Complex Airway problems - Paediatric Perspective

Dave Albert
BACO
Liverpool 2009

www.albert.uk.com

“Complex” Ξ not simple, multiple parts

- Multiple problems with airway
  - Combined Web/stenosis/multiple levels
- Multiple problems with child
  - Syndromic children
- “Difficult to treat”
  - Poor outcomes
    - Posterior laryngeal stenosis
    - Multiple previous surgery

Complex laryngeal stenosis – congenital

Severe congenital web/stenosis

Complete tracheal rings

High take off right upper lobe bronchus

Complex laryngeal stenosis – syndromic

Larsen’s syndrome

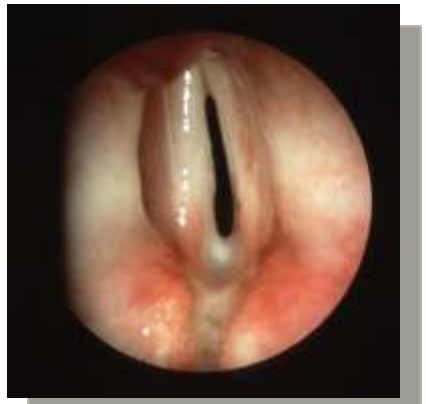
Epidermolysis bullosa

Velo cardio facial syndrome

Complex laryngeal stenosis – previous surgery

Very scarred larynx from multiple laser

Stenosis following laser for papillomatosis



Posterior scar bands with cricoarytenoid fixation

What do we treat? Paeds vs adult

- UPPER AIRWAY
  - Laryngomalacia
  - Subglottic haemangiomas, webs and clefts
  - Difficult decannulation
  - Vocal Cord movement disorders
  - Subglottic stenosis
  - Complex stenosis
  - Tumours

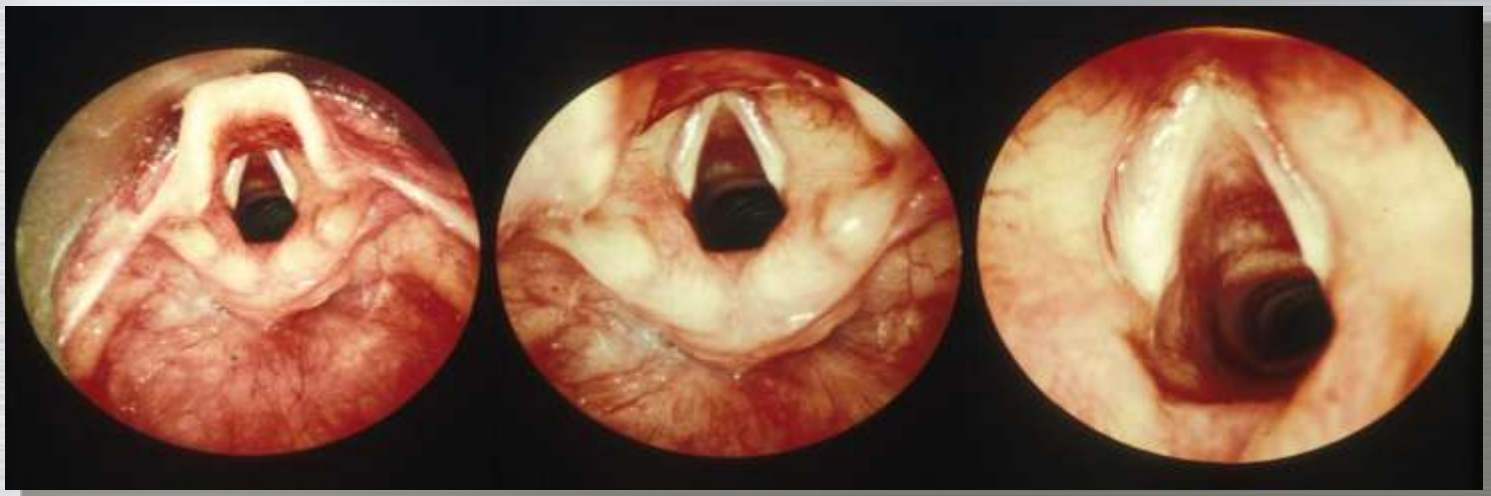
- LOWER AIRWAY
  - Tracheomalacia- intrinsic
  - Extrinsic compression
  - Tracheal stenosis
  - Tumours

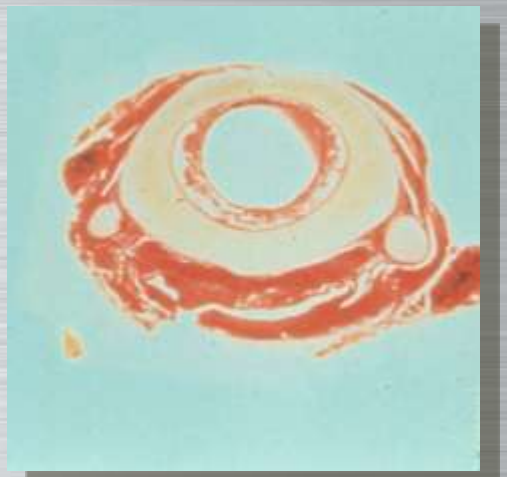
What do we both treat?

- UPPER AIRWAY
- Laryngomalacia
- Subglottic haemangiomas, webs and clefts
- Difficult decannulation
- **Vocal Cord movement disorders**
- **Subglottic stenosis**
- **Complex stenosis**
- Tumours

- LOWER AIRWAY
- Tracheomalacia- intrinsic
- Extrinsic compression
- **Tracheal stenosis**
- Tumours

Paediatric Subglottis





More difficult when very small!

Techniques

- UPPER AIRWAY
- Cartilage grafting
- Resection
- Dilatation/stents
- Lateralisation

- Laryngeal transplant
- Pacing

- LOWER AIRWAY
- Tracheoplasty
- Dilatation/stents

- Tissue engineering

Current paediatric techniques

- Endoscopic

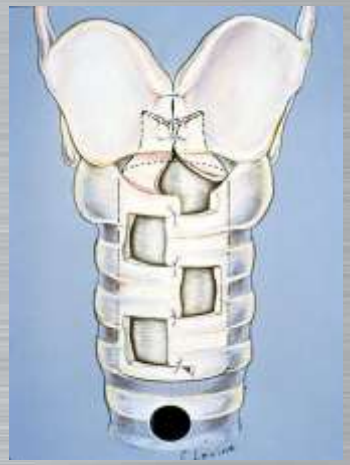
- FESS style surgery
- Sharp rather than Laser
- Radial Dilatation
- Lateralisation
- Microdebrider
- Endoscopic Stents/keels
- T-Tubes

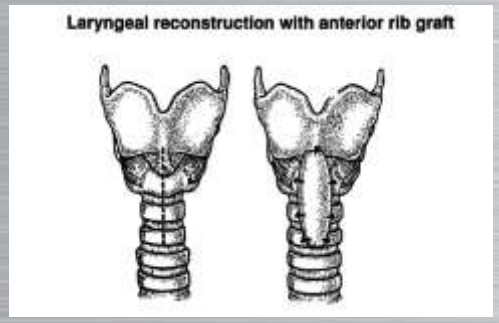
- Open

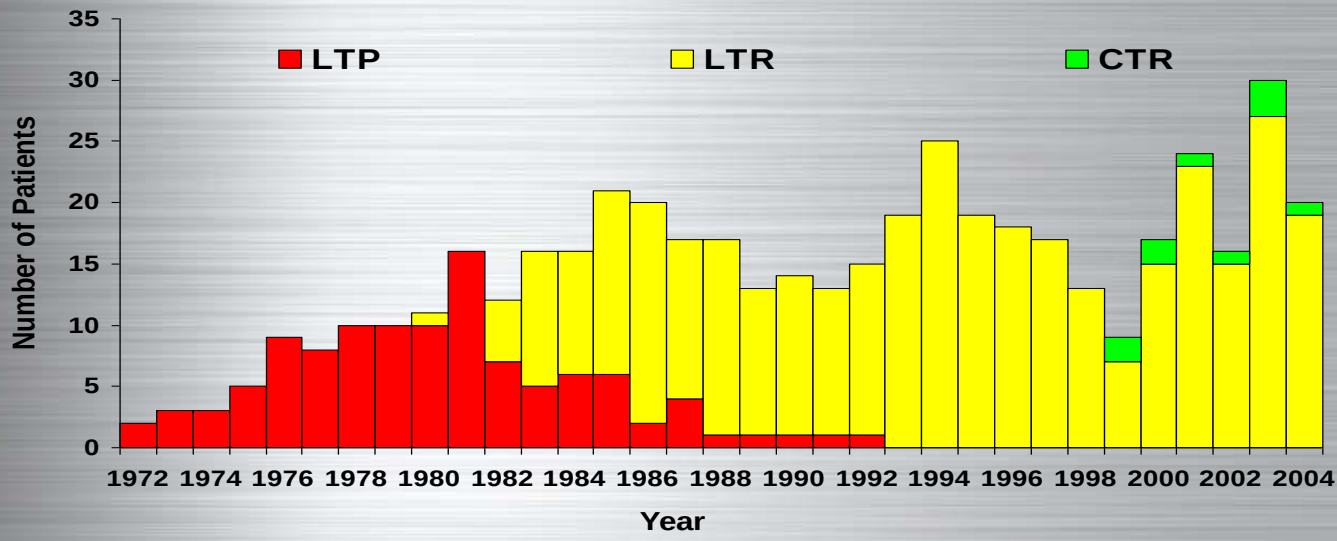
- Cricoid split
- Cartilage grafts
- single/2 stage
- Cricotracheal resection

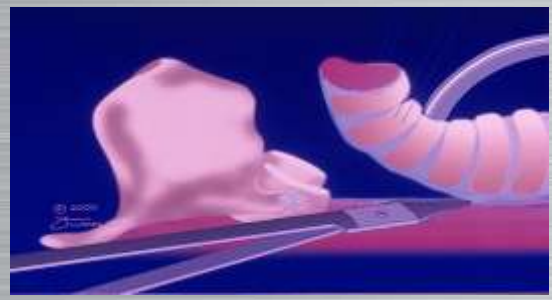
History

- 60’s Premature infants survive
  - Acquired Subglottic Stenosis
  - Tracheostomy
- 70’s Open laryngeal surgery, Rib graft repair
- 80’s Cricoid split to deal with early cases
- 90’s Single stage laryngeal reconstruction
- Partial cricotracheal resection
- 2000+ Endoscopic techniques



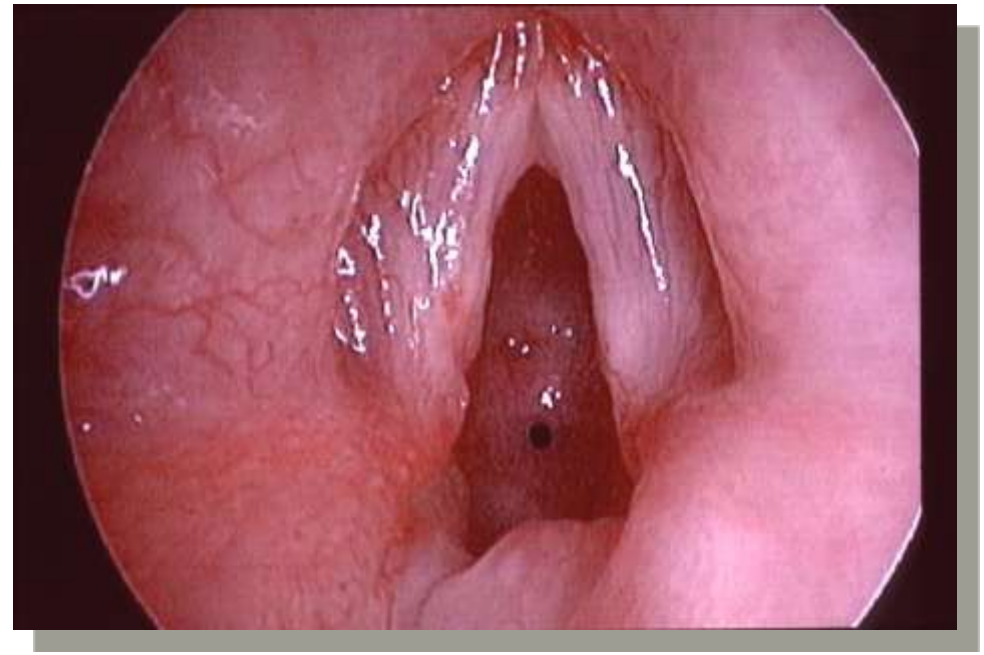

Laryngeal reconstruction with anterior rib graft


LTP
LTR
CTR
Number of Patients
35
30
25
20
15
10
5
0
1972 1974 1976 1978 1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000 2002 2004
Year



