

Constantin Brincusi, October 1938

“ENDLESS COLUMN”

Late follow-up after esophageal replacement

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in Pediatrics & Child Health



Presentation Overview

- Esophageal 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 tortuous or redundant
- Gastric reflux should be minimal
- Does not increase malignant risk
- Should function normal for the lifetime

& ER in oesophageal atresia to be performed in children
after they start walking⁽²⁾

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

2) Should patients with esophageal atresia be submitted to esophageal substitution before they start walking? Tannuri U, Tannuri AC, Dis Esophagus, 2011 Jan, 24(1): 25-9

Esofageal replacement – principles

- Esofageal replacement in children is a major surgical – **thoracic and abdominal surgery, impling 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

Sulfuric acid – industrial clining agents, metal planting

Oxalic acid – paint thinners, metal cleaners

Hydrochloric acid – solvents, drain cleaners, antirust compounds

Phosforic acid – toilet cleaners

Sodium hydorxide – drain cleaners

Potassium hydroxide – oven cleaners, washing powders

Sodium carbonate – soap manufacturing, fruit drying on farms

Amonnia –

Sodium hipoclorite – household cleaners

Sodium polyphosfate – industrial detergents

Potassium permanganate – disinfectants, hair dies

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
- Sclerodermia
- Epidermolysis bullosa



Unusual indications

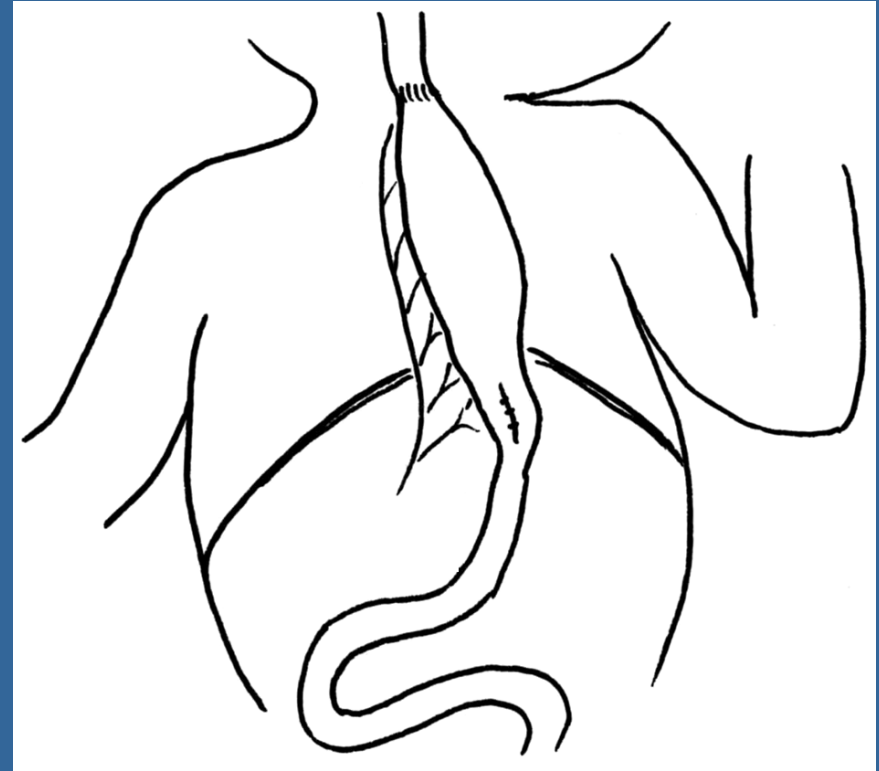
+/- Almost obsolete indications: severe esophageal candidiasis in immunocompromised children, esophageal varices⁽¹⁾

1. Hamza AF, AbdelhayS, Sherif H, Hasan T, Soliman H, Kabesh A et al,
Caustic esophageal strictures in children/30 years experience , J Ped Surg 2003

Types of esophageal replacement 1

- **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



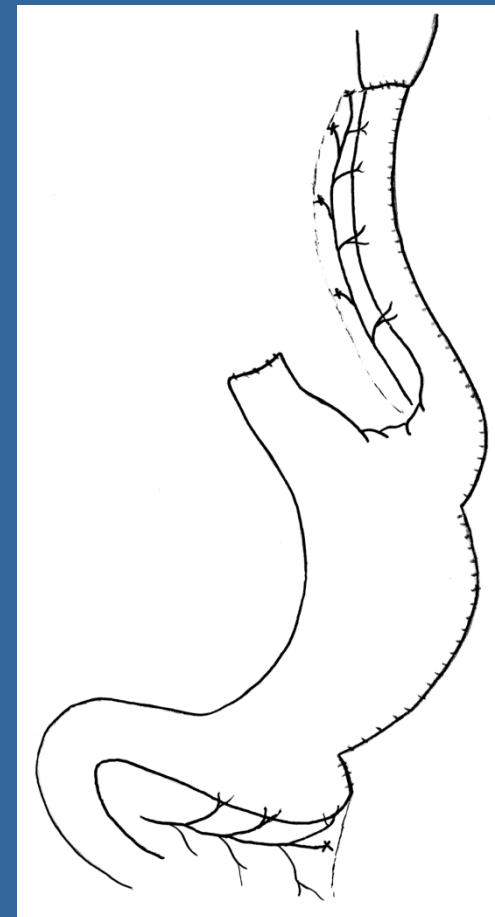
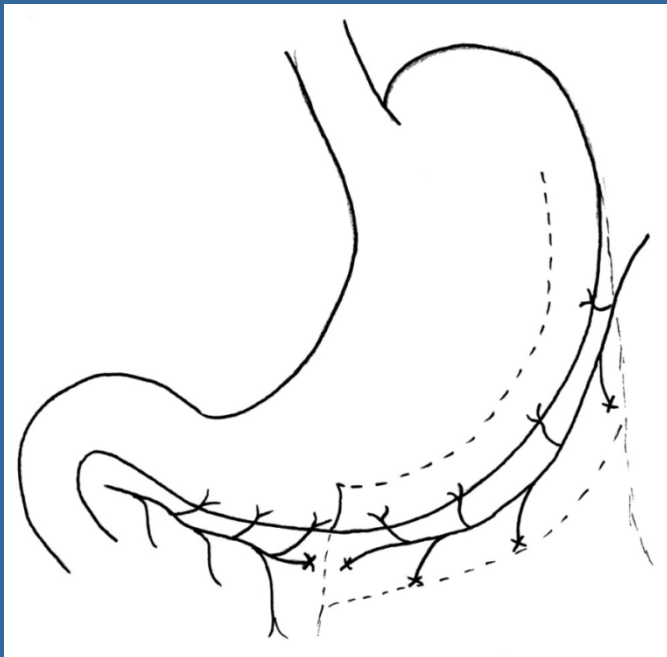
¹ **Gastric Transposition for Esophageal Replacement in Children** Experience With 41 Consecutive Cases With Special Emphasis on Esophageal Atresia - [Ronald B. Hirschl](#),* and [Arnold G. Coran](#),

2) Oesophageal replacement in children, GS Arul, D Parikh, Ann R Coll Surg Engl 2008; 90: 7–12, doi 10.1308/003588408X242222

2) Long term effects of gastric transposition in children, a physiological study, M Davenport, G P Hoise, R C Tasker, I Gordon, E M Kiely, L Spitz, Ann Surg oct 2002; 236(4): 531-541

