Endoscopy of the Airway

Dave Albert

Airway Endoscopy

The Basics

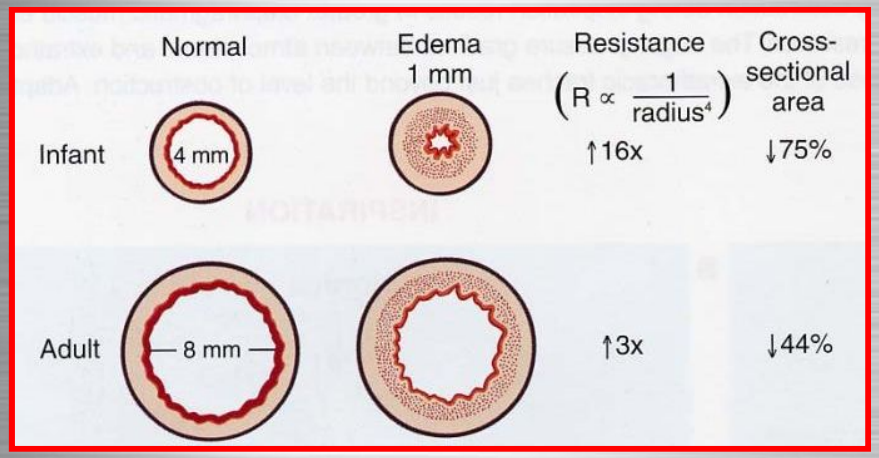
Neonatal

Progressive

Acute

Quiz

The laws of Poiseuille and Bernoulli

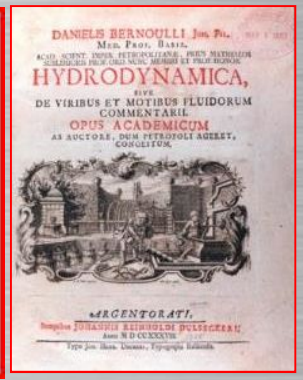


$$\Delta P = \frac{8\mu LQ}{\pi r^4}$$

French physician,physicist and mathemetician

$$\frac{v^2}{2} + gy + \frac{P}{\rho} = constant$$

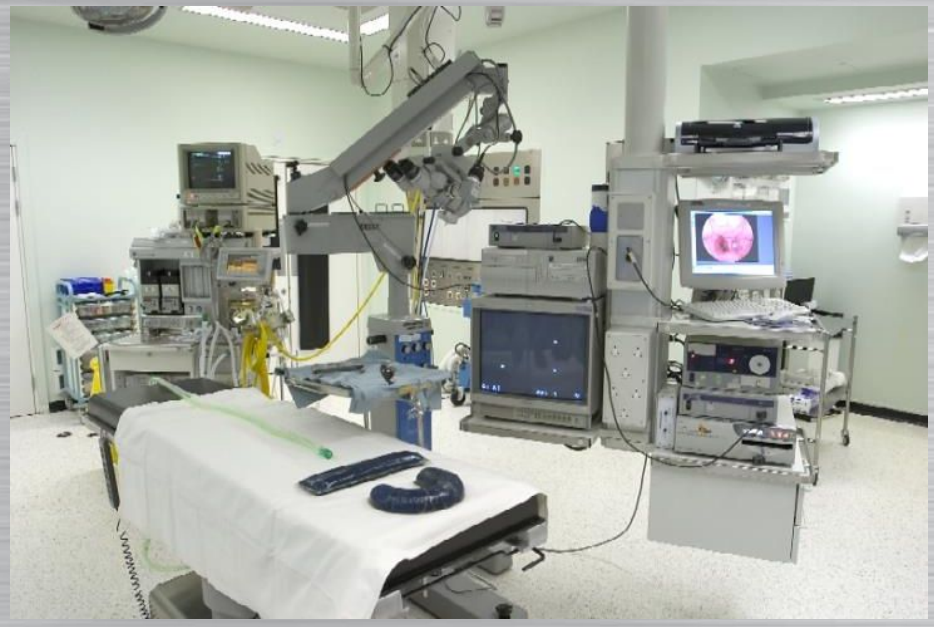
v = fluid velocity along the streamline
g = gravitational constant
y = elevation in g-field
P = pressure along the streamline
ρ = fluid density