Paediatric Subglottic stenosis

- Management
  - Medical
  - Endoscopic
  - Open procedures



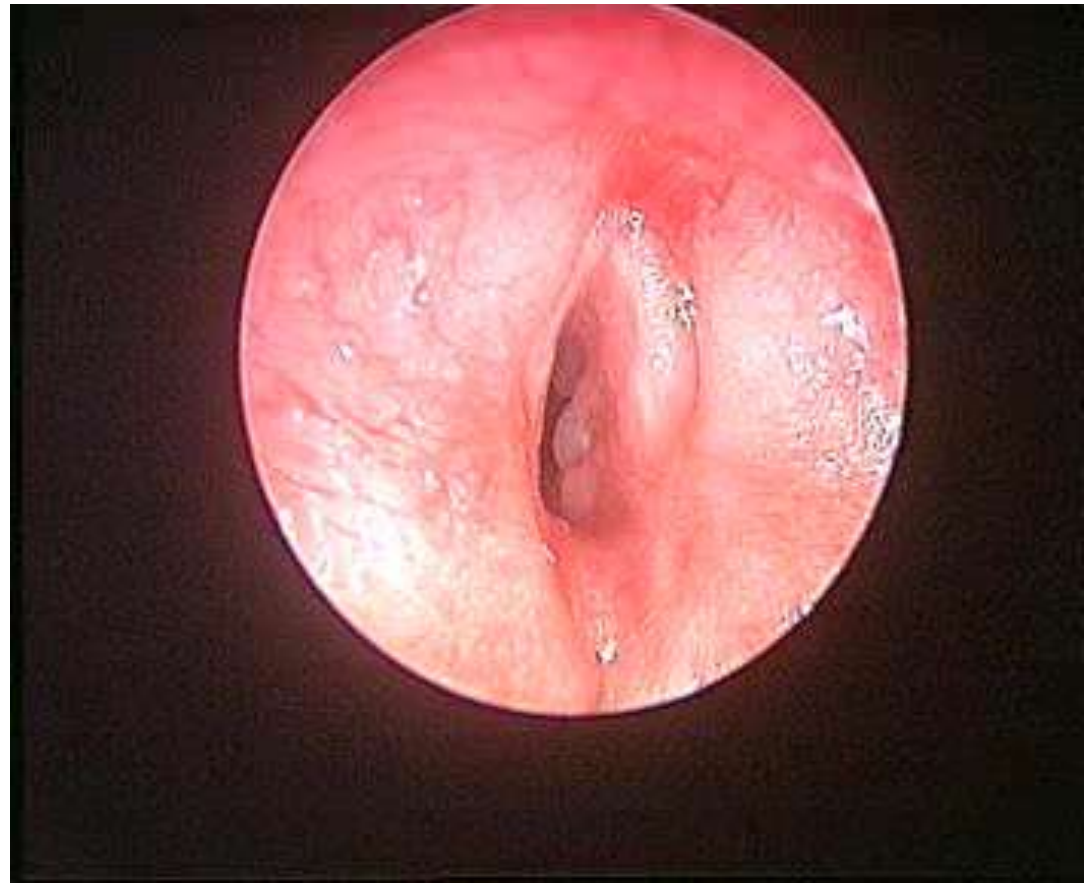
Paediatric tube management

- Smallest stable tube
  - Oral or nasal
  - Shouldered or straight
- Steroids (pre extubation)
- Anti-reflux treatment
- Optimal status pre extubation
- Laryngeal rest
- Duration **not** main factor

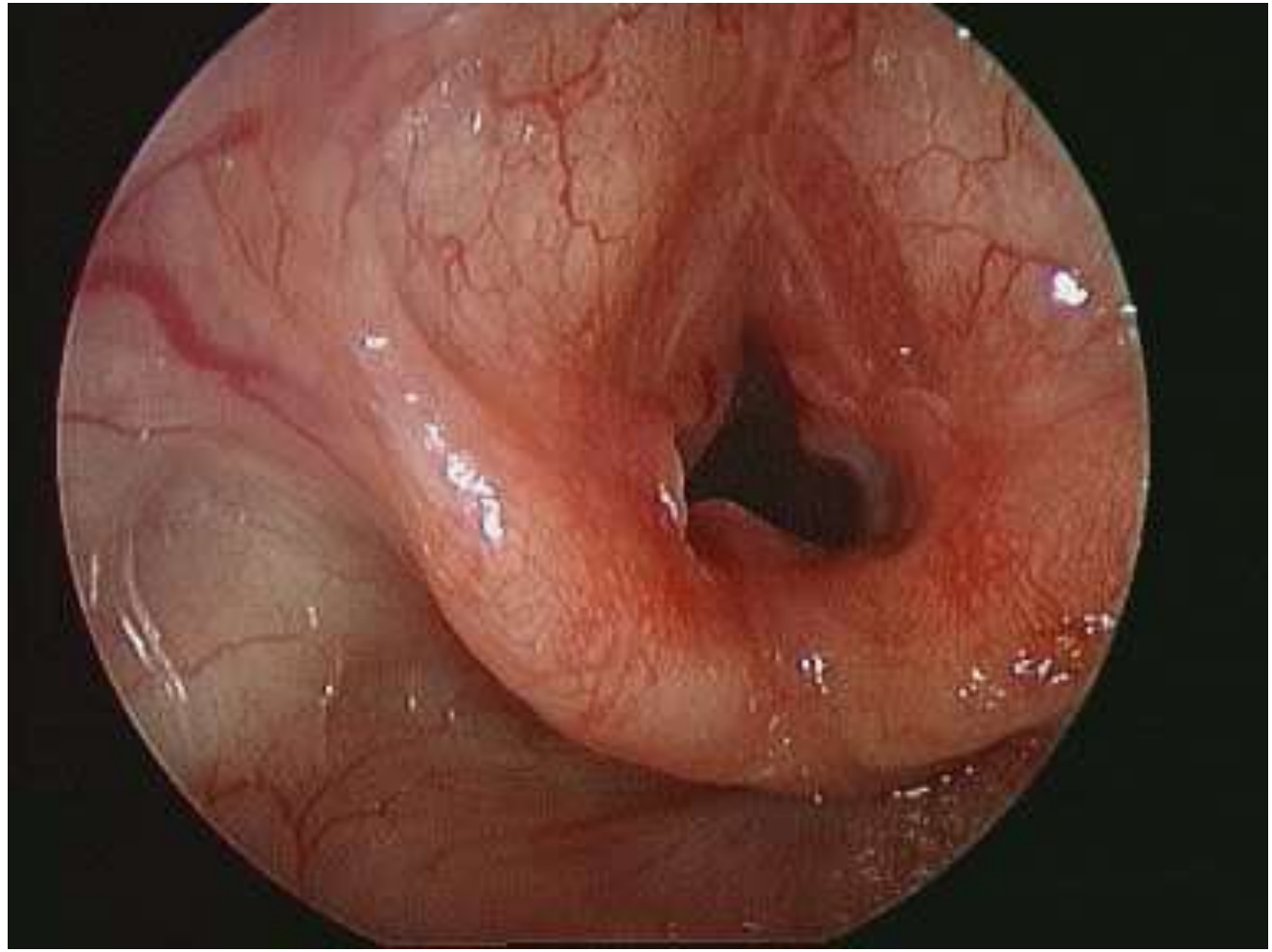
Endoscopic Treatment

- Sharp removal
  - subglottic cysts
  - granulations
- Division of thin webs
- Gentle radial dilatation
  - –Mitomycin C
- Endoscopic cricoid split
  - *–(all with stenting and steroids)*

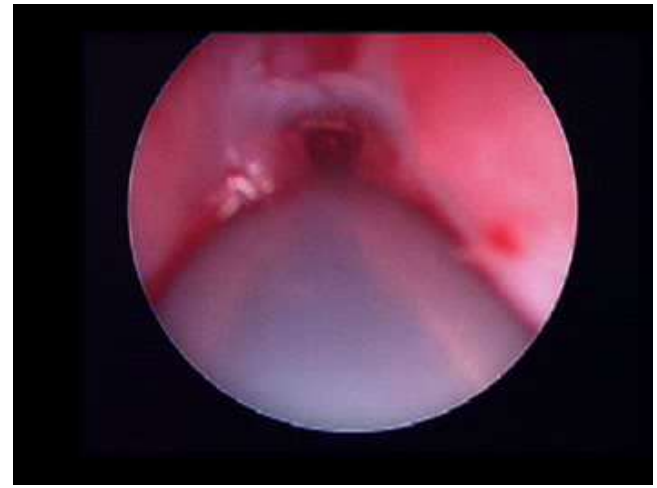
Sharp avulsion of cysts



Endoscopic cricoid split



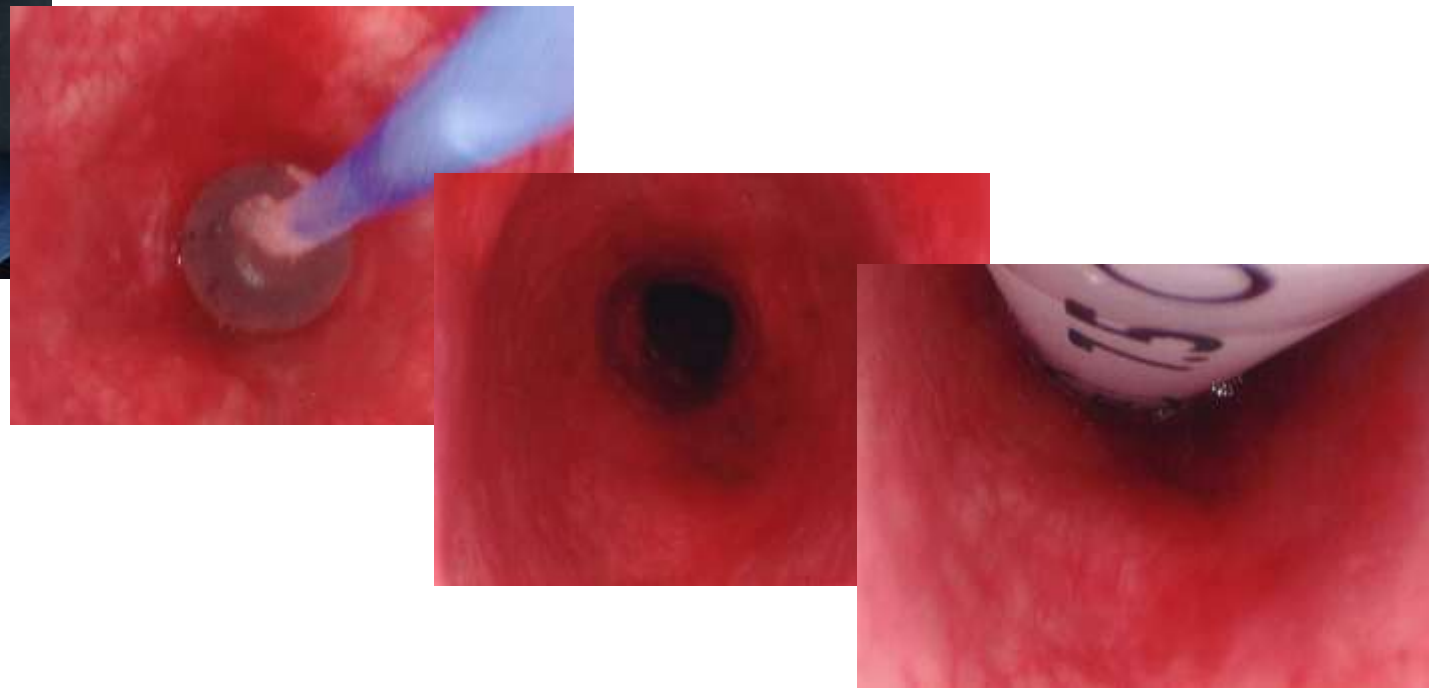
Cut edges of cricoid



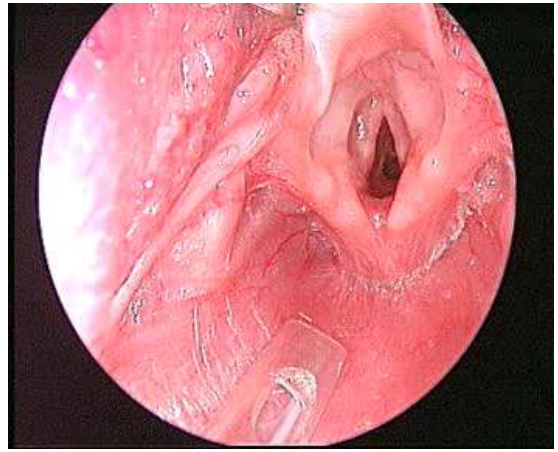
Radial dilatation and Mitomycin C

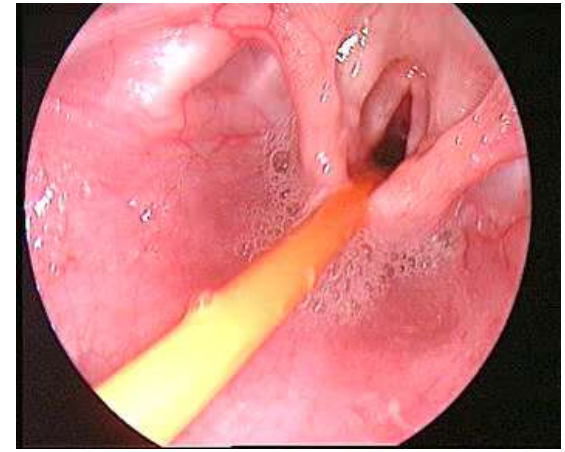
Angioplasty balloon – up to 16 Atmospheres!