Types of esophageal replacement 2

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

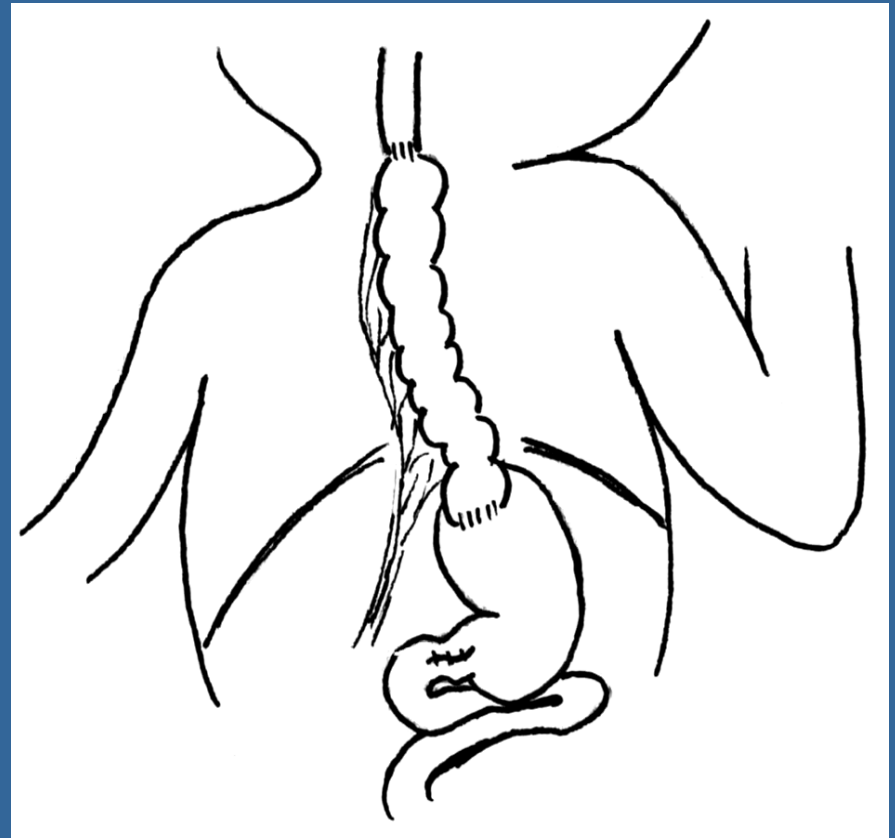


1) Oesophageal replacement in children, GS Arul, D Parikh, Ann R Coll Surg Engl 2008; 90: 7–12,

2) Gavriiliu D, Replacement of the esophagus by a reverse gastric tube. Our problems.Surg1975; 12: 36-64

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

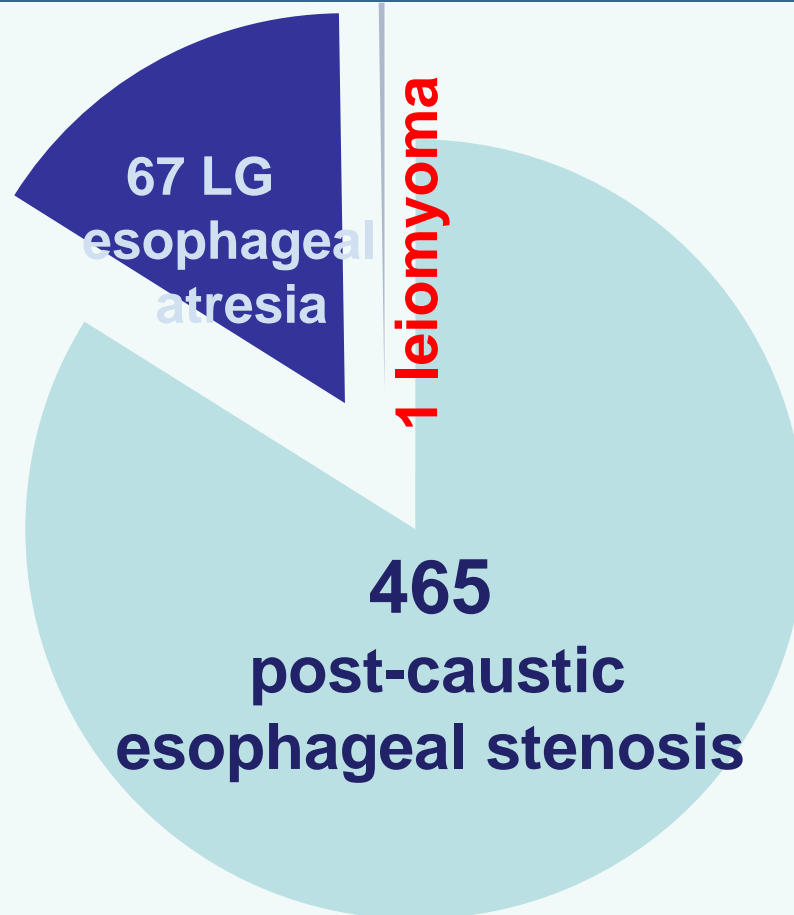
route	advantages	disadvantages
Retrosternal	<ul style="list-style-type: none">- Ease procedure	<ul style="list-style-type: none">- Longest route from neck to abdomen- Angulation of the graft
Transpleural		<ul style="list-style-type: none">- Displacement of the lung
Posterior mediastine	<ul style="list-style-type: none">- Most direct route- Organ contained in the mediastinum-Thoracotomy not always required	

INDICATIONS – Experience

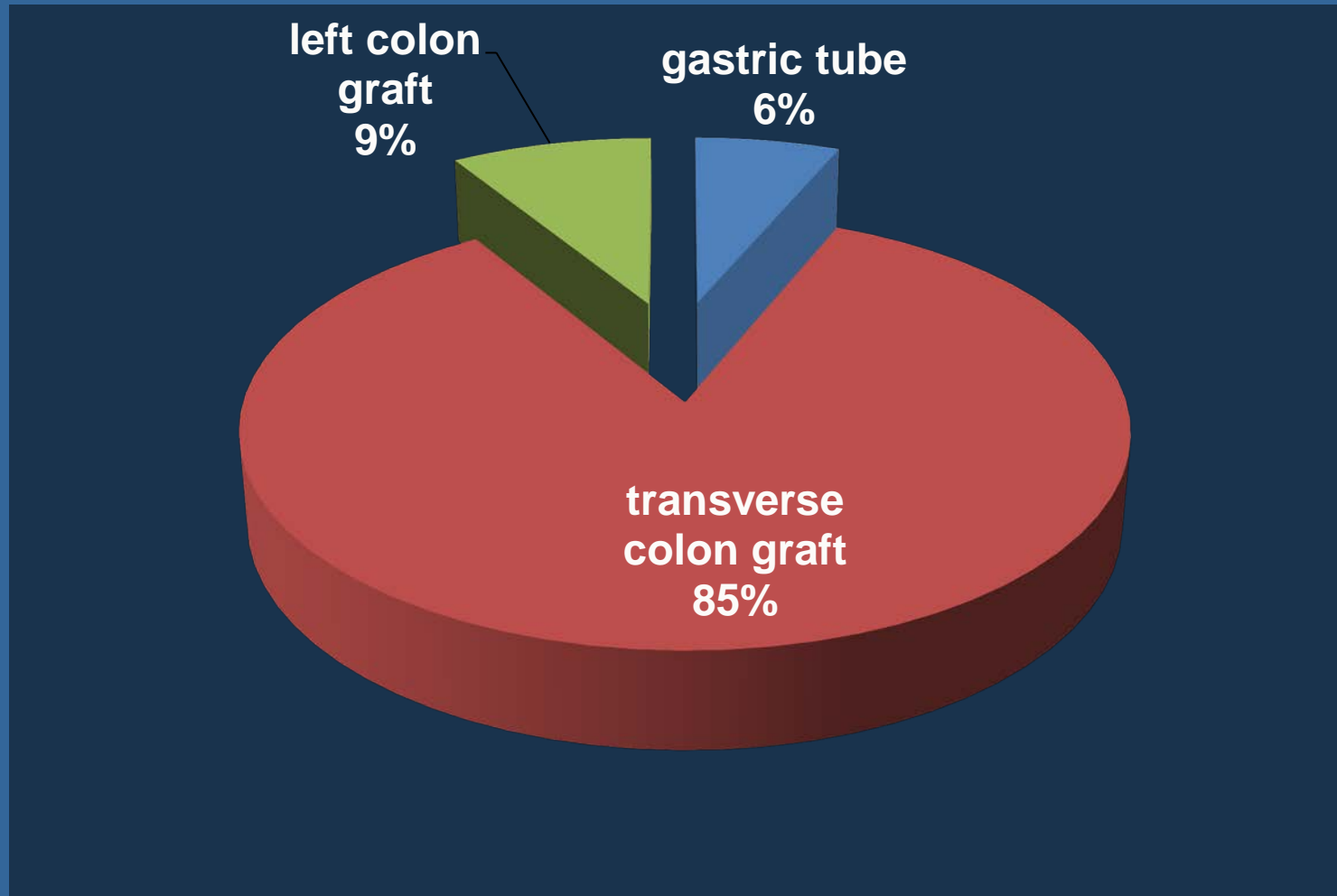
533 patients - *Esophageal Replacement* using transverse colon graft / gastric tube