Dutch Swiss mathemetician physician and physicist

Basics of Endoscopy

- Team
  - –Anaesthetist
  - –Nurse
  - –Surgeon
- Equipment
  - –Hopkins rod endoscopes
  - –Video/still digital recording
  - –Microdebrider rather than laser
  - –Balloon
- Spontaneous respiration



Flexible Endoscopy

Good screening procedure

Good for dynamic conditions

May miss :-

- Cricoarytenoid fixation
- Cleft larynx
- Subglottic pathology

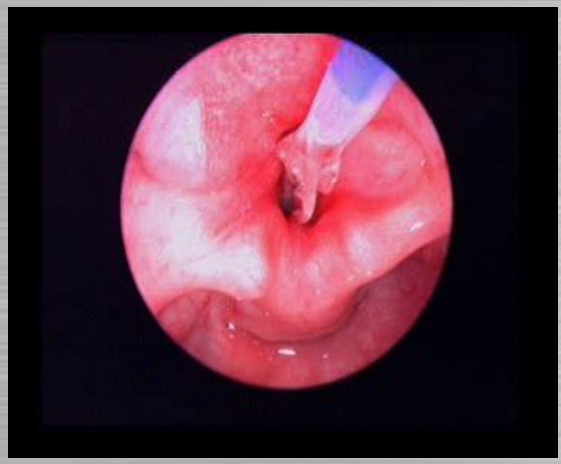
Rigid Endoscopy

Precarious airways -

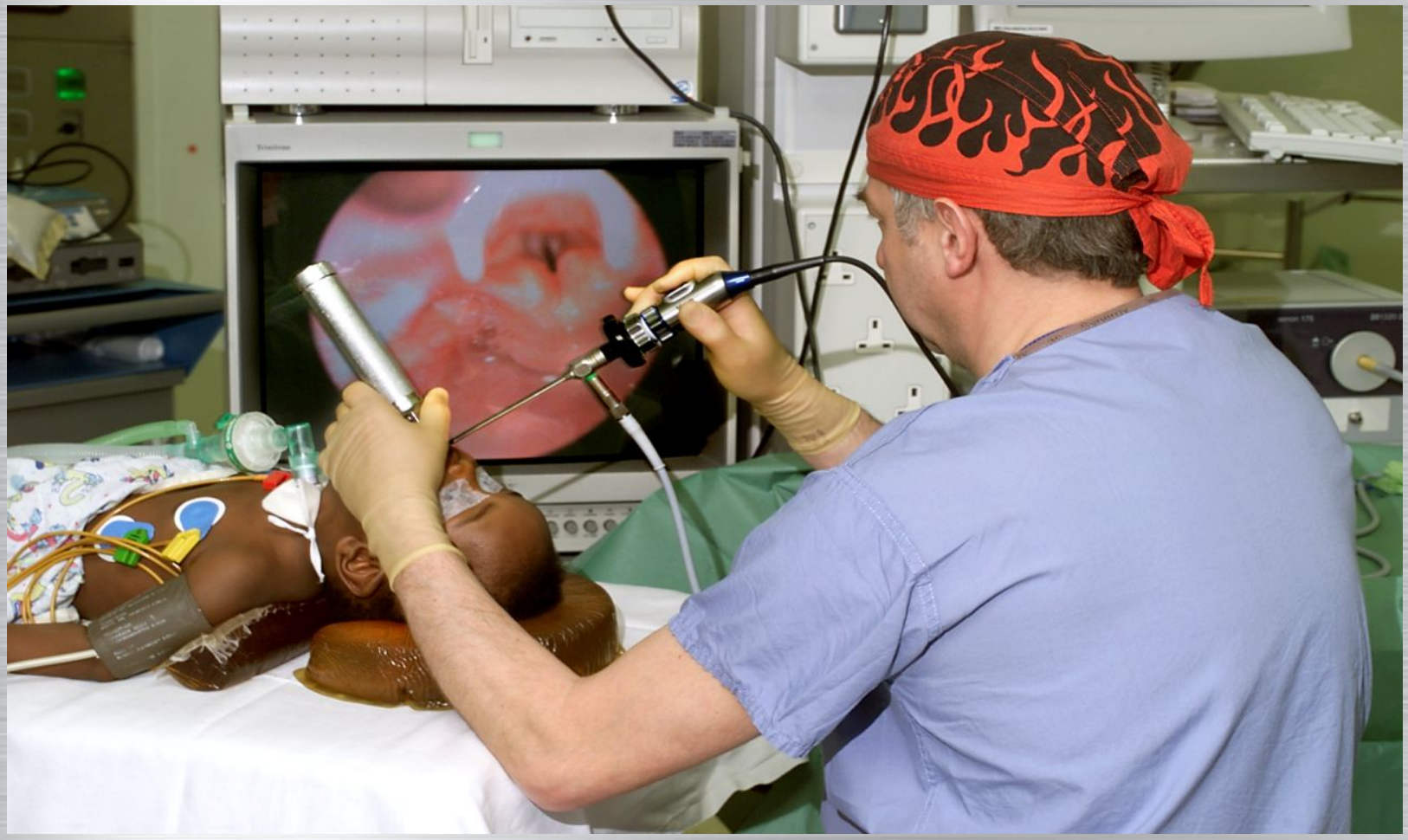
- –more control

Can probe arytenoids etc

