Aetiology

• Poor tube management
  – Size of tube (leak)
  – Duration of intubation

• Small cricoid (acquired on congenital)

• Reflux

• Poor general status
Prevention

- Laryngeal Rest
- Medical
- Tubes
- Cricoid split
Developing stenosis: Laryngeal rest

- Avoid reintubation and elect to leave child intubated for 2 weeks
Developing stenosis: Medical management

• Steroids

• Anti-reflux treatment

• Antibiotics?
Change to a straight well fixed tube

- Shouldered/straight
- Oral/nasal
Developing stenosis: Cricoid Split

- Decompression operation
  - Allows oedema to disperse
  - Includes a period of laryngeal rest
  - Includes steroids and other measures to facilitate extubation
Basic Options for Established Disease

- Laser
- Mitomycin C
- T-Tube
- LTR with stent
- Single stage LTR
- Crico-tracheal resection

E.T.T
Stent
Established disease - Laser

BEWARE
Established disease - Mitomycin C

Mitomycin:
Antineoplastic antibiotic - acts as an alkylating agent by inhibiting DNA and protein synthesis
Useful to prevent restenosis
Established disease: T-Tube

- Acts as combined laryngeal stent and tracheostomy tube
- Ideally blocked
- May block
Established disease - Conventional LTR

• Reconstruction is covered by a tracheostomy
  – ?stent above trachostomy
• Usually a rib cartilage augmentation
Established disease - Single stage

• Reconstruction covered by a period of intubation
• Any existing tracheostomy is closed
Established disease - Cricotracheal resection

• Technique for severe stenosis that resects a segment of upper trachea and anterior cricoid but retains the cricoid plate
Operative details

- Cricoid split
- LTR with stent
- Single stage LTR
- Crico-tracheal resection
Cricoid Split

Premature infant fails extubation because of laryngotracheal stenosis

Cricoid Split

50-70% success

Extubation
Cricoid Split - Indications

Mild soft subglottic stenosis/edema (Grade I-II)

- Over 1.5 kg
- No cardio-respiratory compromise
- No significant reflux
- No other complicating factors
  - Micrognathia
  - Sepsis
  - Tracheobronchomalacia
  - etc.
Cricoid Split

“Decompression”
Cricoid Split - Procedure

Initially intubated with a small tube

**Anterior split:** $1^\circ$ tracheal ring, cricoid and \(\text{ thyroid} \)

\( \uparrow \) Posterior split

Reintubated with age appropriate tube:

check length

Drain to prevent surgical emphysema
Cricoid Split - Postoperative care

Intubated for 5-7 days. Not paralysed or ventilated

Antibiotics

Exubate under steroid cover

  Dexamethasone 0.25mg/kg then 0.1mg/kg QDS

Reintubate with care if needed **
Critical factors in choice of procedure for ESTABLISHED stenosis

Endoscopy findings

Degree of stenosis (Grade I-IV) - *staging*

Other details of stenosis

Distance from tracheotomy/glottis - espc for CTR
Length
Anterior/posterior
Inter-arytenoid scar, cricoarytenoid fixation
Supra stomal collapse
Glottic webs

General health

Weight
Presence of tracheostomy
Staging

Grade I          0 - 50%
Grade II         50 - 70%
Grade III        70 - 99%
Grade IV         100%

<table>
<thead>
<tr>
<th>Classification</th>
<th>From</th>
<th>To</th>
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<tbody>
<tr>
<td>Grade I</td>
<td>No Obstruction</td>
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<tr>
<td>Grade II</td>
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<td>Grade III</td>
<td>71% Obstruction</td>
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<tr>
<td>Grade IV</td>
<td>No Detectable Lumen</td>
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</table>
Staging - Sizing using ET tube
Conventional LTR with stent

Premature infant fails extubation because of laryngotracheal stenosis

↓

Tracheostomy

↓

Serial endoscopies

↓

LTR with stent

↓

Remove stent + further endoscopies

↓

Decannulation

50-80% success, depending on grade of stenosis
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
“Augmentation”
LTR - Procedure

Laryngofissure exposing the whole length of the stenosis, opening stoma if necessary
Posterior split until cricoid plates separate
Posterior graft: square
Anterior graft: grooved or as a “T”
Conventional LTR - Post operative care

Removal of stent via larynx
Rescope ? Laser
KTP to stomal granulation, careful check for collapse
Conventional LTR - Post operative care

Decannulation

ward

surgical

cartilage support to stoma (single stage)

TCF excision
Single stage LTR

Premature infant fails extubation because of laryngotracheal stenosis

Single stage laryngeal reconstruction

70-90% success

Extubation
Single stage LTR - Indications

Failed extubation

- >2 kg
  - “Healthy” as for cricoid split

Recurrent croup

Progressive stridor

Patients with tracheostomy
“Augmentation in favourable patients”
Techniques - with an existing tracheotomy

Laryngofissure

Position posterior graft if required

Tracheotomy tube removed

Endotracheal tube inserted

Anterior graft(s) for stenosis and to close/support tracheotomy stoma
Techniques - without an existing tracheotomy

(extended) Laryngofissure
Position posterior graft if required
Correct size endotracheal tube inserted
Anterior graft
Single stage technique - post op

Check tube length

Leave intubated 7-10 days

Minimal paralysis

Check for airleak

Any reintubation needs to be very gentle

Rescope, reintubate and downsize at ?1/52
Cricotracheal resection

Grade III-IV

Usually as a single stage

Upper excision below cords
  preserve posterior cricoid
  cricoid plate drilled to reduce stenosis

Lower excision sloping up
Cricotracheal resection

Here is a sketch of a cricotracheal resection:

- **Suprahyoid release**
- **? removal**
- ** Arytenoid cartilage**
- **Resection margin (upper)**
- **Posterior cricoid plate preserved**
Cricotracheal resection
Cricotracheal resection
Cricotracheal resection
Cricotracheal resection
Cricotracheal resection

Tension sutures laterally to protect anastamosis

Chin sutures to prevent extension

Intubate for 7-10 days

Scope prior to extubation and downsize
Cricotracheal resection
LTR and CTR- Summary

Avoid tracheotomy if safe to do so

refer before tracheotomy

Single stage is more demanding but if successful

has a number of advantages

Not all patients suitable for single stage

Cricotracheal resection