1964

2010



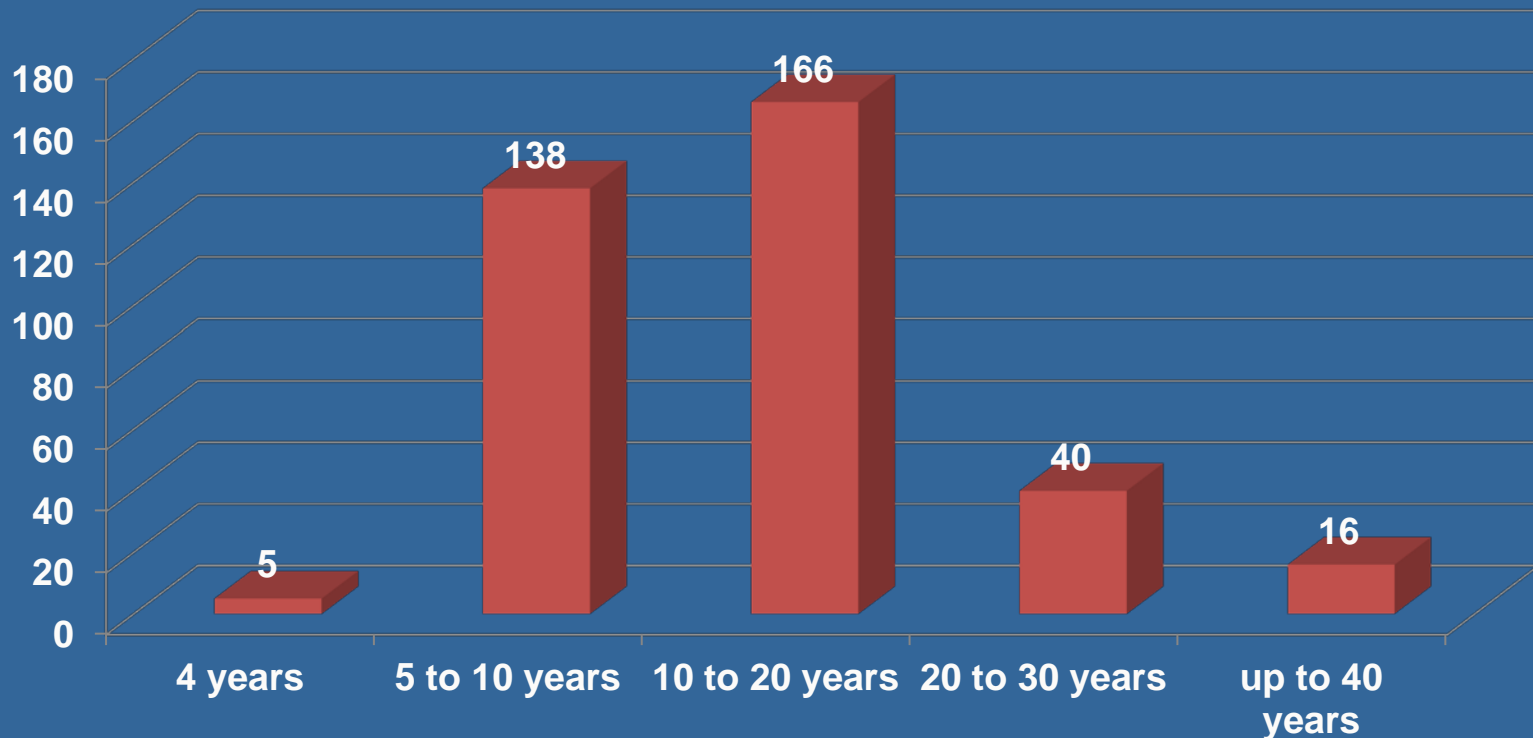
TYPE OF GRAFT – review group



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 postoperative complications
- Hospital stay
- Mortality
- Strictures formation
- Leak of the anastomosis
- Disphagia
- Endoscopic aspect
- Statural ponderal development
- *HRQoL* questionnaire