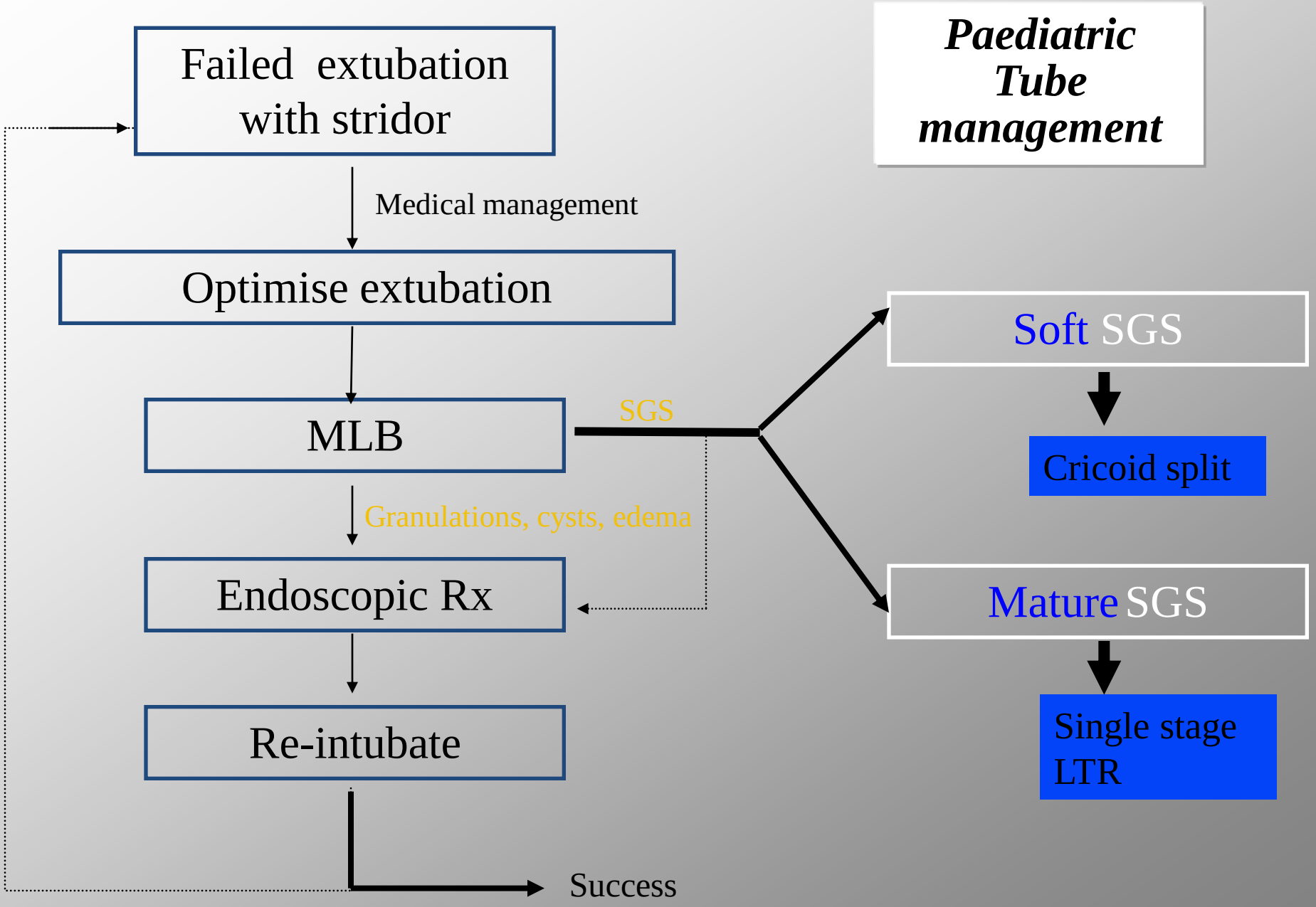
- *Antineoplastic antibiotic - acts as an alkylating agent by inhibiting DNA and protein synthesis*



Endoscopic web division






Paediatric Tube management
Failed extubation with stridor
Medical management
Optimise extubation
MLB
SGS
Granulations, cysts, edema
Endoscopic Rx
Re-intubate
Success
Soft SGS
Cricoid split
Mature SGS
Single stage LTR

Open procedures

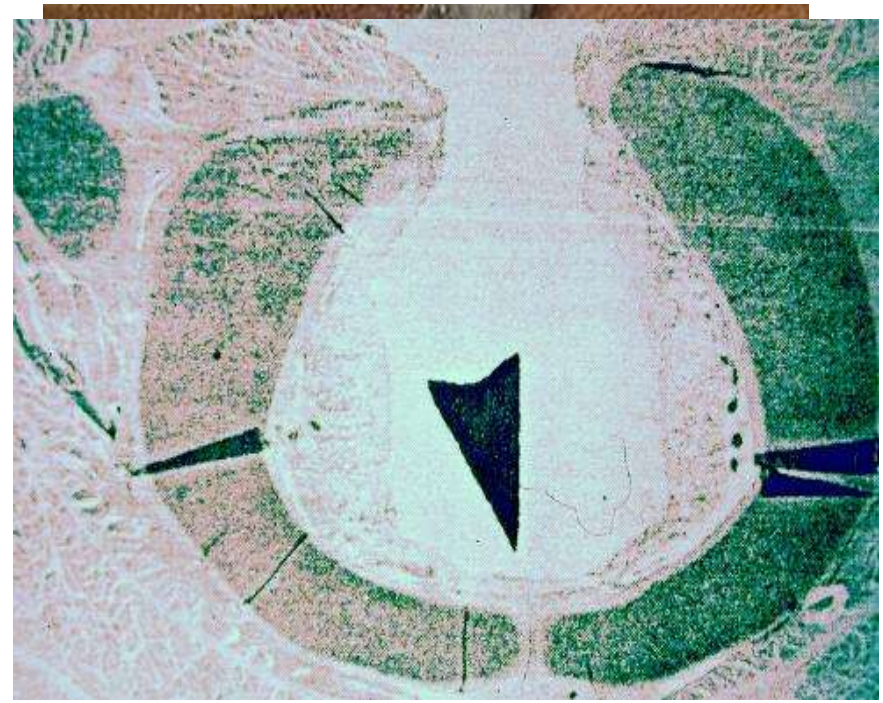
Anterior Cricoid split- split and stent procedure for neonates with failed extubation due to early SGS

Laryngotracheal Reconstruction (LTR) – framework expansion with cartilage grafts for mature stenosis

Cricotracheal resection – resection with end on end anastomosis for total or near total stenosis

Cricoid Split

– “Decompression”



Cricoid Split

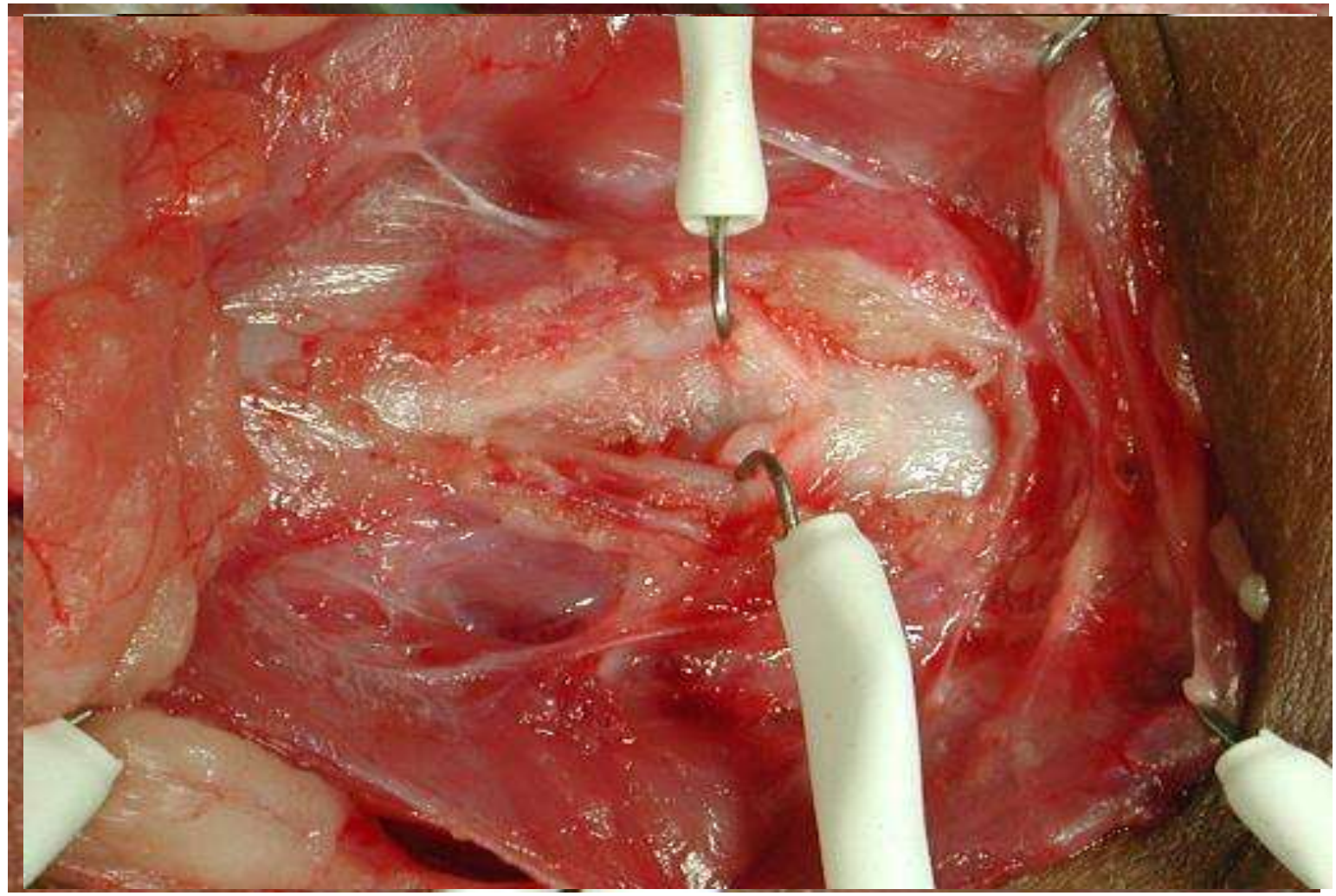
- Indications
  - –Soft edema
  - –> 1.5 kg
  - –Fit
- Procedure
  - –Split-1° ring, cricoid and ½ thyroid
  - –Re-intubated-check length
  - –Drain
- Postoperative care
  - –Intubated for 5-7 days. Not paralysed or ventilated
  - –Antibiotics
  - –Exubate under steroid cover

Single stage LTR

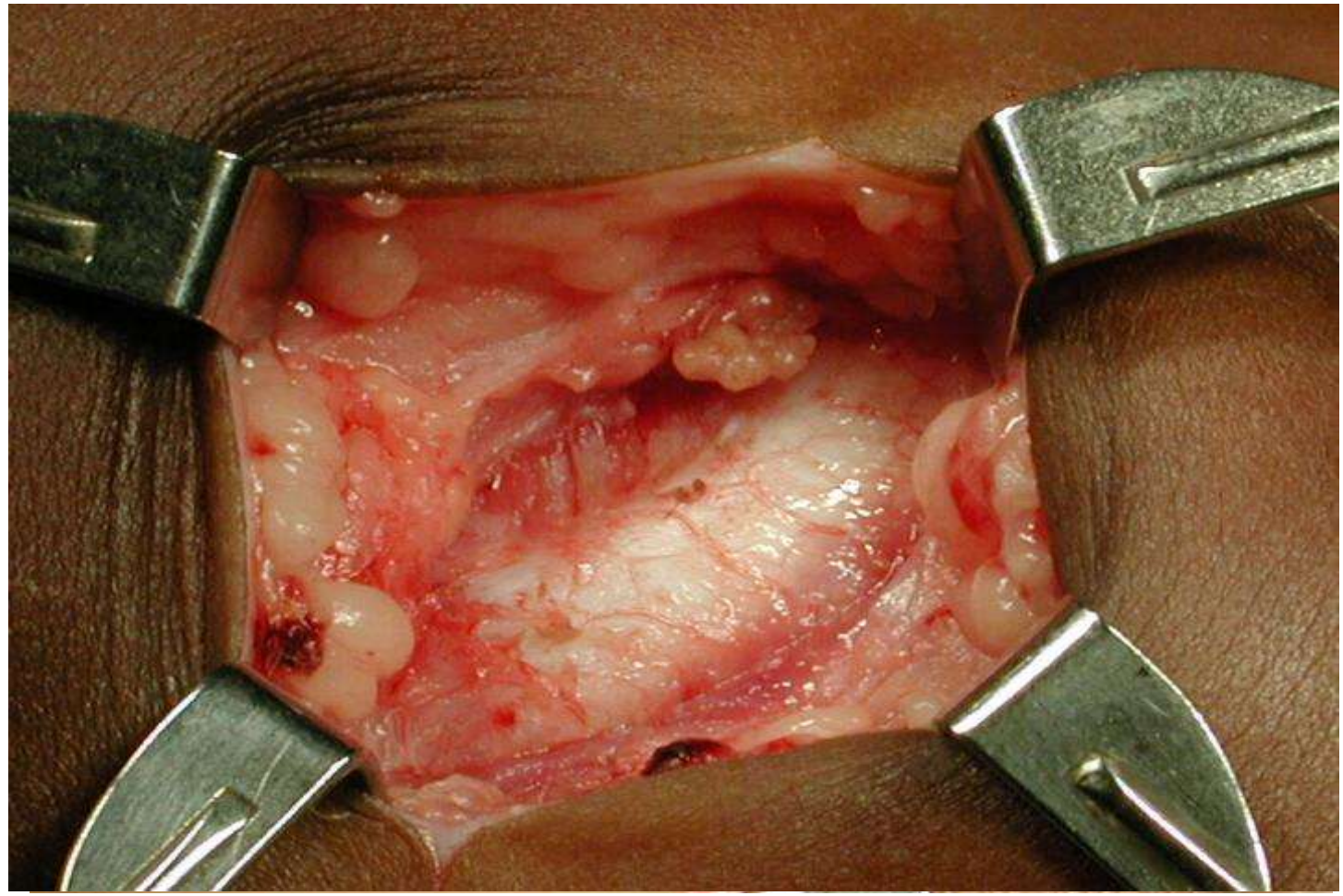
- “Augmentation procedure that aims to combine all elements into one operation”
- .