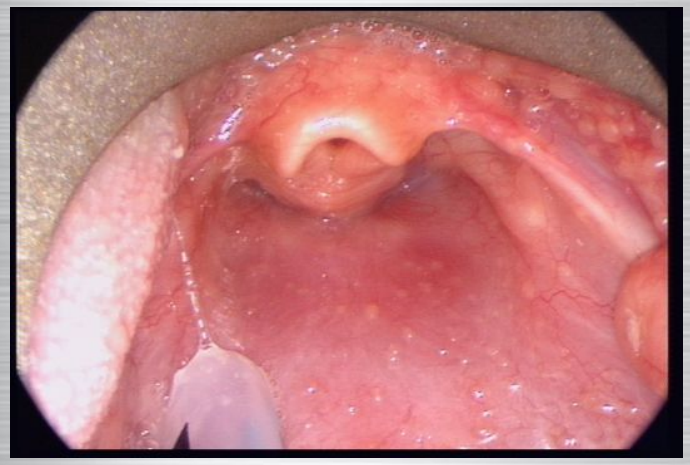
Can treat endoscopically

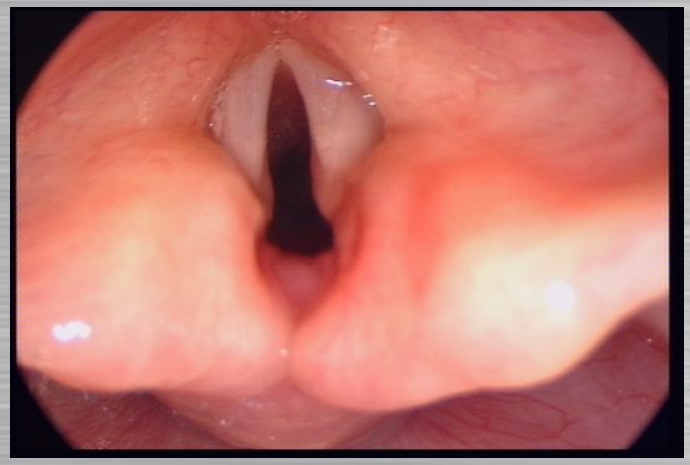


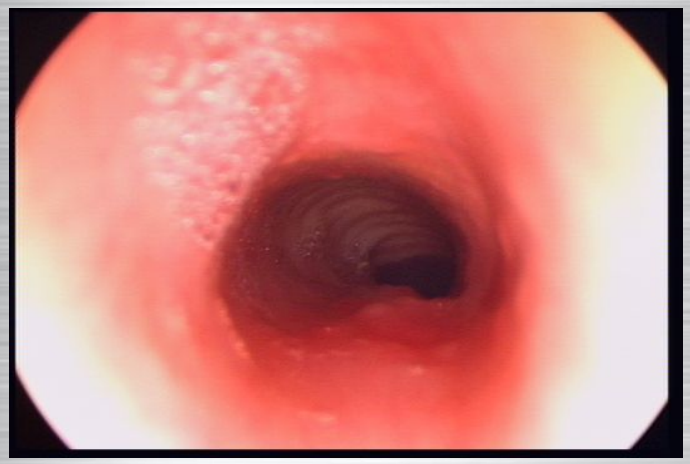
‘FESS’ Style Endoscopy

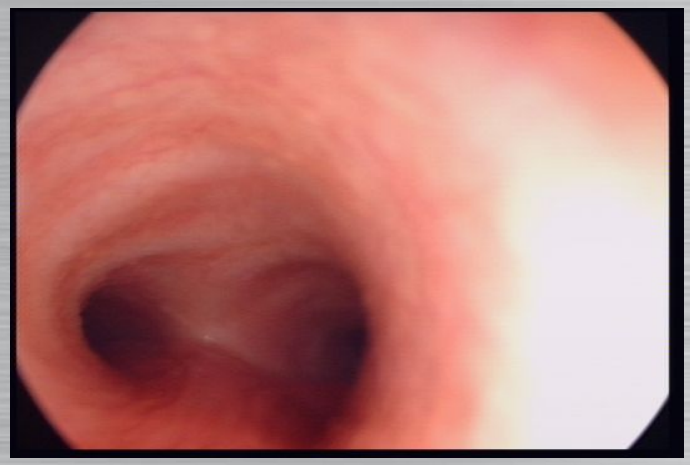


‘Four Shot’ Views

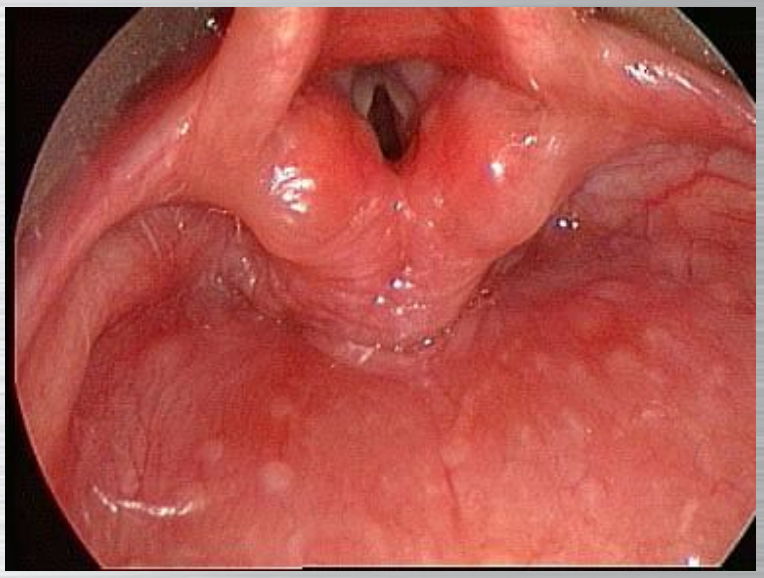