As seen on
contrast swallow

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

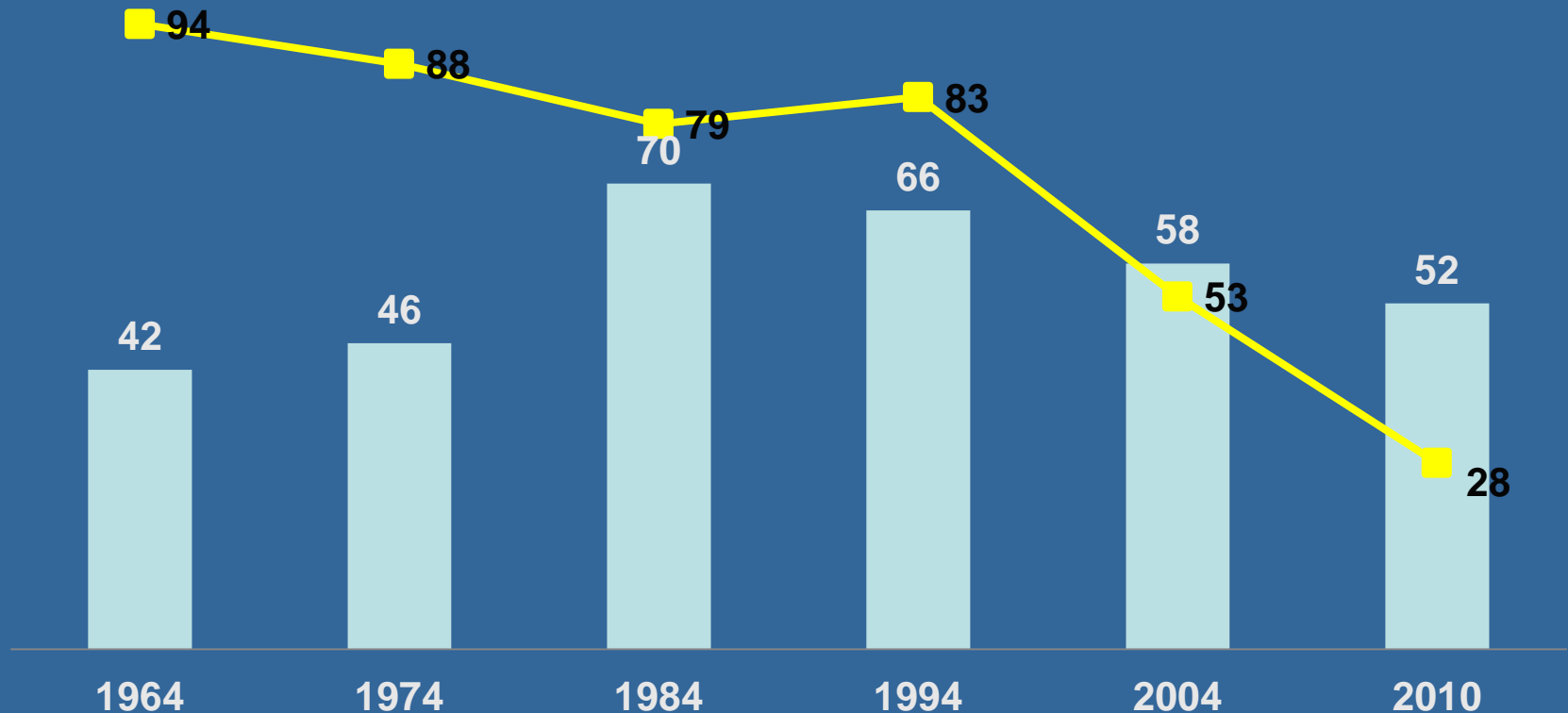
Early complications

- 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

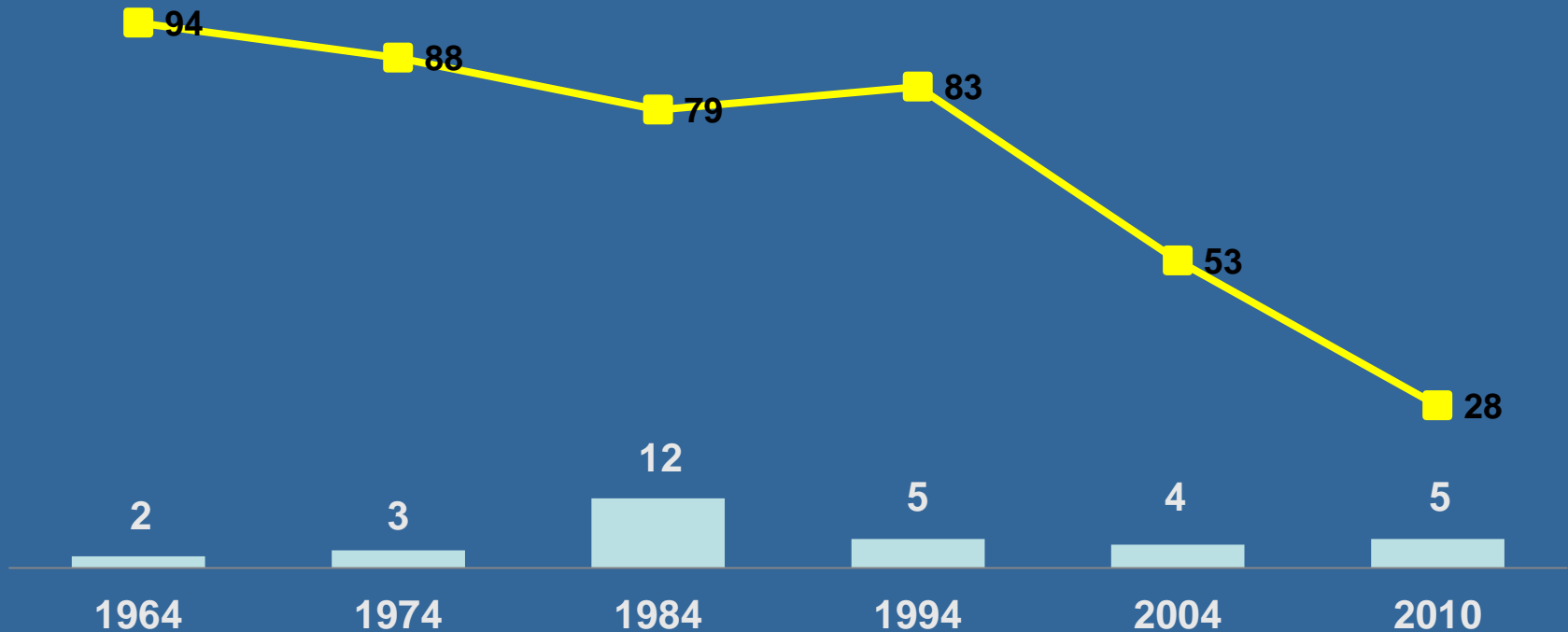
■ number of operations per period of 10 years
■ length of hospital stay