- Period of intubation instead of stent

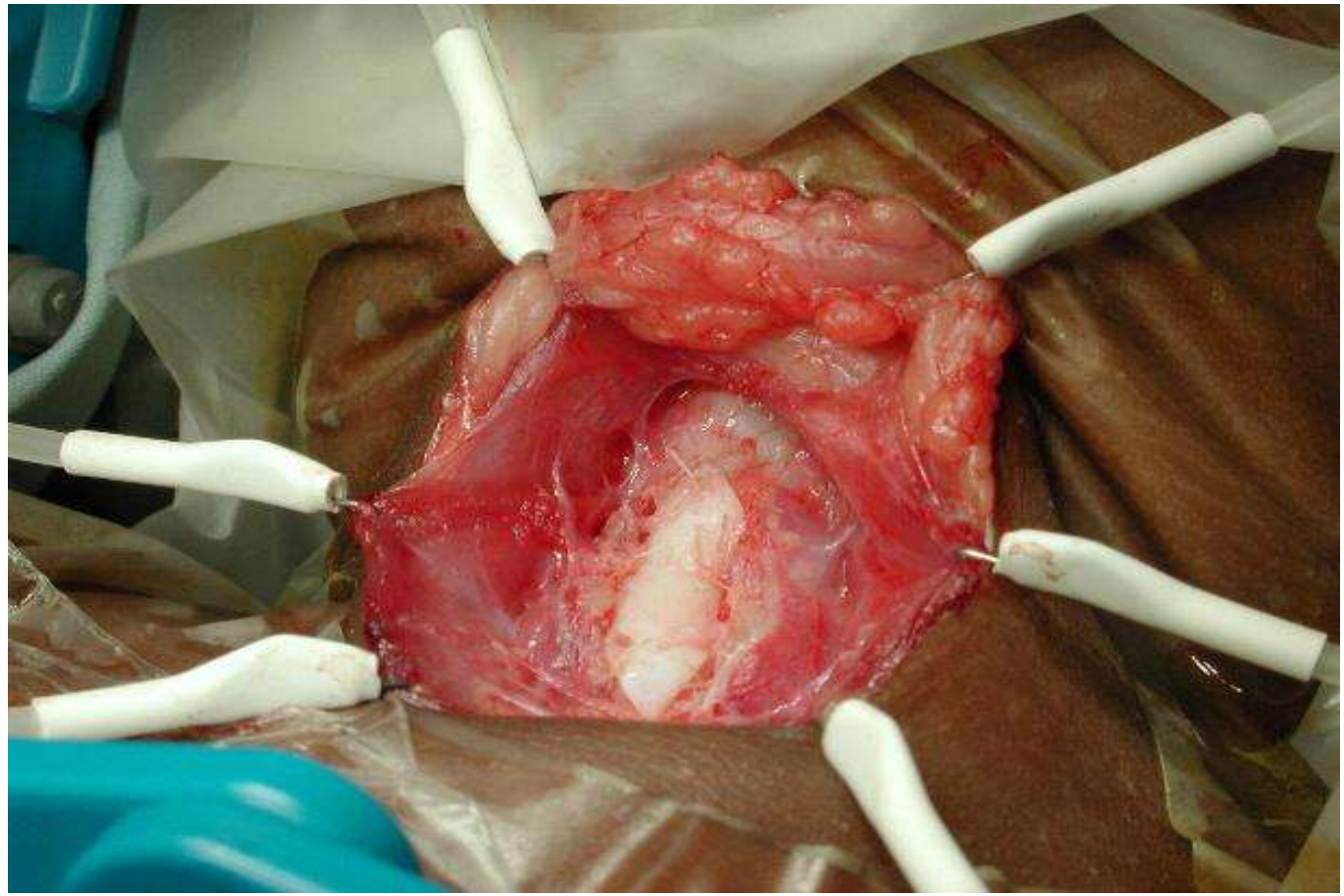
Laryngofissure in intubated patient



Rib graft harvest



Graft placement



SSLTR - Postoperative care

- Intubated for 7 days. Not paralysed or ventilated
- Antibiotics
- Exubate under steroid cover
  - Dexamethasone 0.25mg/kg then 0.1mg/kg QDS

–

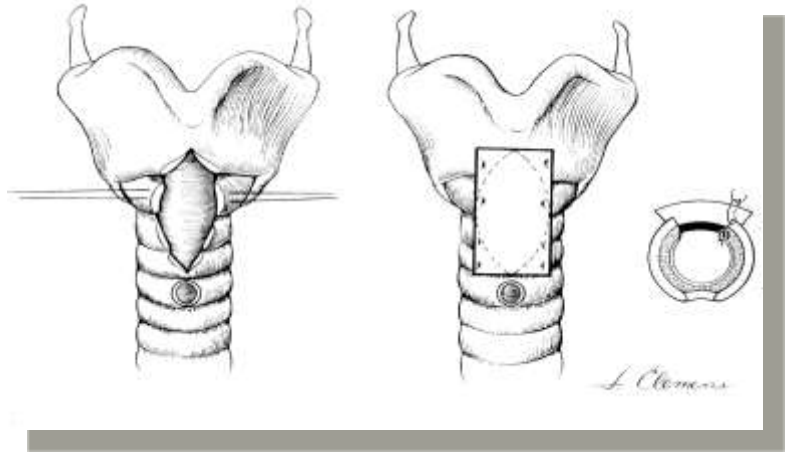
- Reintubate with care if needed **

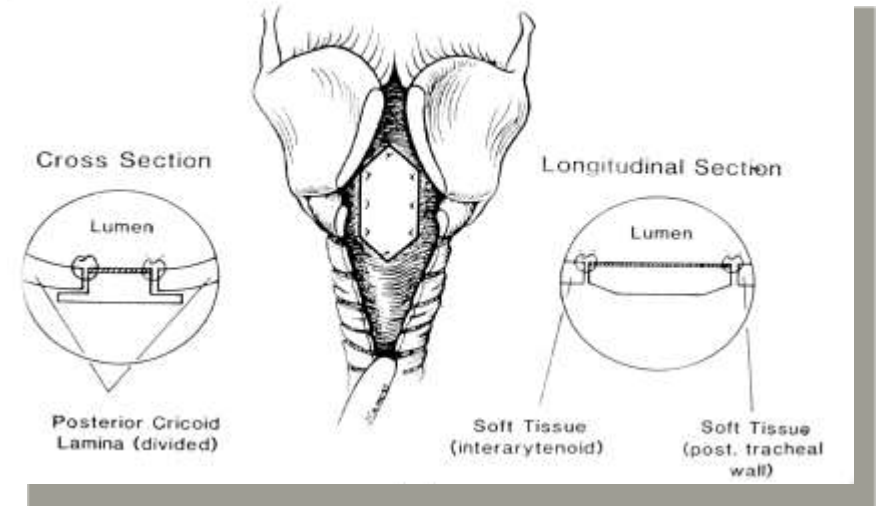
Conventional LTR with tracheostomy

- “Traditional Staged procedure using a stent”

LTR

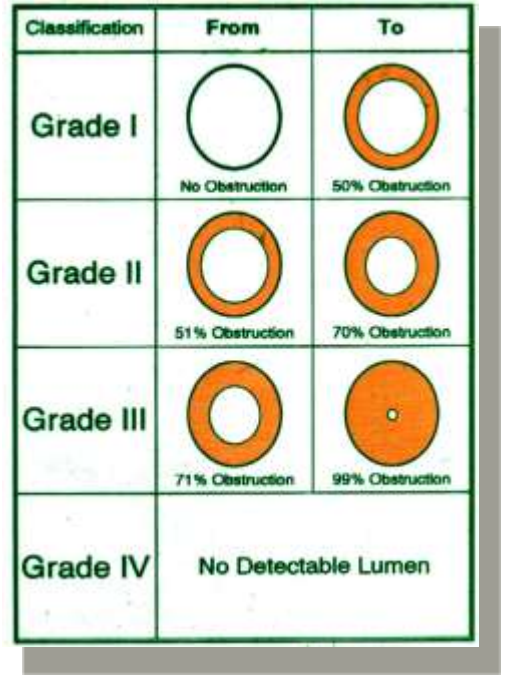
- “Augmentation”
- Rib cartilage
  - Anterior
  - Posterior