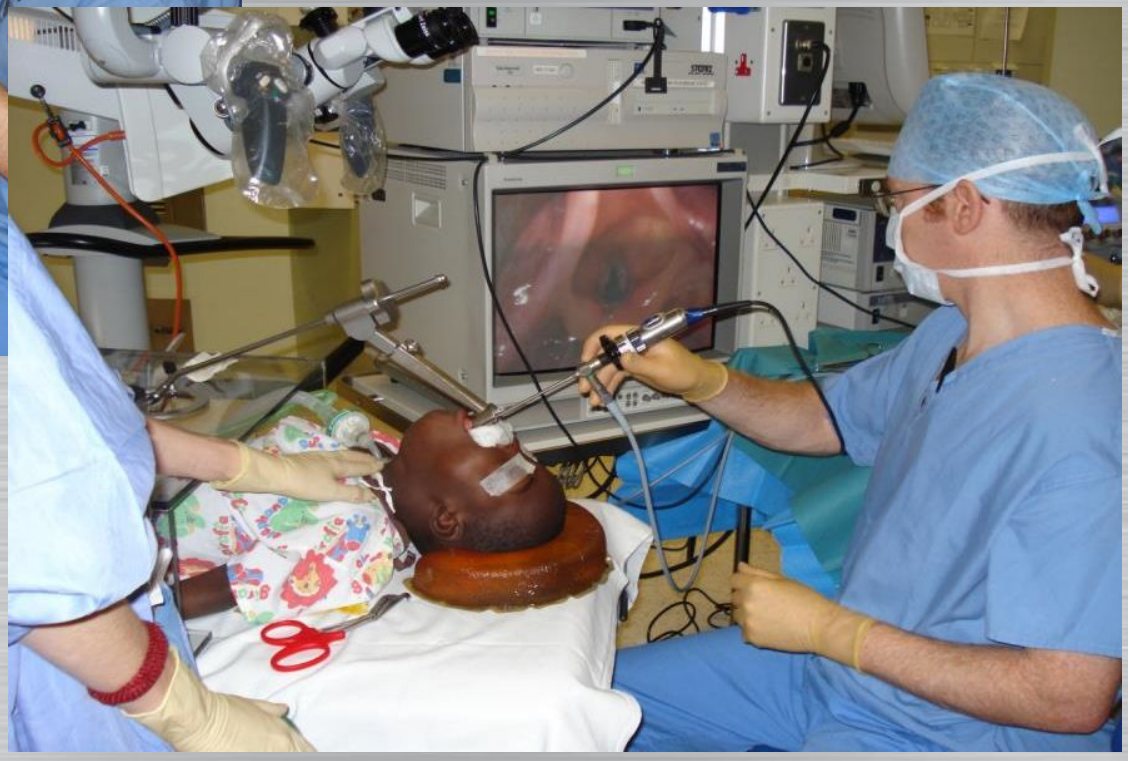




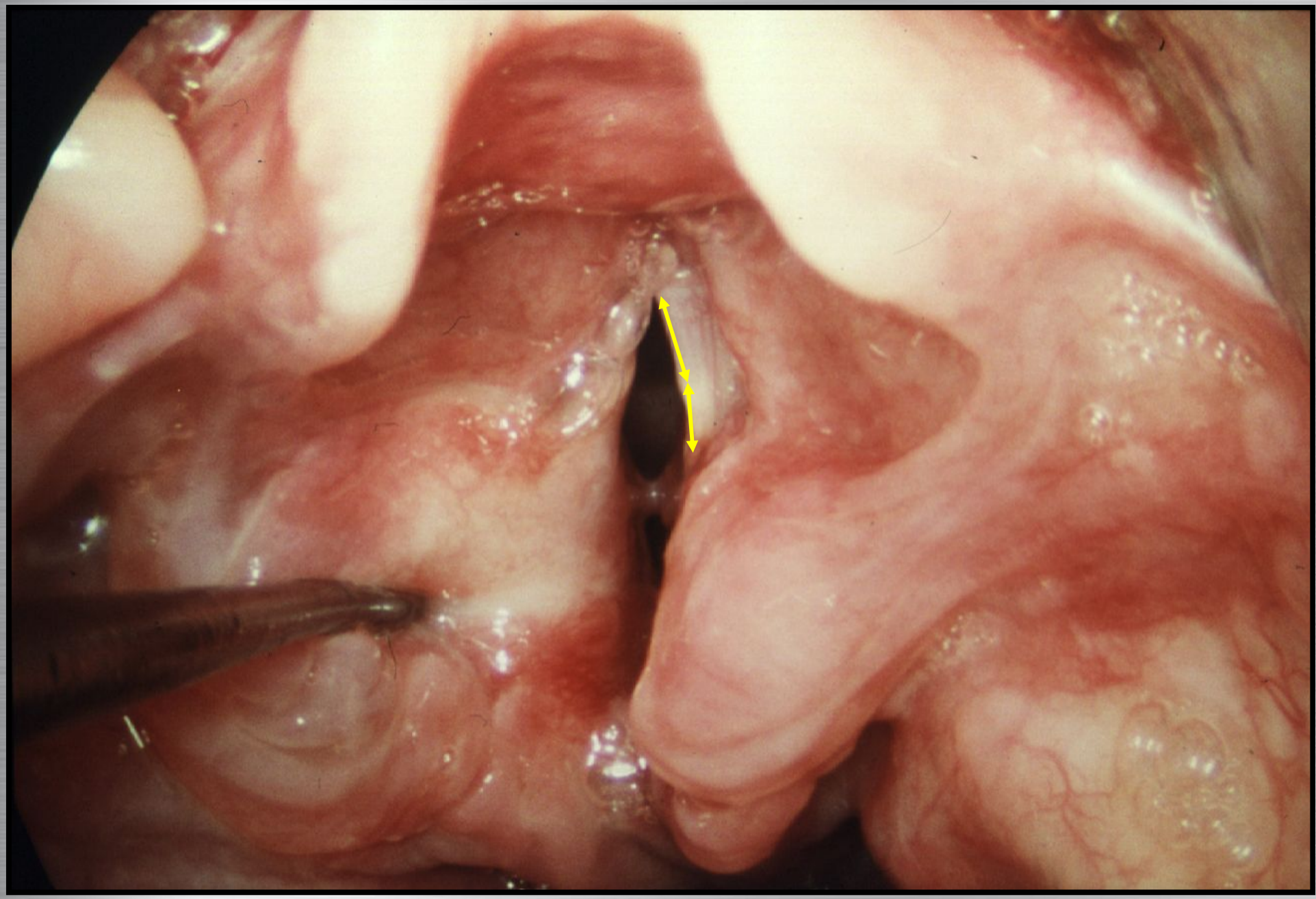
Dynamic View



Traditional Microlaryngobronchoscopy




HOPKINS



NEONATAL

Laryngomalacia: History

Stridor

- Not usually present at birth (first week)
- Quiet at rest/asleep
- ⬆ with feeding and crying
- musical quality