Hospital length stay / number of operations / year

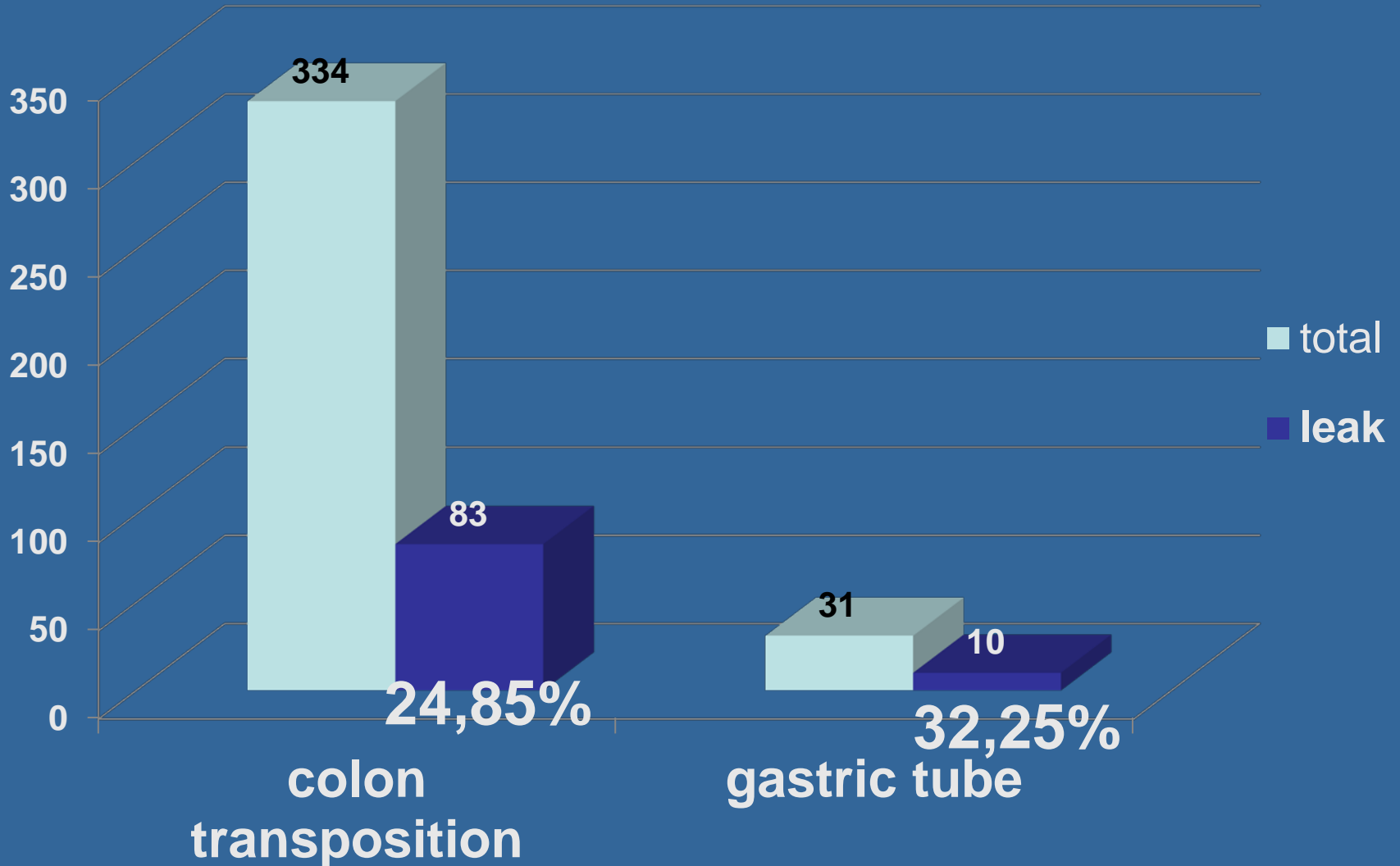
Gastric tube

■ number of operations per year ■ length of hospital stay



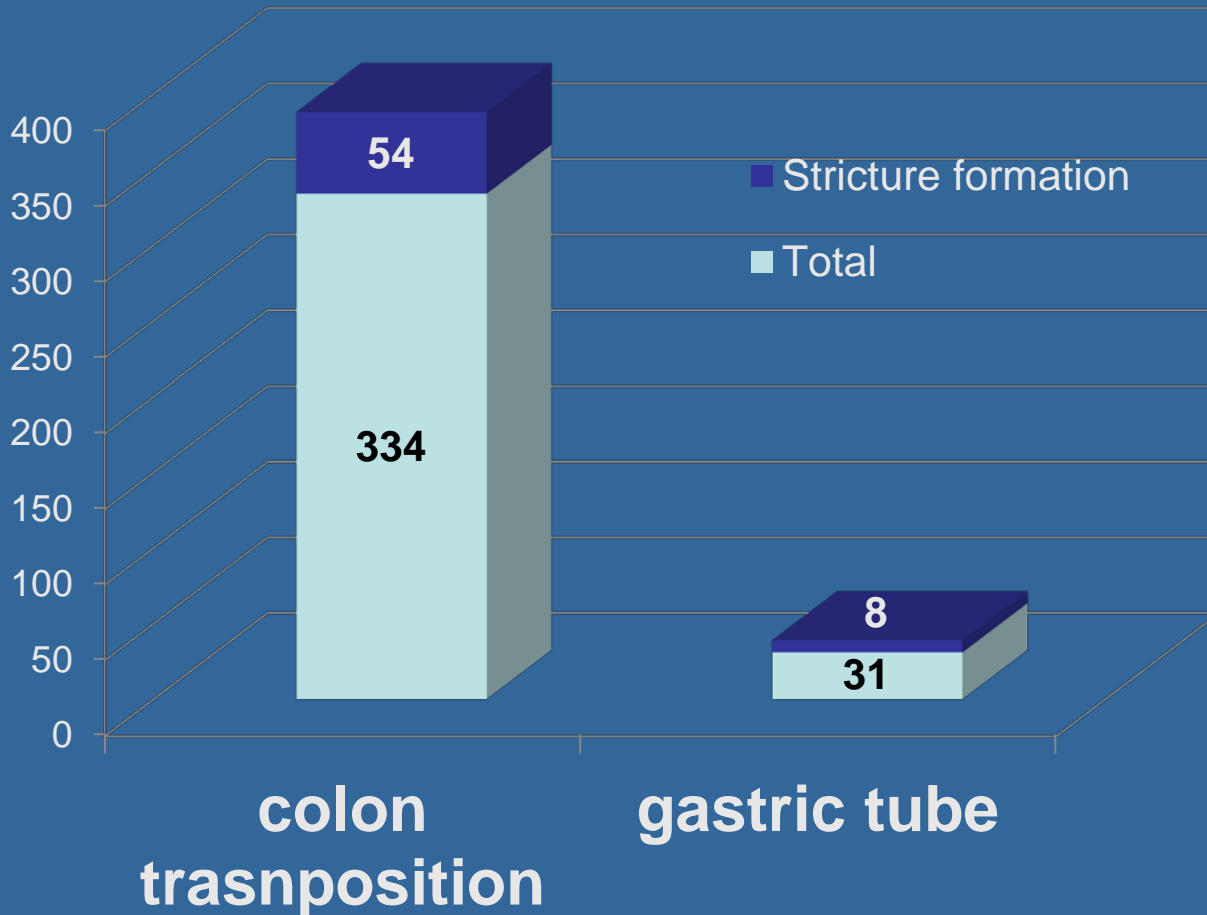
Leak incidence

Decrease leak incidence in the last 5 years



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



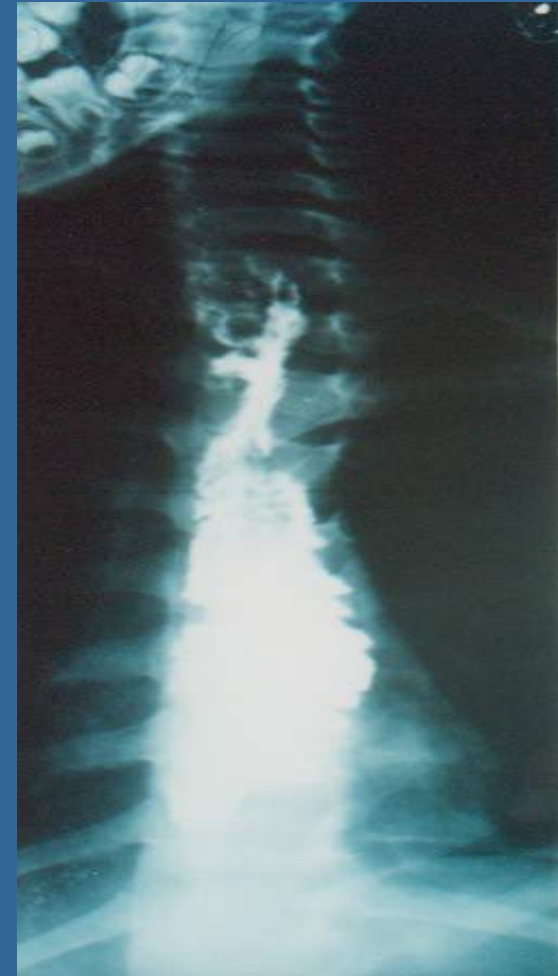
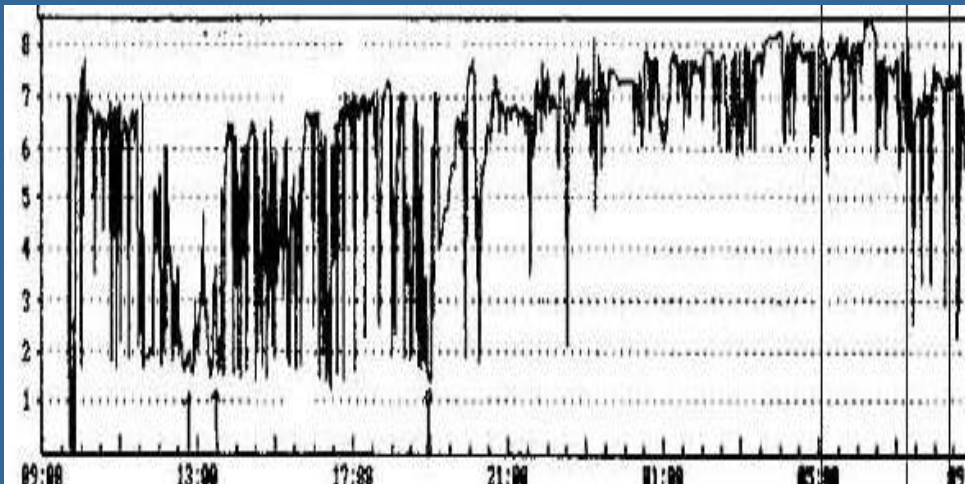
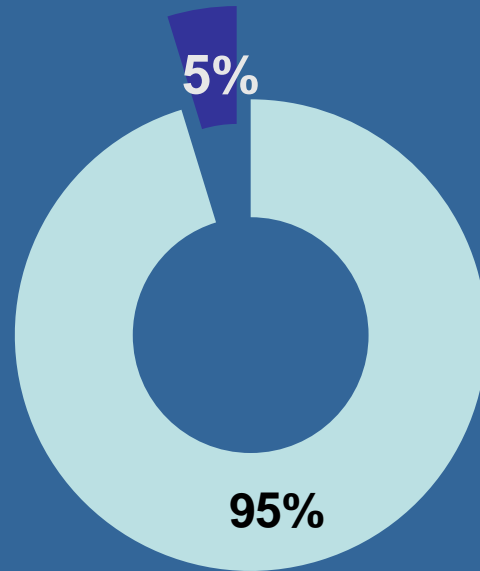
Storied stenosis

**Pseudo-
diverticular**

**High esophageal
stenosis**

Gastroesophageal reflux

■ followed patients ■ gastroesophageal reflux



Endoscopic examination

ID. No. :

Sex : Age :

D. O. Birth :

01/01/2000

00:42:31

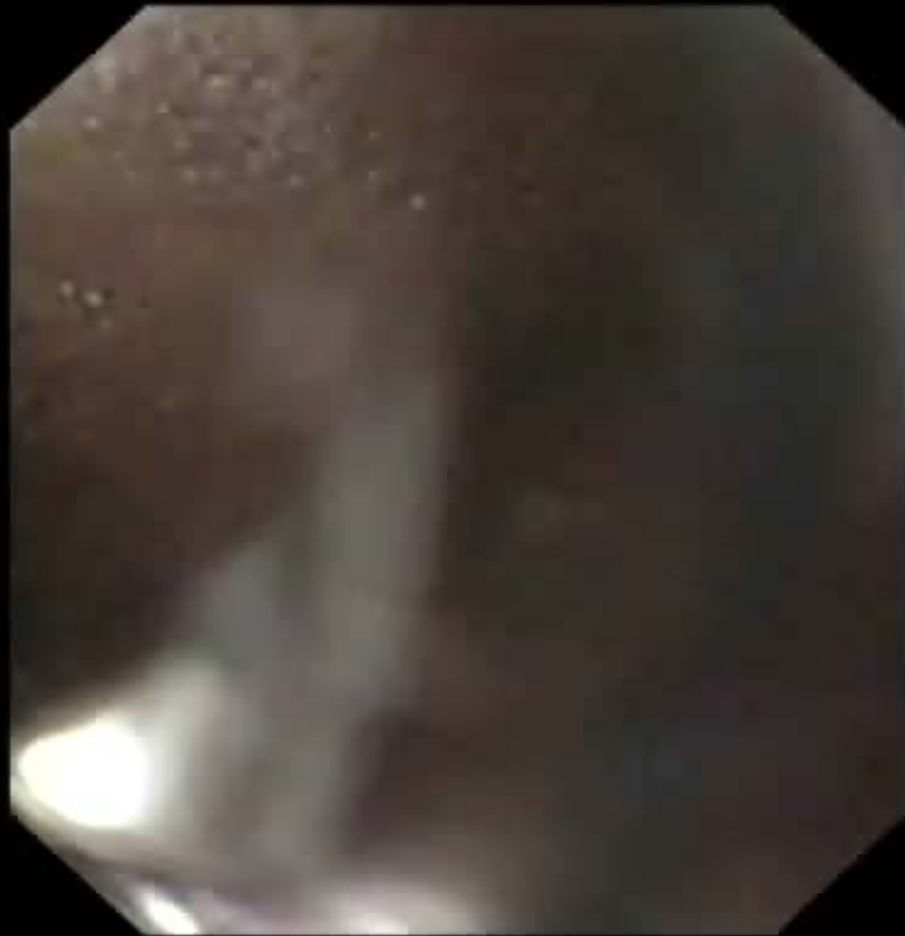
CVP :