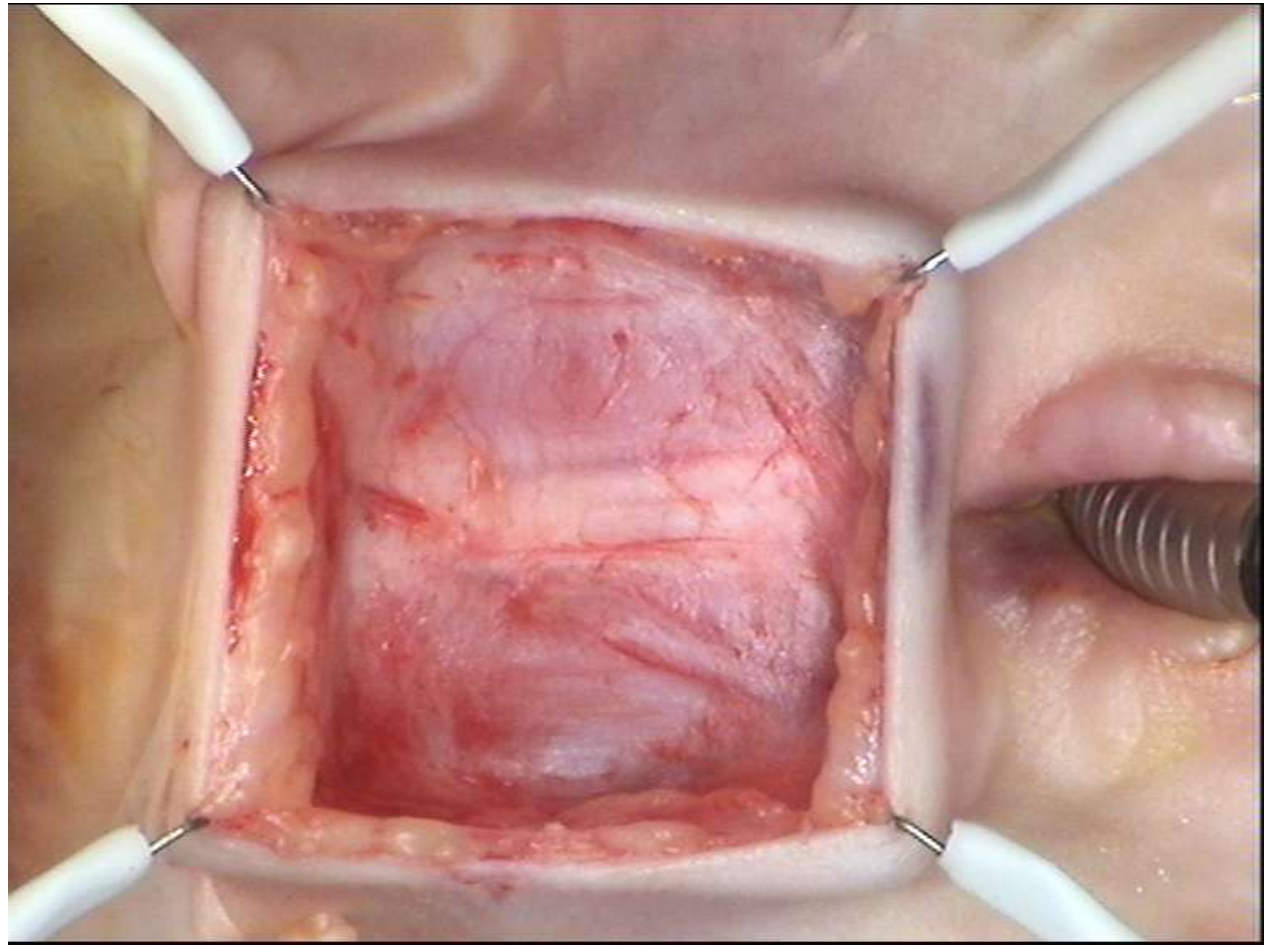


LTR with stent - Indications

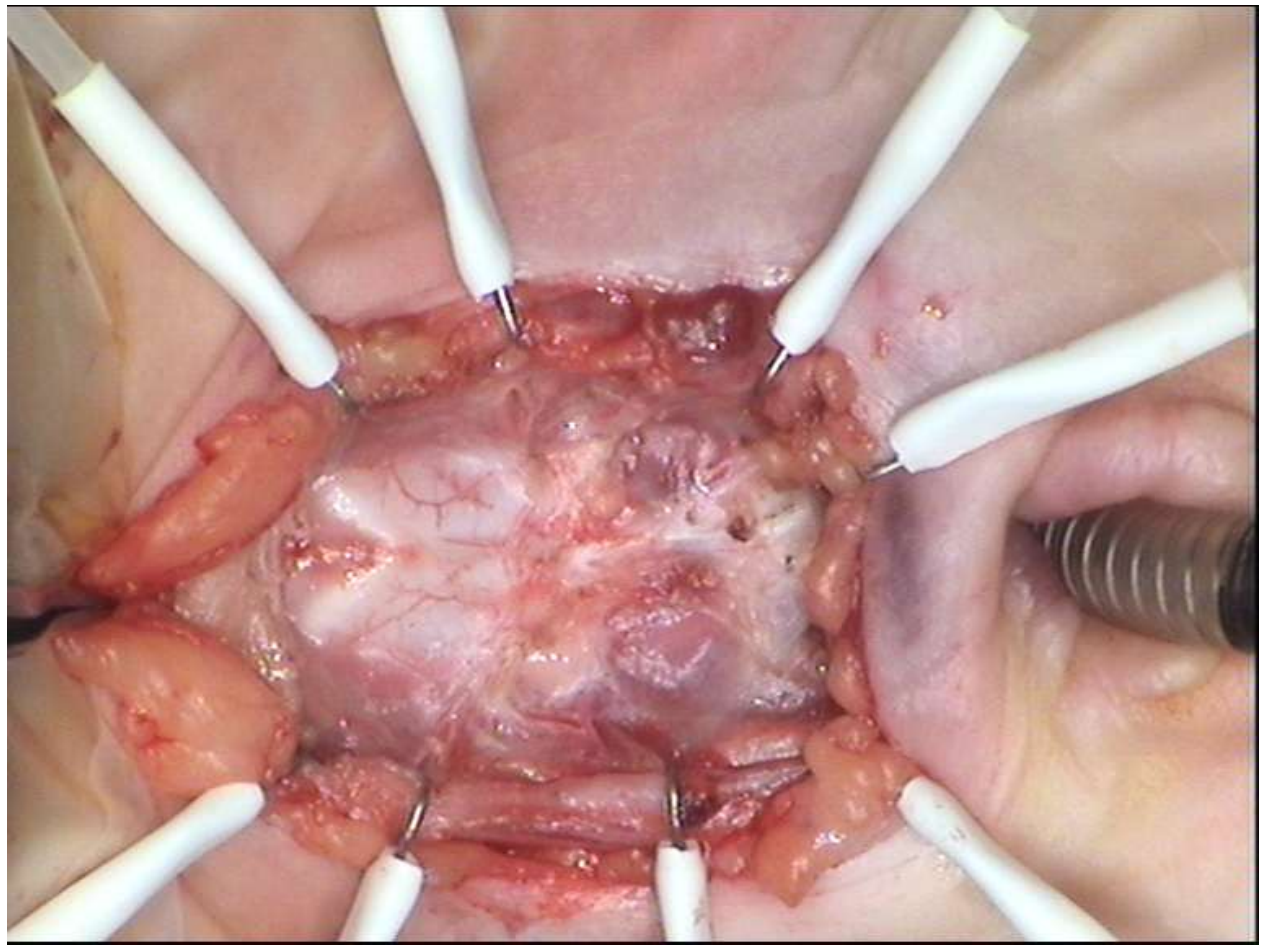
- Severe stenosis grade III-IV
  - Complicating medical conditions
  - Child/parent not keen on ITU
- Still need to optimise medical conditions especially reflux