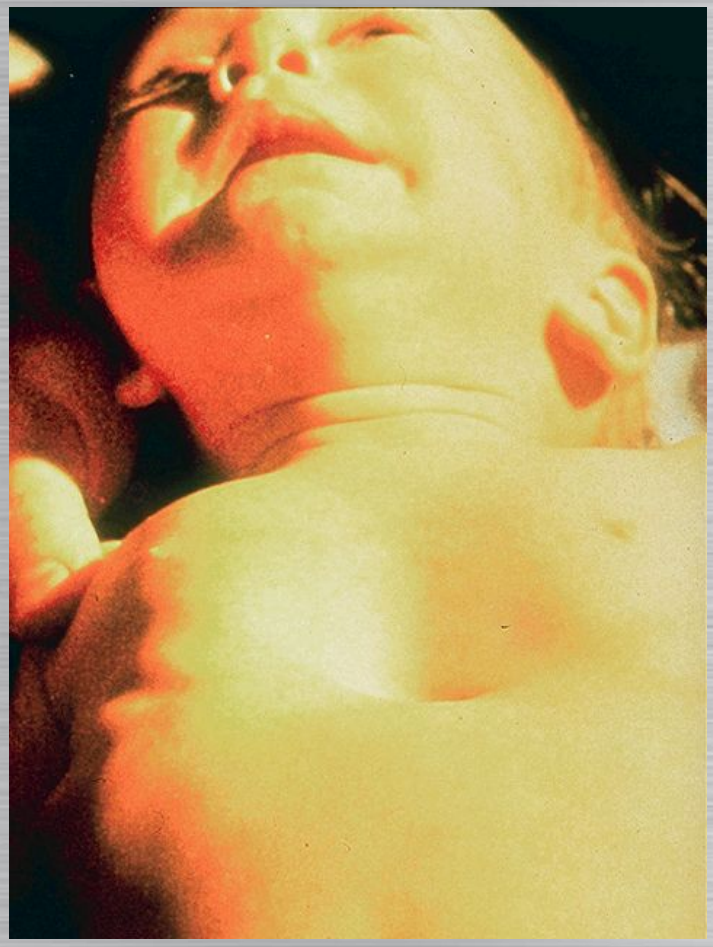
cry : normal

cyanotic episodes: unusual

growth/weight : affected if severe

Laryngomalacia: Examination

- Inspiratory stridor ⬆ with crying
- Recession
- Check for
  - cutaneous haemangiomata signs of syndromes:
    - –small jaw, wide spaced eyes, low set ears etc



Laryngomalacia: Endoscopy

to confirm diagnosis of laryngomalacia

to exclude co-existent airway pathology

Fibre-optic in office – screening

? Now minimal “standard of care”