D. F :

Pump

Et: 1 Gr:N

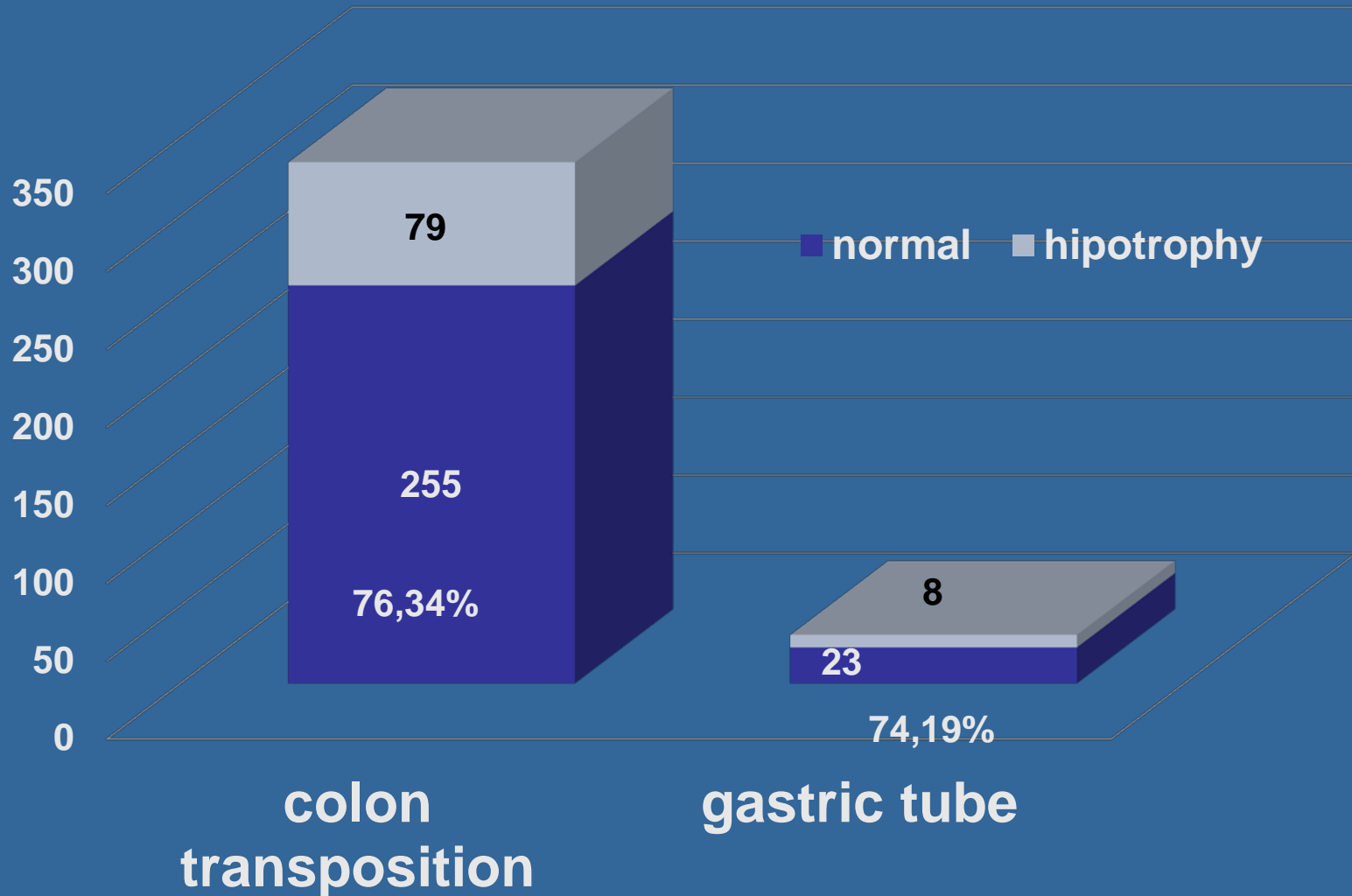
Name :



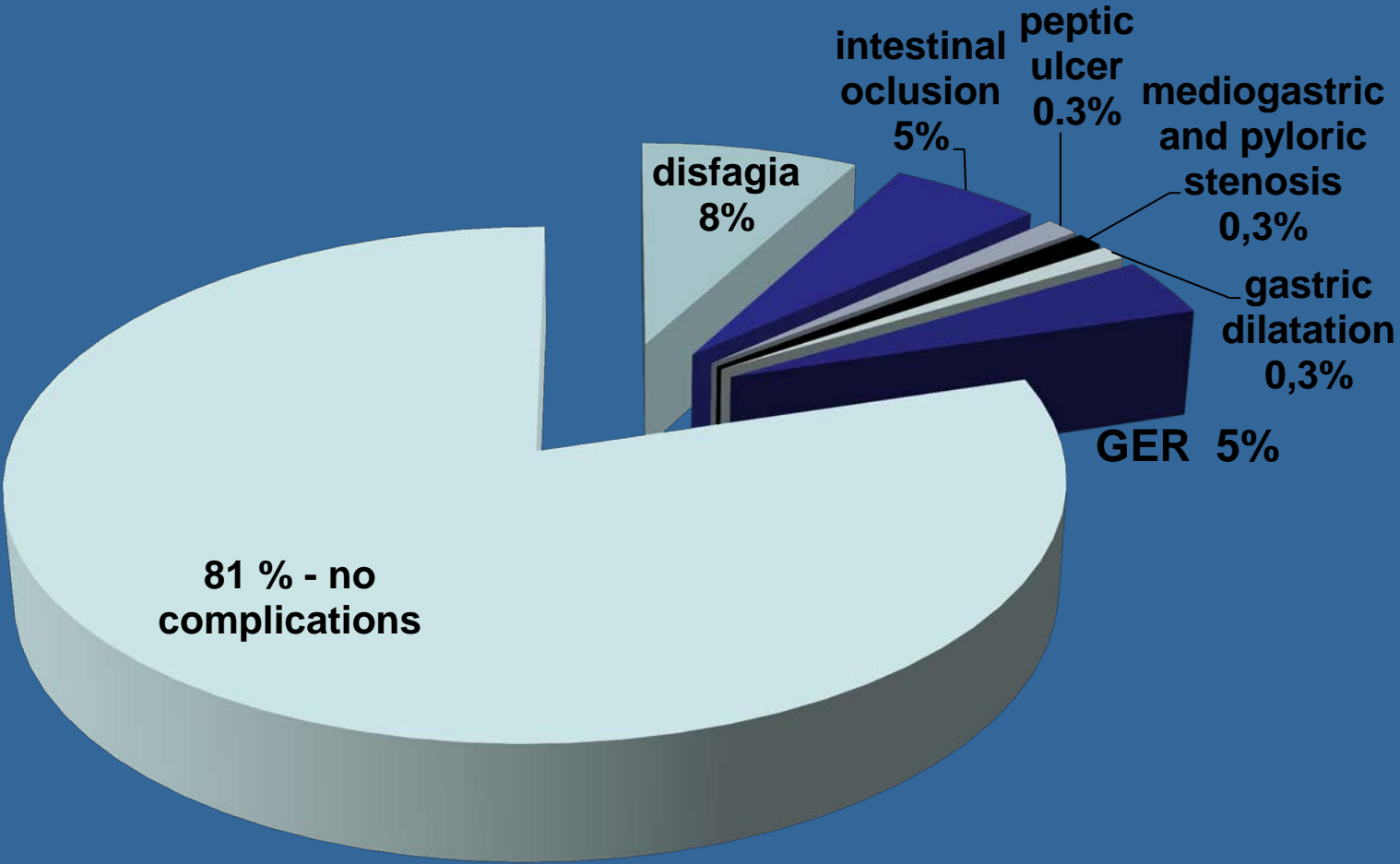
Physician :

