposition

- Disfagia: 8%
- Intestinal occlusion: 5%
- Peptic ulcer: 0.3%
- Mediogastric and pyloric stenosis: 0.3%
- Gastric dilatation: 0.3%
- GER: 5%

81% - no complications
Late complications – gastric tube

- No complications: 53%
- Intestinal occlusion: 2%
- Anemia: 16%
- Nocturnal coughing: 24%
- Disfagia: 5%
Mortality

- 7 deaths - 1.65%
  - 6 in the first days after surgery
  - 1 at distance – 1 year after surgery

- Since 1994 NO mortality
Case report 1
esophageal and gastric diffuse nodular leiomyofibromatosis

Esophagectomy + gastrectomy

- Oesophageal replacement with isoperistaltic transvers colon pulled through the posterior mediastinum
- Colon graft – duodenal end to end anastomosis
Case report 2

- 3 years old boy with esophageal replacement
- 1 year after surgery – **bleeding - upper gastrointestinal graft dilatation**

AP  lateral view
Health related quality of life

WHY?

# «a number of unsolved issues remain
# the current approach to difficult cases is not yet established”


# long term sequelae after esophageal repair / replacement are common

HRQoL is an assessment of how the individual's well-being may be affected over time by a disease, disability, or disorder – Wikipedia
ADULT HRQoL after E Surgery/Normal 1

- **Regurgitation** was found 17% compared to normal 10%.

- **Dysphagia** was found 10% / 2% → significantly higher – P<5.

- **Lower respiratory symptoms** were found with a P<0.5.

- **Psychosocial symptoms query Scores** did not differ between operated/healthy population → P = Non Significant NS.

- **Type of esophageal conduit does not influence the HRQoL.**

ADULT HRQoL after E Surgery 2

- The HRQoL was affected in 15% and from those,
  - 58% presented acquired disease and
  - the rest 42%, had beside Esophageal Atresia (AE), associated anomalies.

- Morbidity from esophageal functional disorders & respiratory ones impairs HRQoL in 15% of review patients, that had a surgical procedure

HRQoL – long term

„HRQoL after complex and/or complicated EA is good. In adults, disease-specific symptoms negatively affect HRQoL. Our data indicate that saving the esophagus may achieve the best HRQoL”

2 J PediatrSurg. 2014 Apr;49(4):631-8, Long-term health-related quality of life after complex and/or complicated esophageal atresia in adults and children registered in a German patient support group

Dingemann C1, Meyer A2, Kircher G3, Boemers TM4, Vaske E5, Till H6, Ure BM
The PedsQL Condition – Specific Modules
WITH SCALES for Physical, Emotional, Social, School Functioning
Disease-Specific Modules available for: asthma, rheumatology, diabetes, cancer, and cardiac conditions

FOR CONGENITAL MALFORMATIONS?
Future? TE Replacement

**Scaffolds**

a. Transplanted
   Repopulated by host cells

b. seeded prior to transplantation

Short segments, patches
- epithelial
- muscular

Long segments
- poor results
- stenosis, mortality

**Stenting**

**Omental wrapping** vascularization+/−

**Decellurized matrices** — choice for scaffolds

**Smart polymers** signalling cell – scaffold interaction
Conclusions I

- We preferred the colon grafts because:
  - it assures an adequate length of the graft
  - has a good and constant vascularisation
  - the left colic artery anastomosis with the superior sigmoidian artery was always preserved
  - no functional impairment
Conclusions II

• No esophageal stripping was performed

• No malignant lesions of the remaining oesophagus

• The mediastinal esophageal stump was drained to prevent abscess

• In high stenosis: longitudinal incision of the posterolateral wall of the hypopharynx and esophagus + oblique anastomosis

• In children, transvers colon graft preparation and its thoracic placement is technically achievable in all cases, all vascular variants included
Take home message

Treat taking into account:

- repeated examinations
- medical situation,
- realize the procedure you manage the best,
- being able you may assure the treatment of possible complications,
- have a look at the social level of the family and society

Nicolae Tonitza - Girl (1901) National Art Gallery, Bucharest
THANK YOU

Johannes Brahms
Hungarian Dance No 5
Claudio Abbado,
Winner Phylarmonic Orchestra

Bertalan Székely
Boy with Bread and Butter 1890

Nicolae Grigorescu
Boy Country women (1894)
National Art Gallery, Bucharest