MLB under GA for full assessment

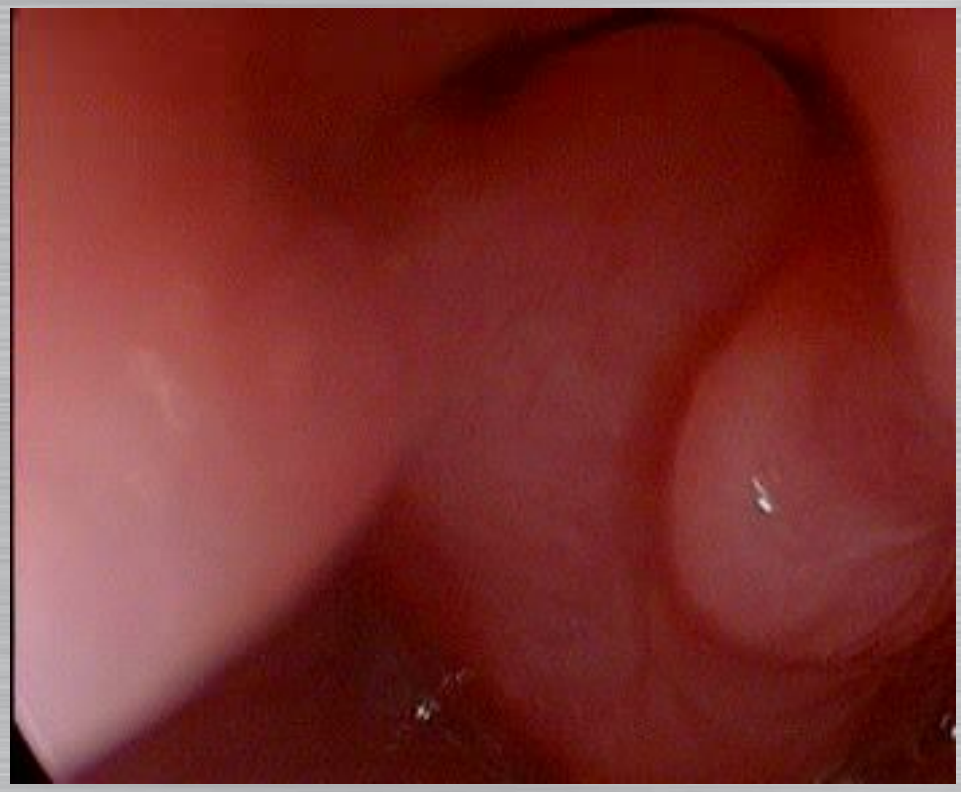
When to perform rigid endoscopy in suspected laryngomalacia

- Intubation history
- Traumatic birth
- Stridor from day 1
- Cyanotic episodes
- Aspiration
- **Failure to thrive**
- Biphasic stridor
- Severe recession
- Other congenital abnormalities
- Abnormal neurology

Posterior Laryngomalacia

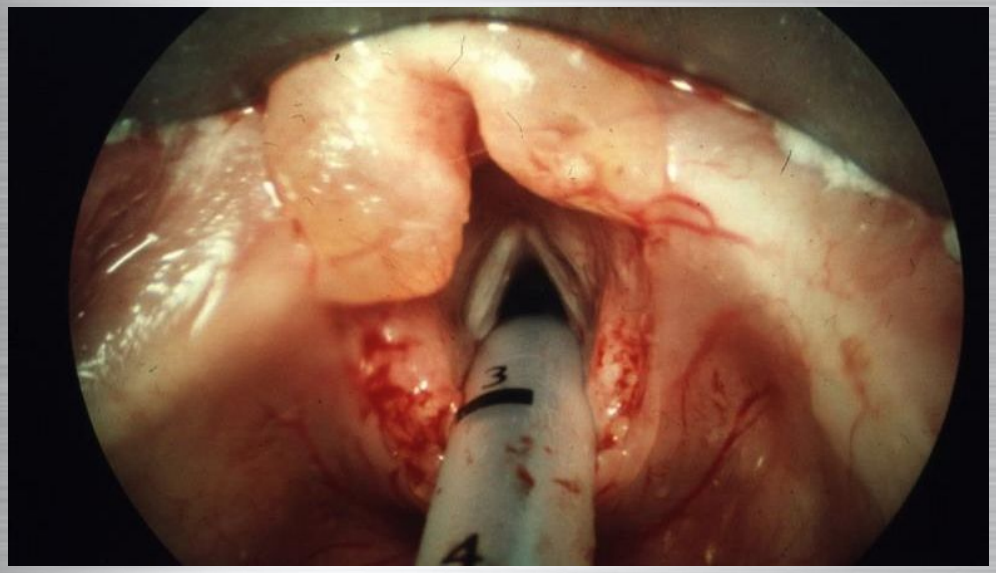
- Prolapse of arytenoid into laryngeal lumen