Comment :

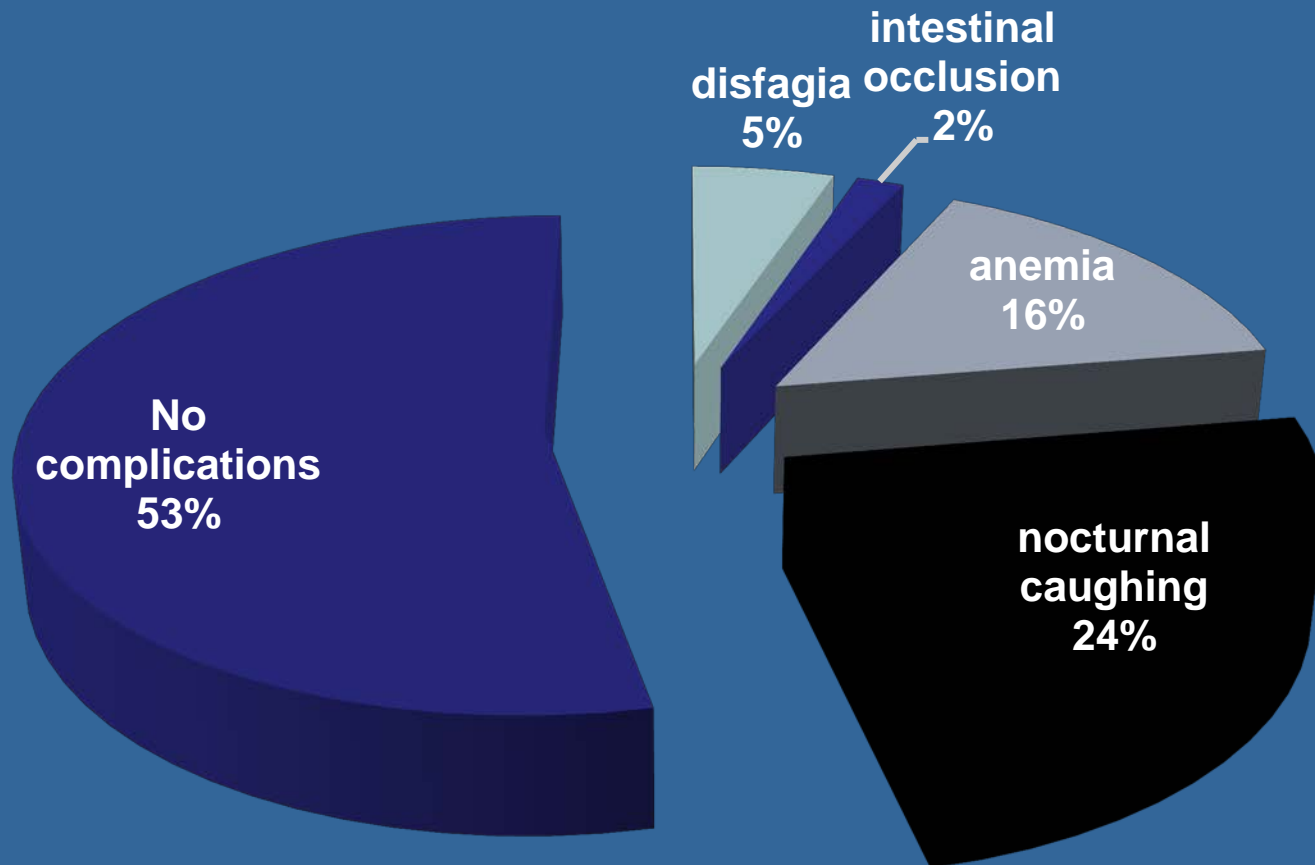
Staturo ponderal desenvoloppement



Late complications – colon transposition



Late complications – gastric tube

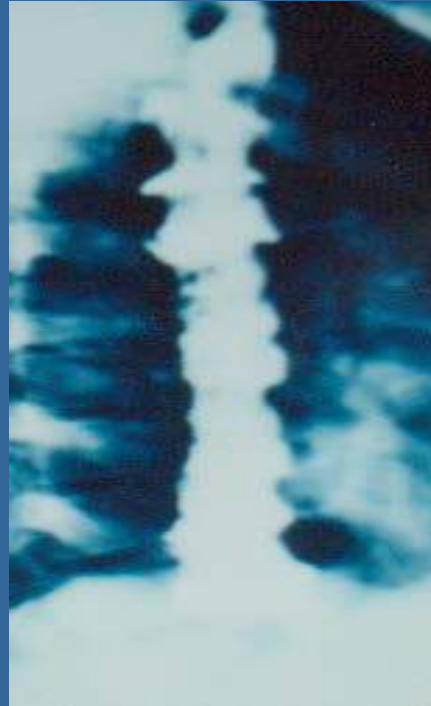
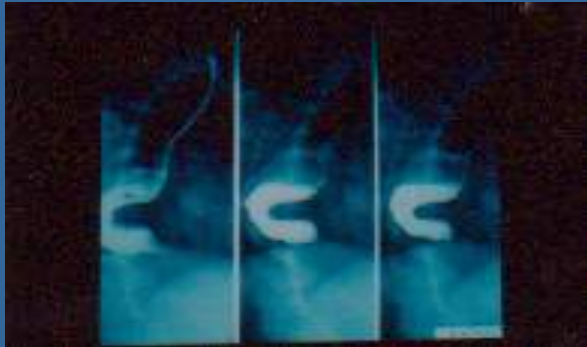


Mortality

- 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

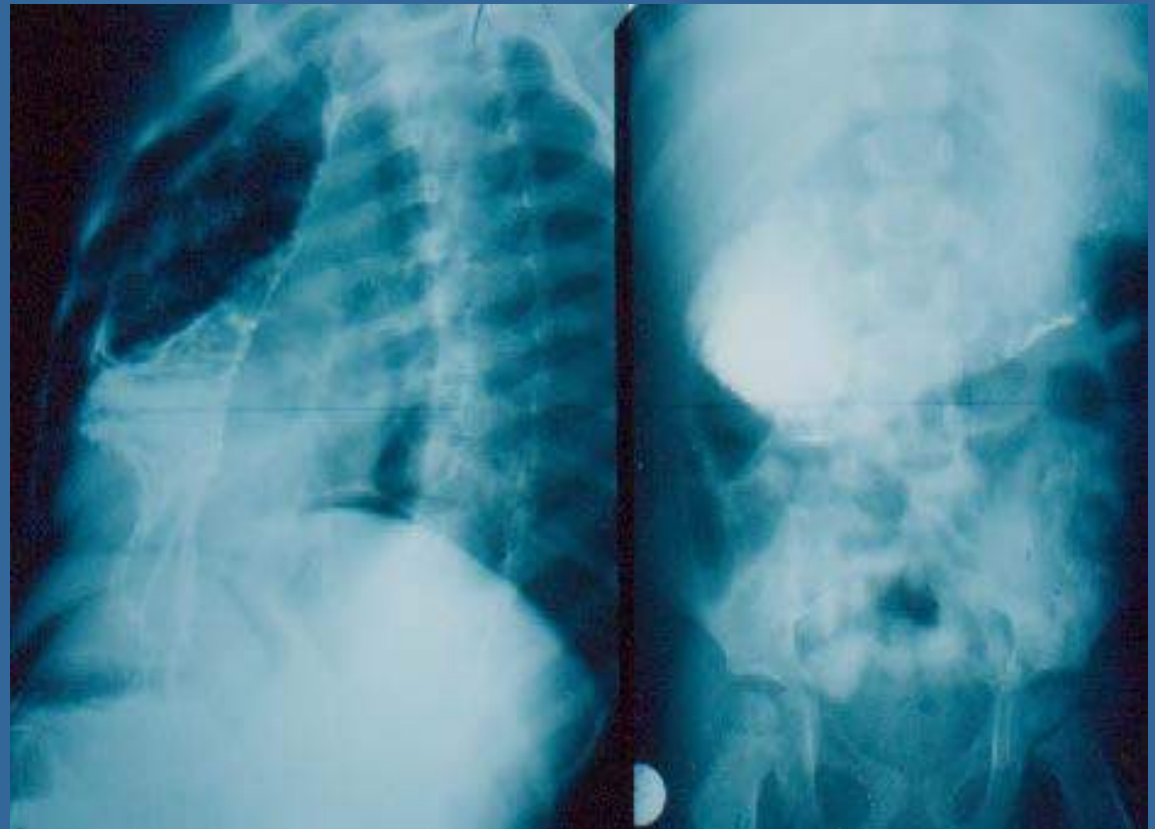
- Oesophageal replacement with isoperistaltic transvers colon pulled through the posterior mediastinum
- Colon graft – duodenal end to end anastomosis