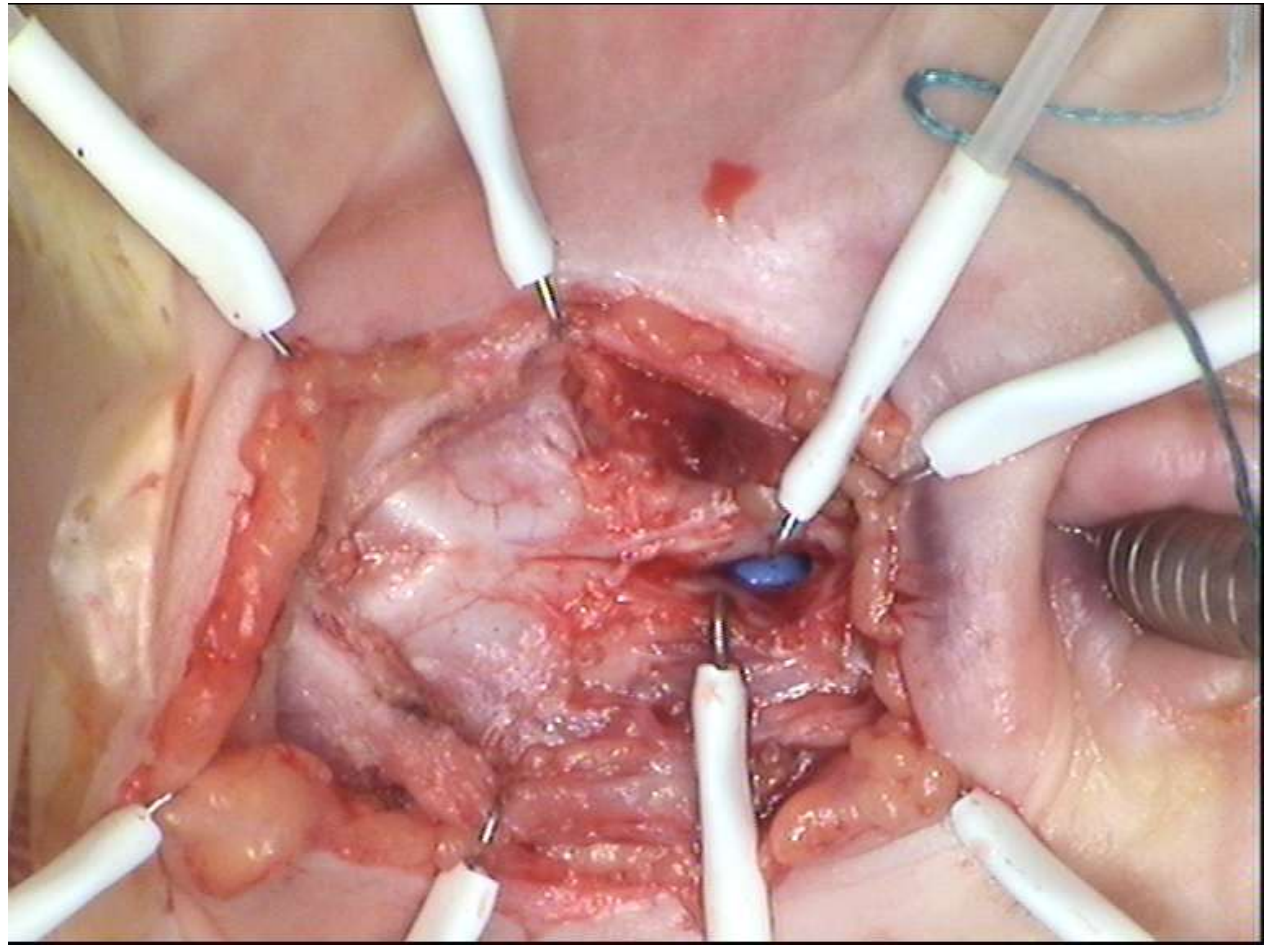
Expose strap muscles



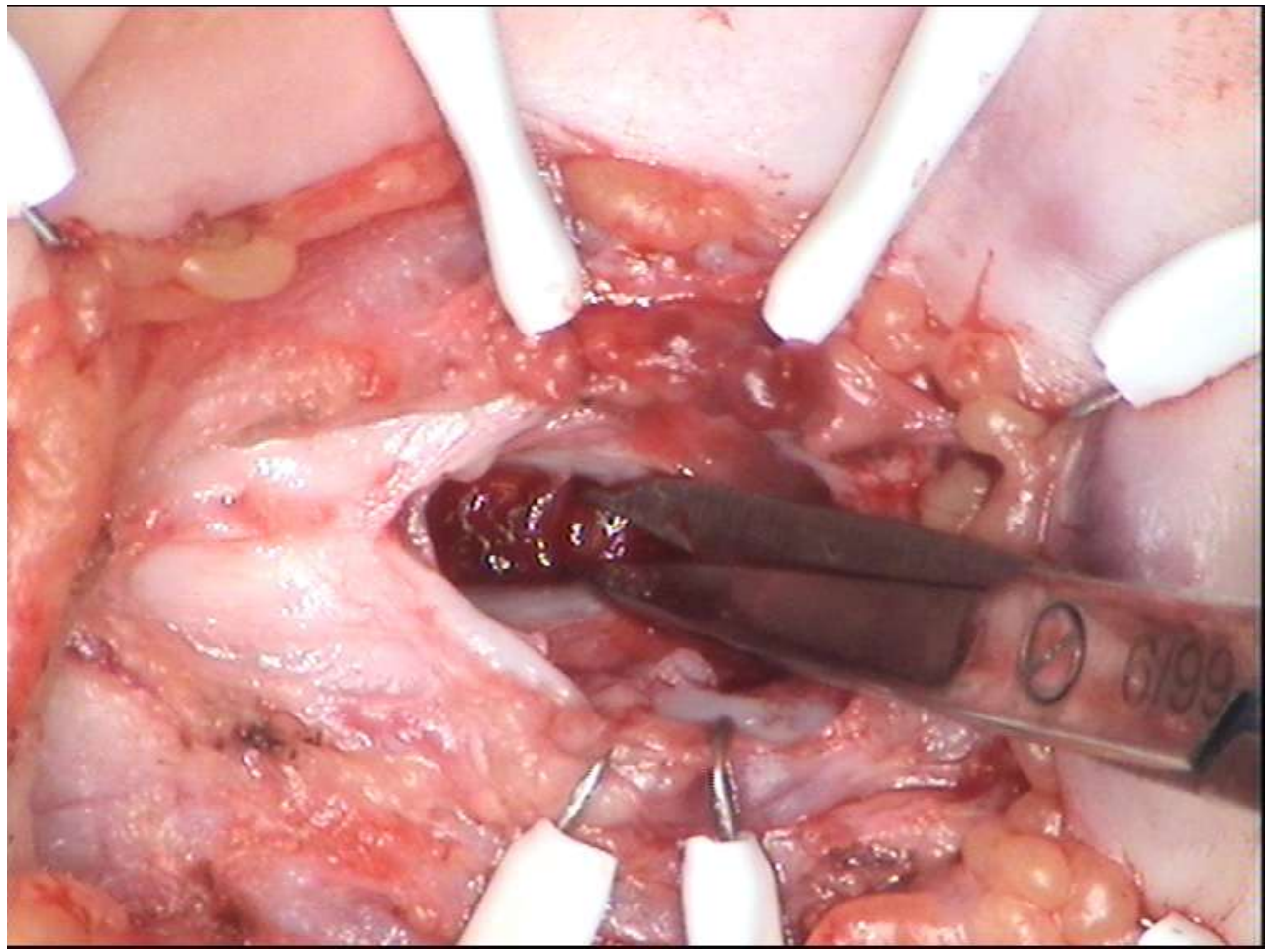
Expose larynx



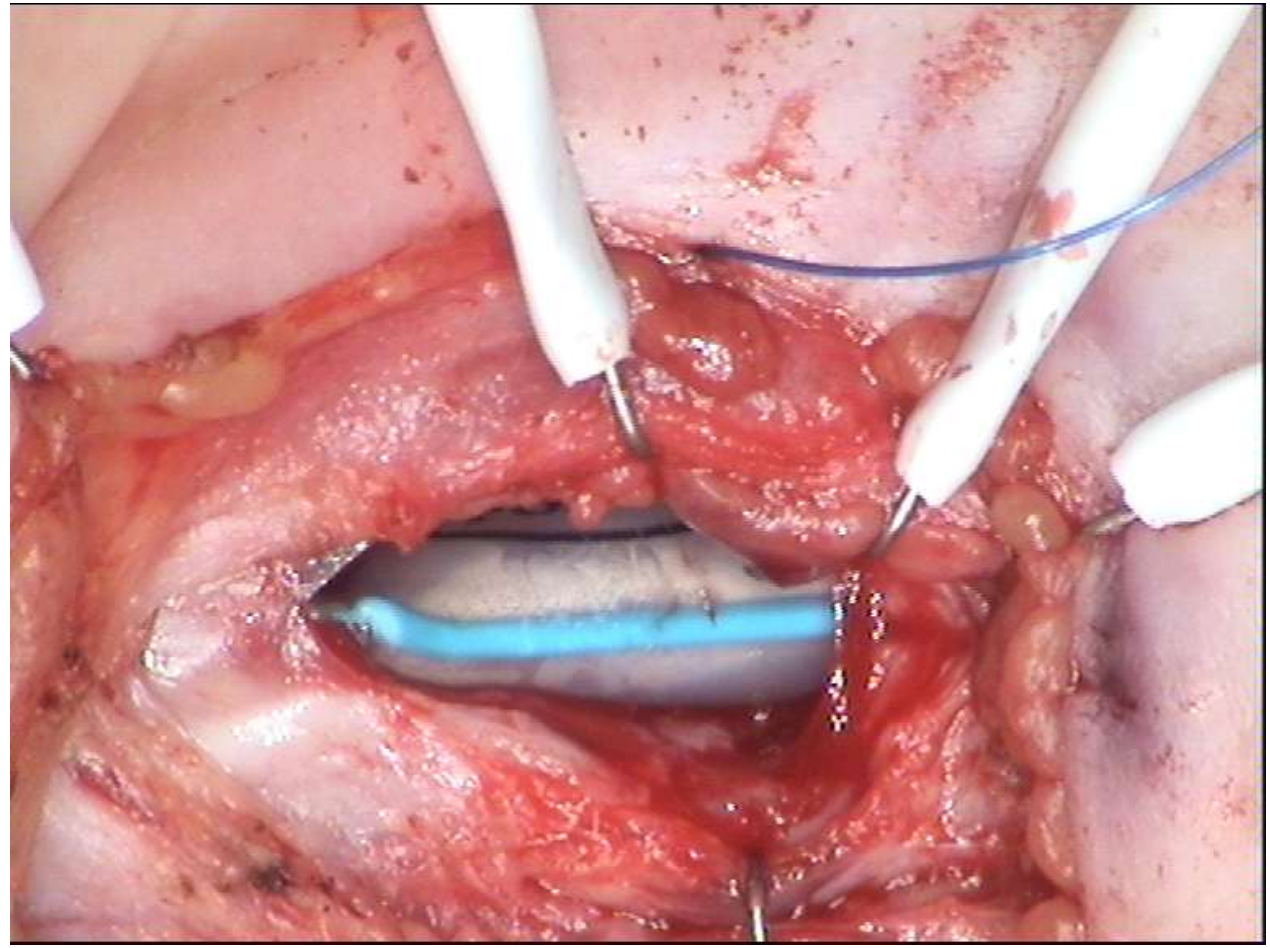
Laryngofissure



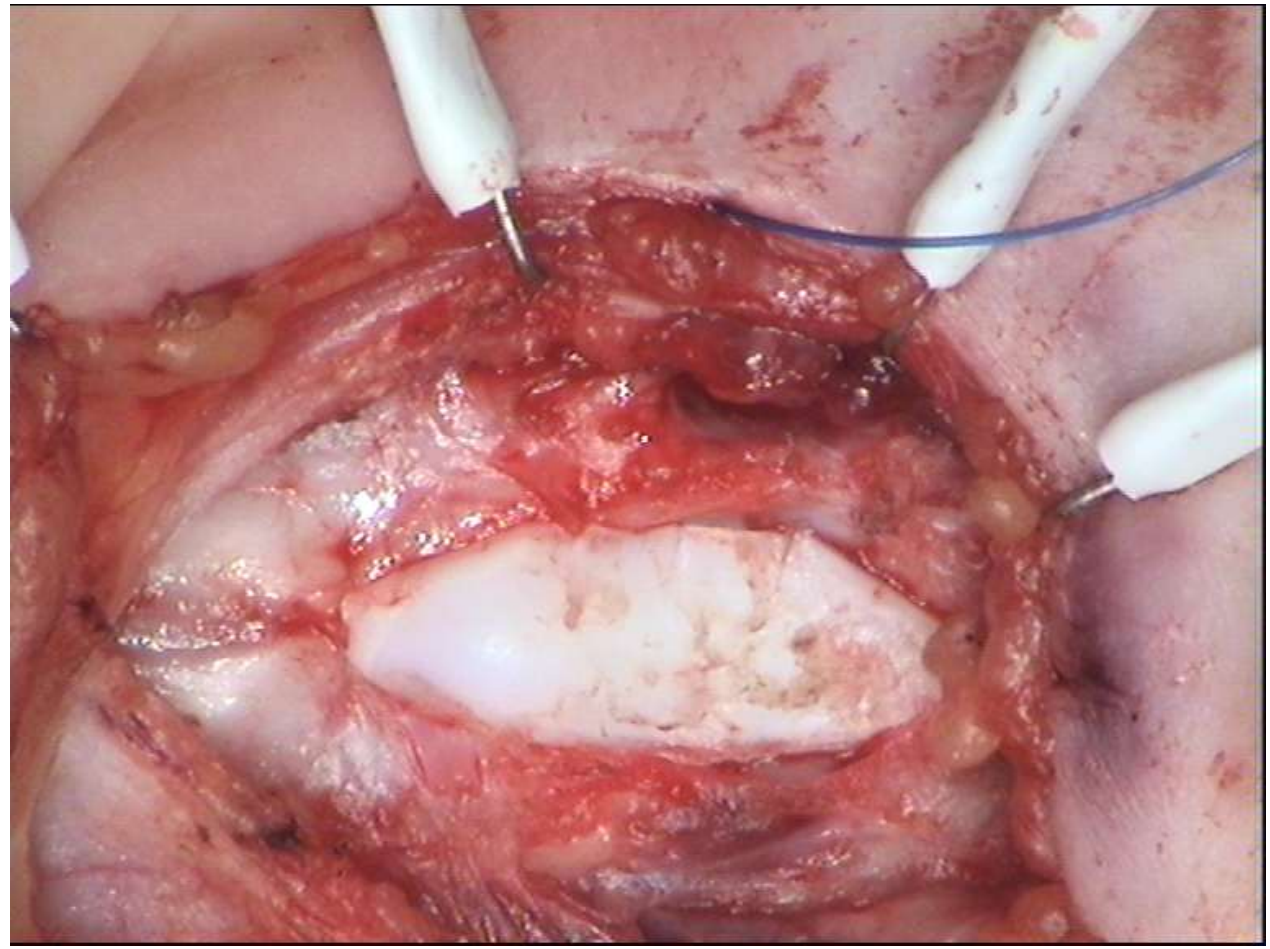
Posterior split



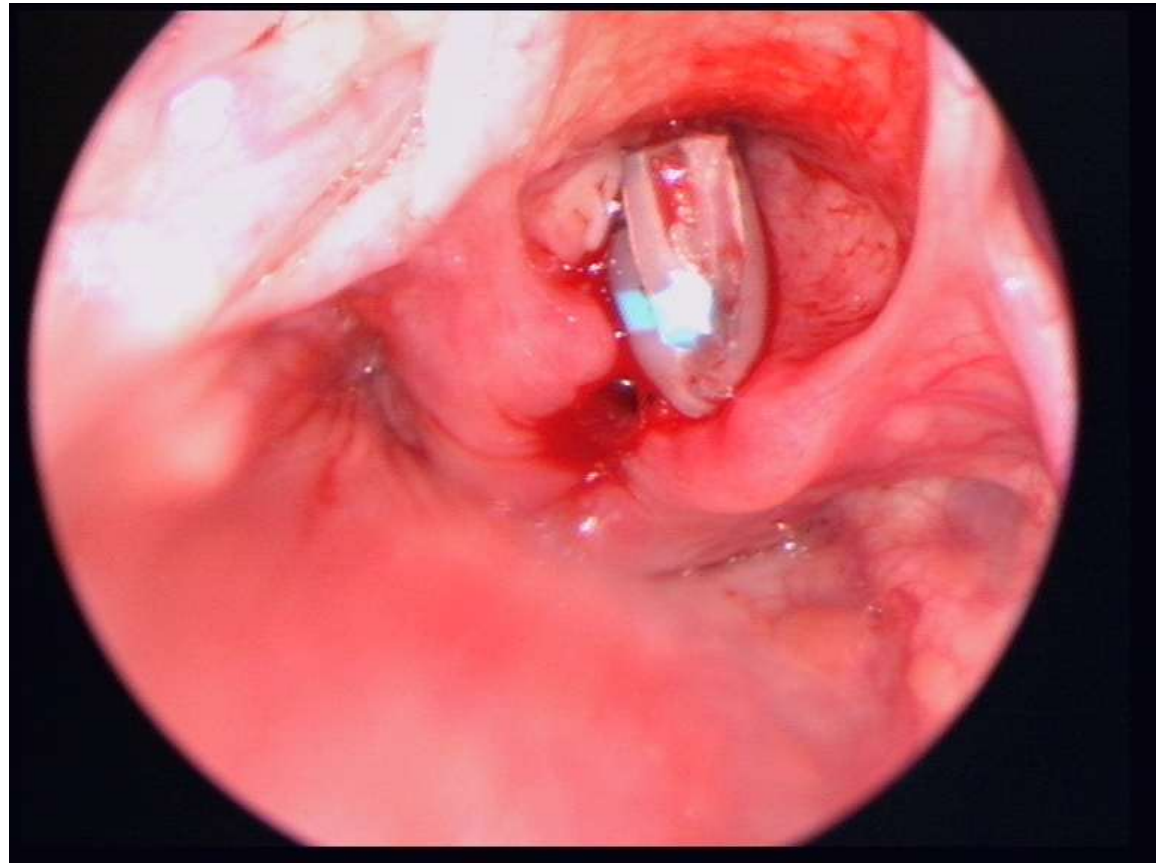
Stent



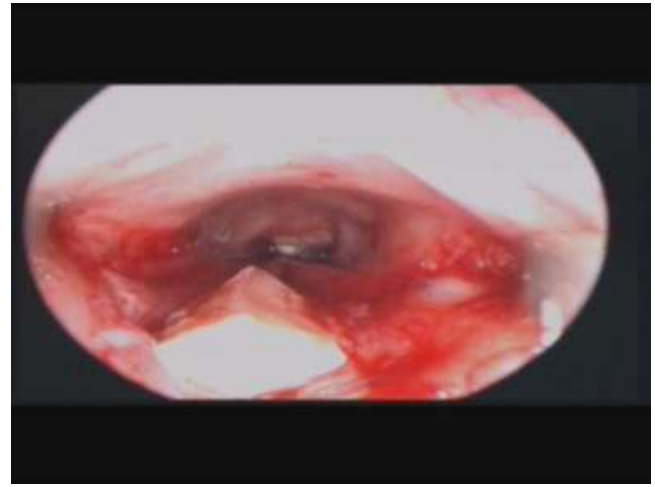
Anterior graft



Endoscopic posterior graft



Endoscopic posterior graft



Results of LTR Cotton 1989

Decannulation rate	Patient	Procedures (%)
Grade 2 97%	95	129 (33%)
Grade 3 91%	80	94 (17%)
Grade 4 72%	25	28 (12%)

Results of LTR - GOSH

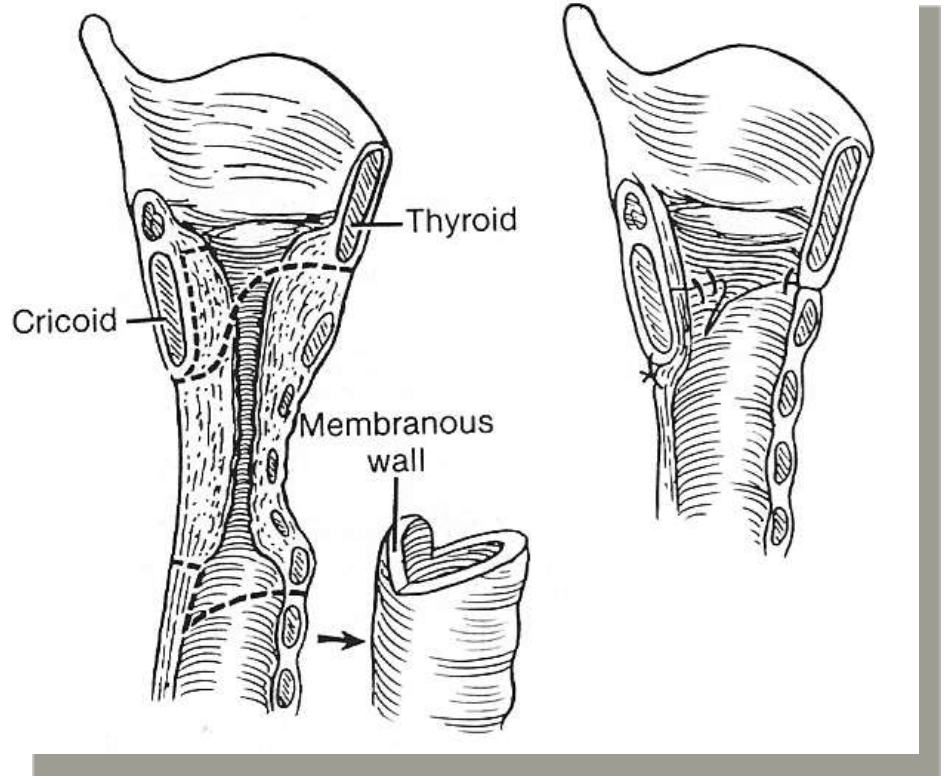
- 266 procedures
- (presented ESPO Helsinki Evans 1998)