Case report 2

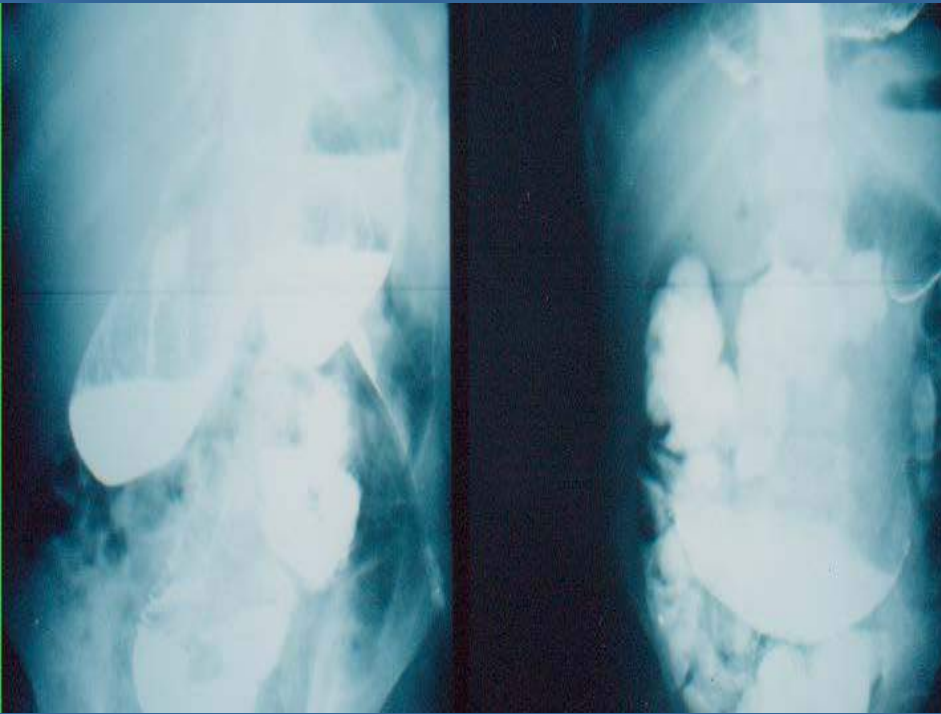
- 3 years old boy with esophageal replacement
- 1 year after surgery – **bleeding - upper gastrointestinal graft dilatation**

AP

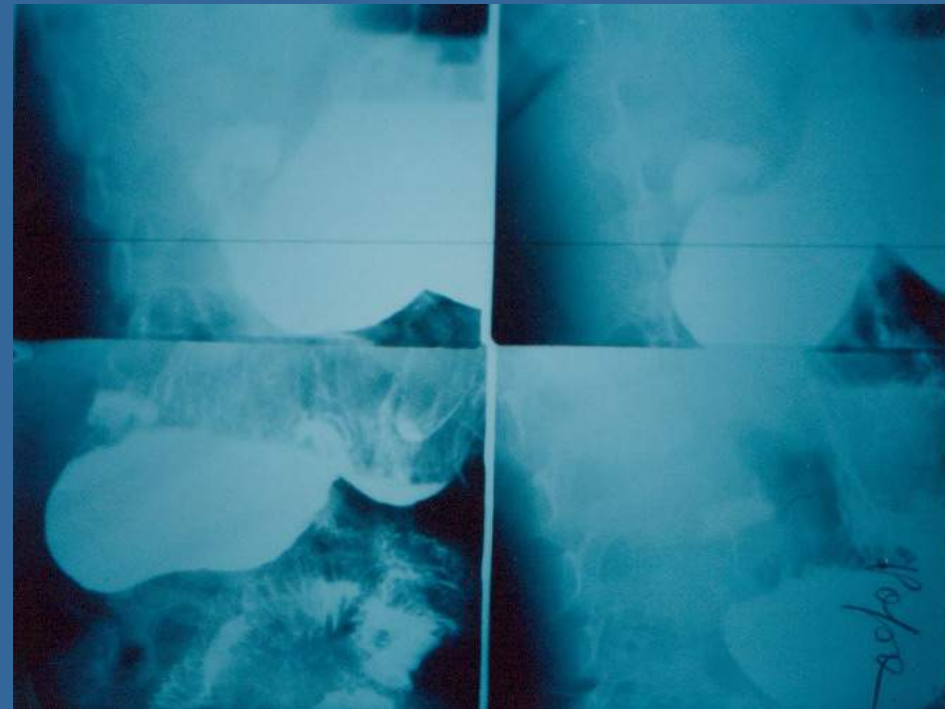
lateral view



Case report 2



Gastric dilatation – pyloric stenosis



Kissing ulcer

Health related quality of life

WHY?

«a number of unsolved issues remain

the current approach to difficult cases is not yet established”¹

1.Scandinavian Journal of Surgery 100: 273–278, 2011, J. A. Tovar, A. C. Fragoso, Current controversies in the surgical treatment of esophageal atresia

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 → $P = \text{Non Significant}$
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 procedure¹*

¹ Koivusalo A, et al – Dep. Of PS, Children Hosp, Helsinki, Finland - J. Pediatric Surg. 2010, Feb; 40(2):307 – 12, Health-related Quality of life in adult patients with esophageal atresia, a questionnaire study

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

2 [J Pediatr Surg](#). 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 C](#)¹, [Meyer A](#)², [Kircher G](#)³, [Boemers TM](#)⁴, [Vaske B](#)⁵, [Till H](#)⁶,
[Ure BM](#)

PEDS QL

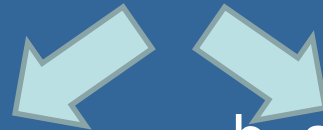
**The PedsQL Condition – Specific Modules
WITH SCALES for Physical, Emotional,
Social, School Functioning**

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

Long segments

epithelial

muscular

migration

poor results

stenosis, mortality

- **Stenting**

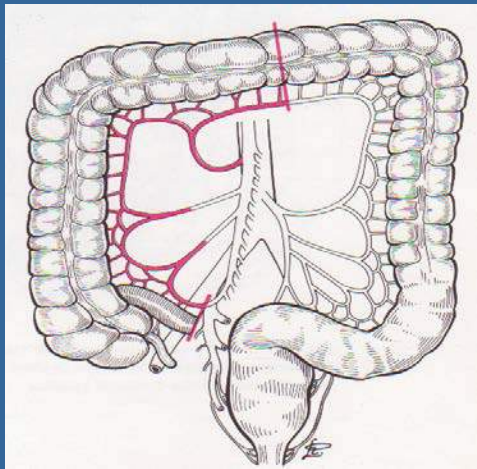
- **Omental wrapping** vascularization+/-

- **Decellurized matrices** – choice for scaffolds

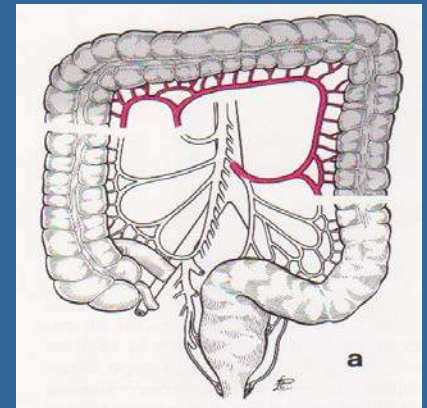
- **Smart polymers** signalling cell – scaffold interaction

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



Right Colon & Ileal Graft with Right Colic and ileocaecal arteries



Graft with Left Colic artery

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



Bertalan Székely
Boy with Bread and Butter 1890

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



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