- Grade 2 94%
- Grade 3 90%
- Grade 4 66%

Partial Cricotracheal resection

- Grade III-IV
- Usually as a single stage
- Upper excision below cords
  - preserve posterior cricoid
  - cricoid plate drilled to reduce stenosis

Cricotracheal resection

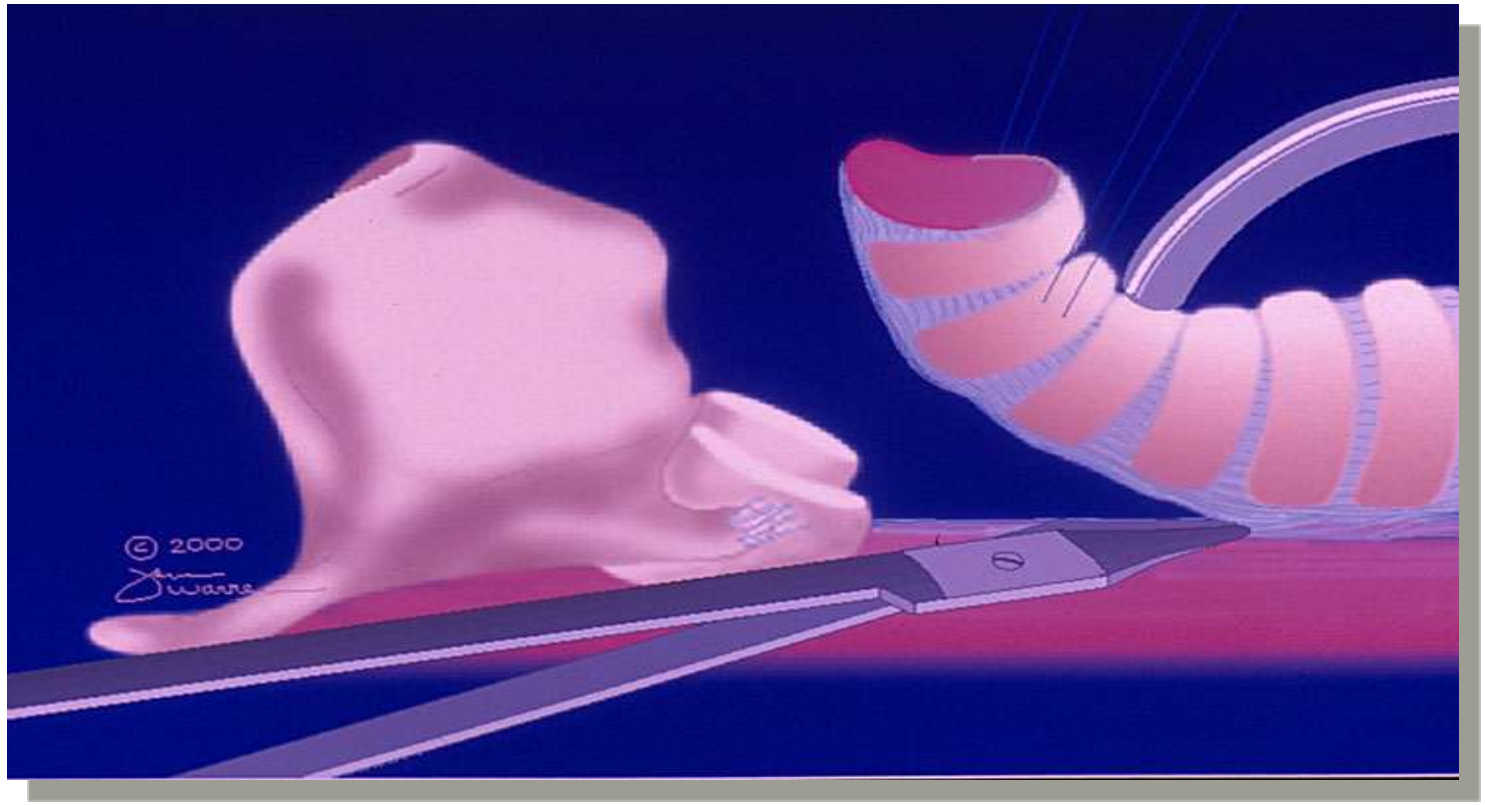


Cricotracheal resection

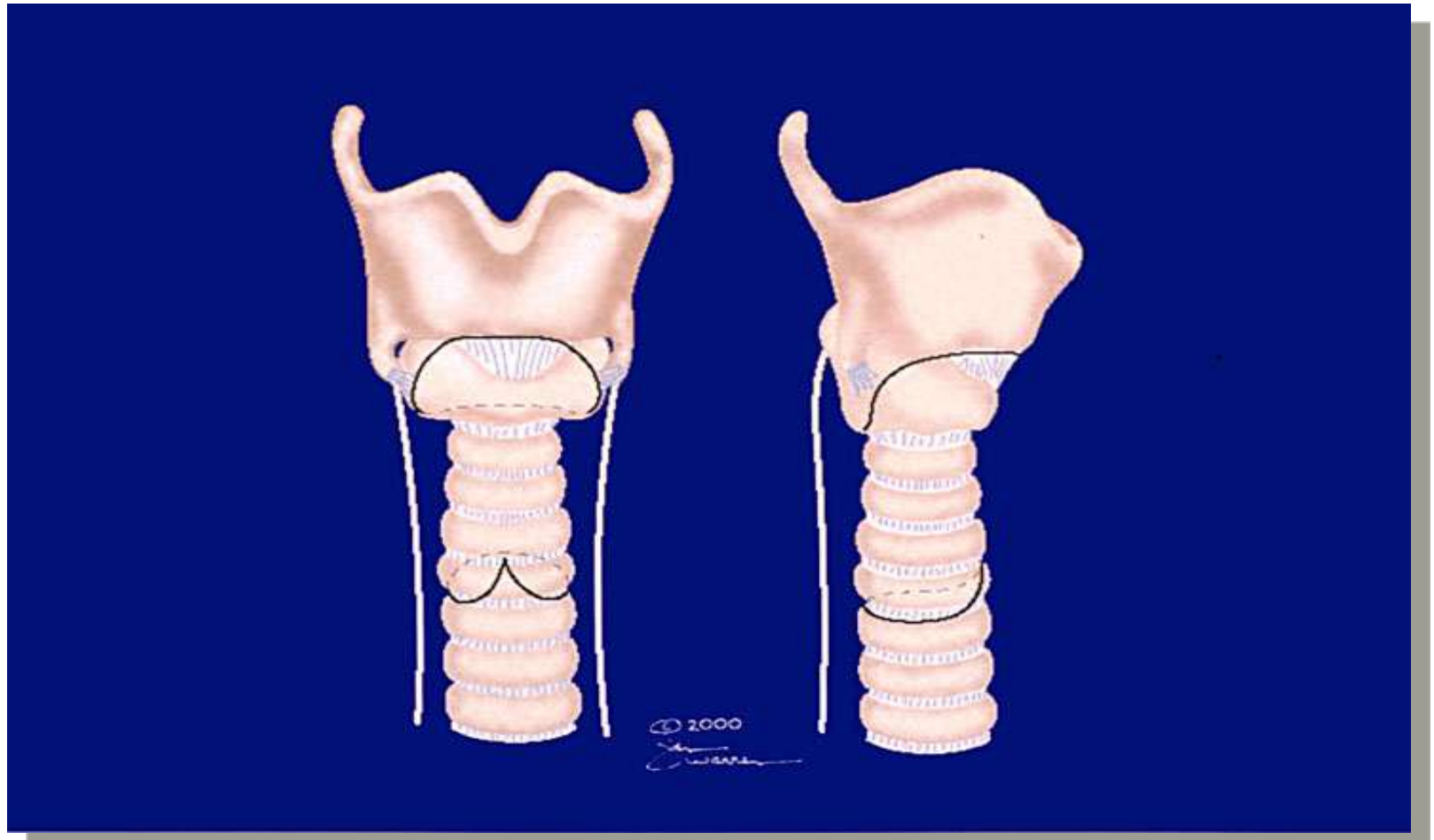
- Intubate for 7-10 days
- Scope prior to extubation and downsize

- No longer use lateral tension sutures or neck sutures

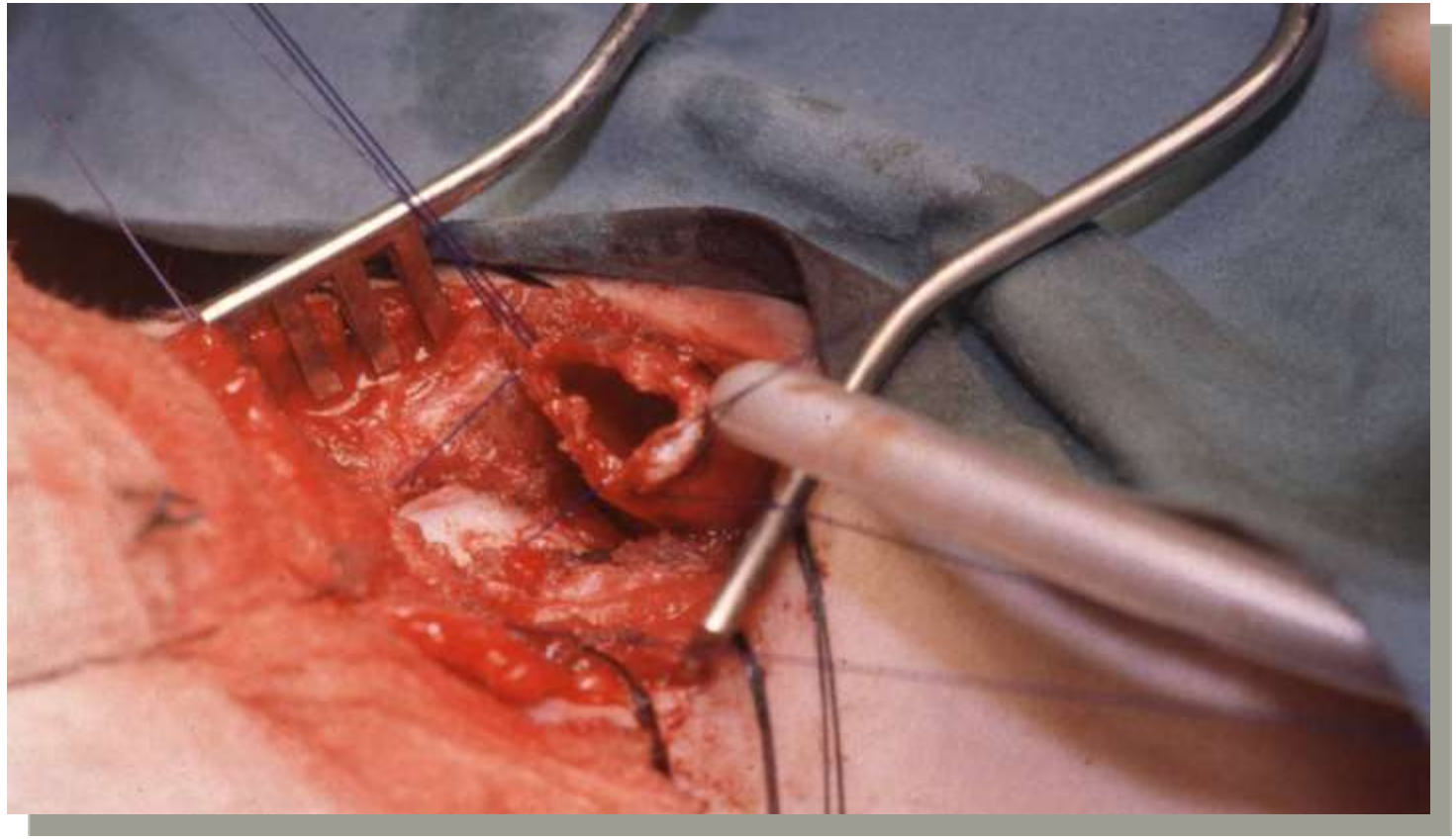
Cricotracheal resection

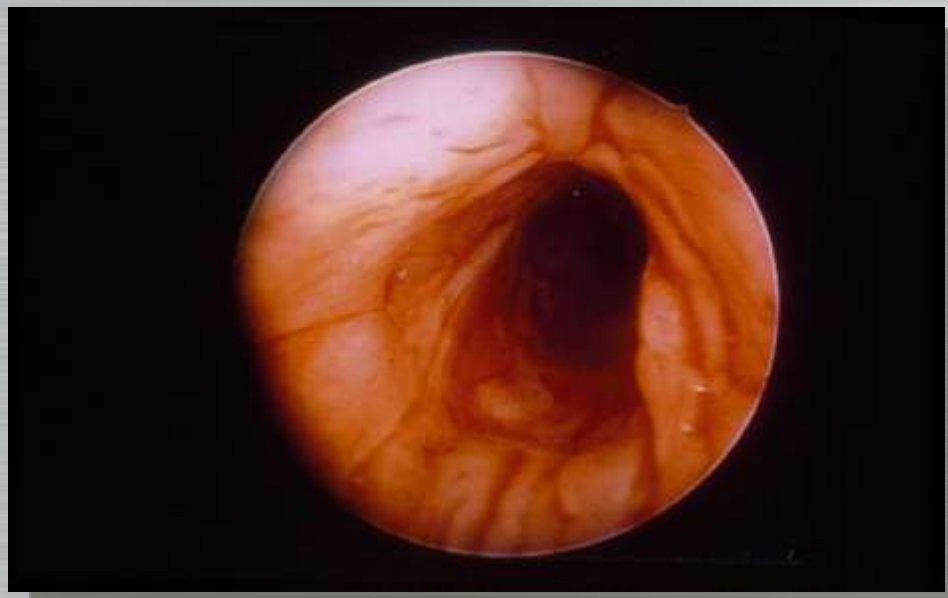


Partial Cricotracheal Resection
Monnier 1993



Cricotracheal resection

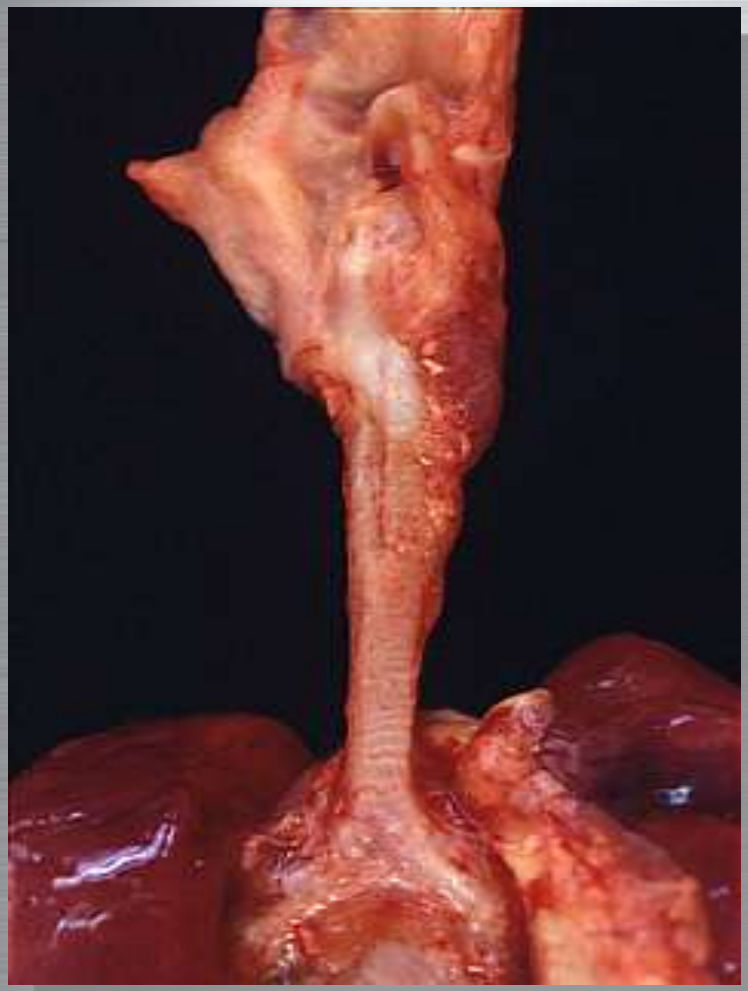


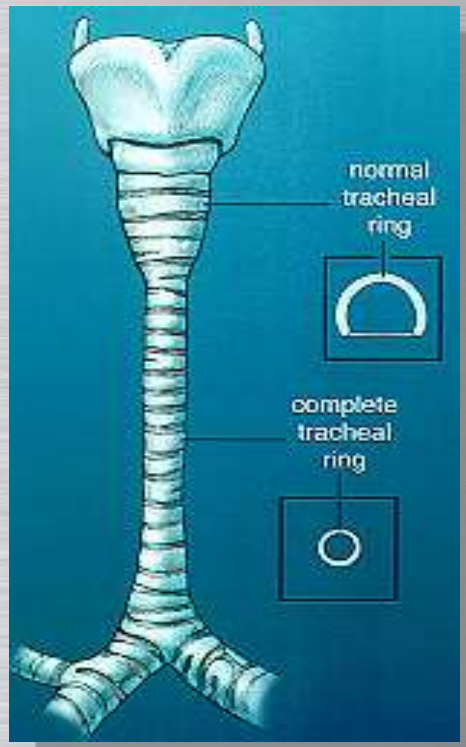


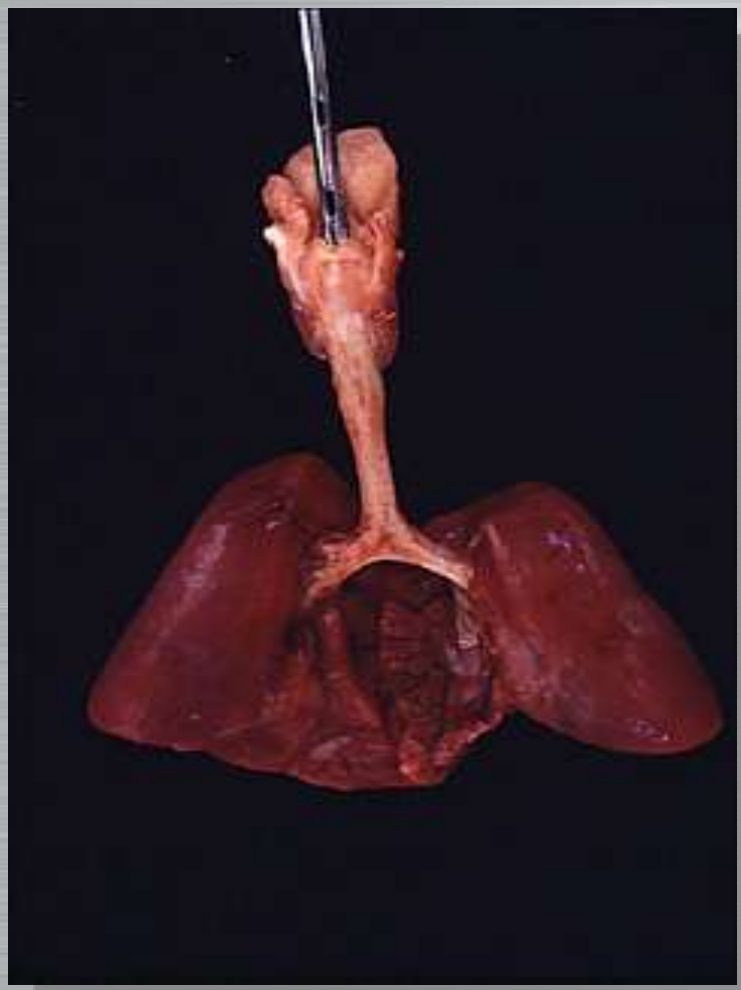
My current guidelines

Grade		
I	Conservative	
II	Endoscopic if soft	LTR once established
III	LTR	CTR if severe and clear of cords
IV	LTR	CTR if clear of cords

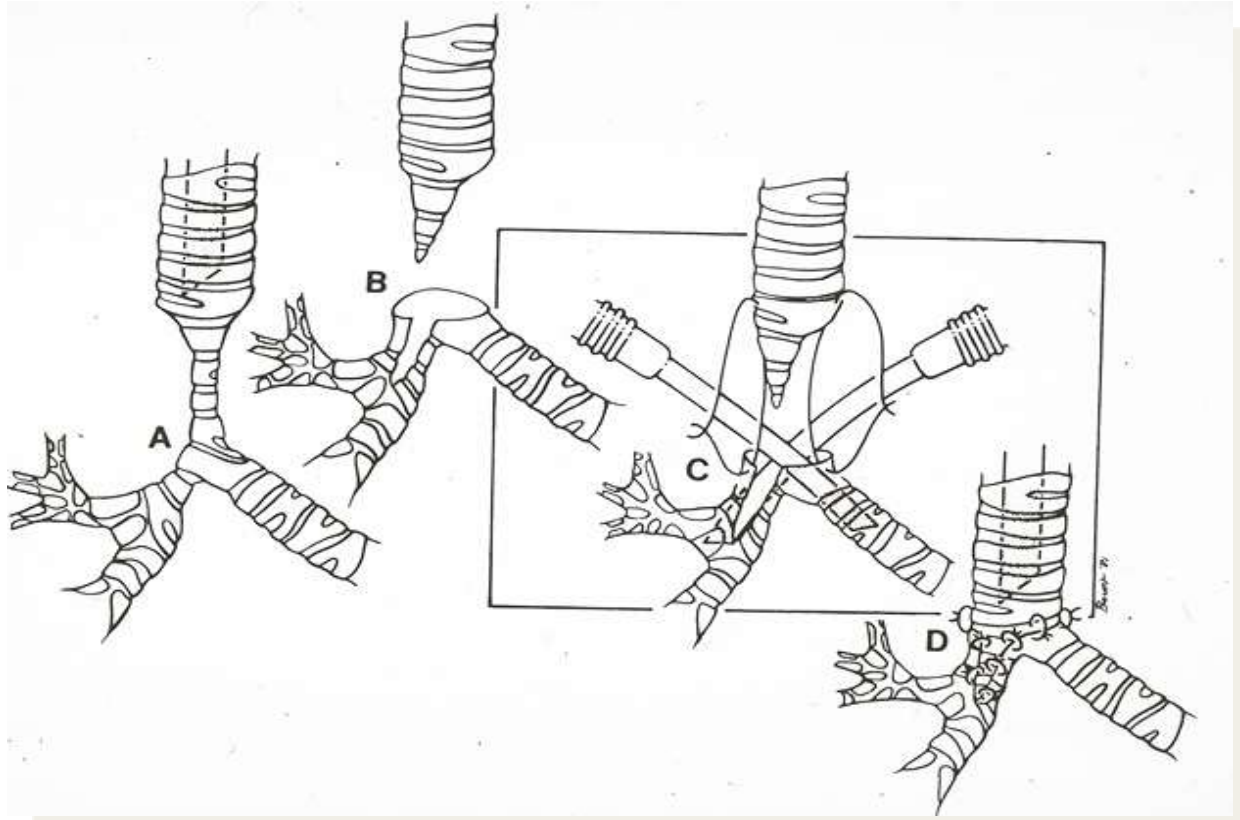
Complete Tracheal Cartilage Rings



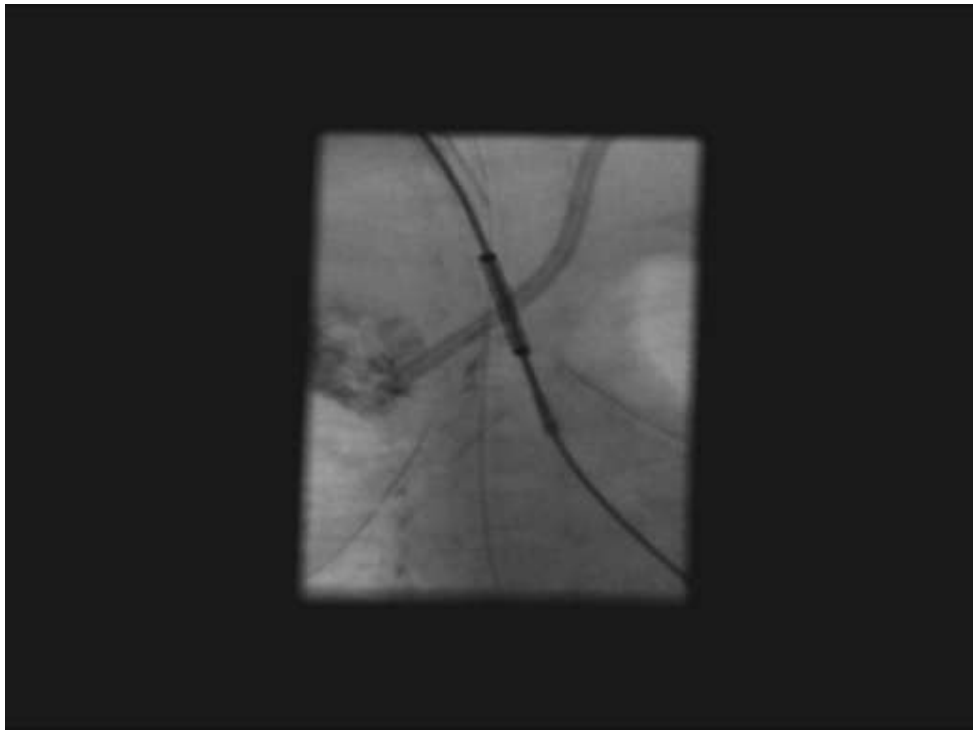




Slide Tracheoplasty



Balloon dilatation of metal stents



The Future

- Paediatric and adult laryngology will continue to learn techniques from each other
- Laryngeal transplantation, laryngeal pacing and tissue engineering are very exciting developments

BAPO Meeting 2009

- Lowry Hotel
- Manchester
- September 18th
- www.bapo.org.uk