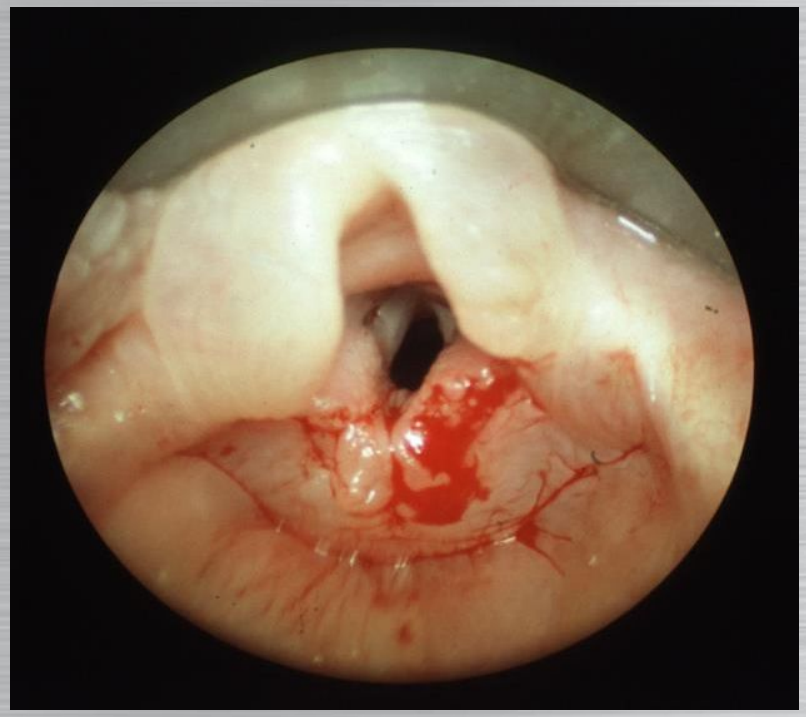
- Trim or snip if:
  - Failure to thrive
  - Severe airway difficulties
    - –eg desaturation



Aryepiglottoplasty: Surgery

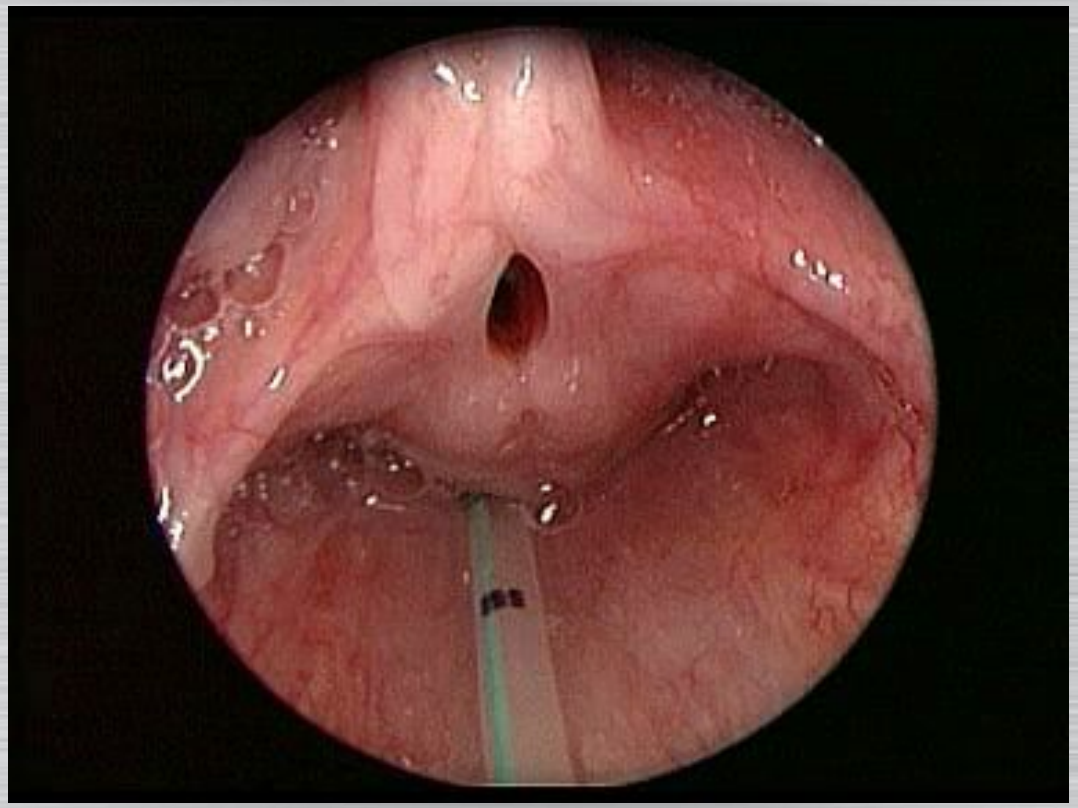
Mucosal excision



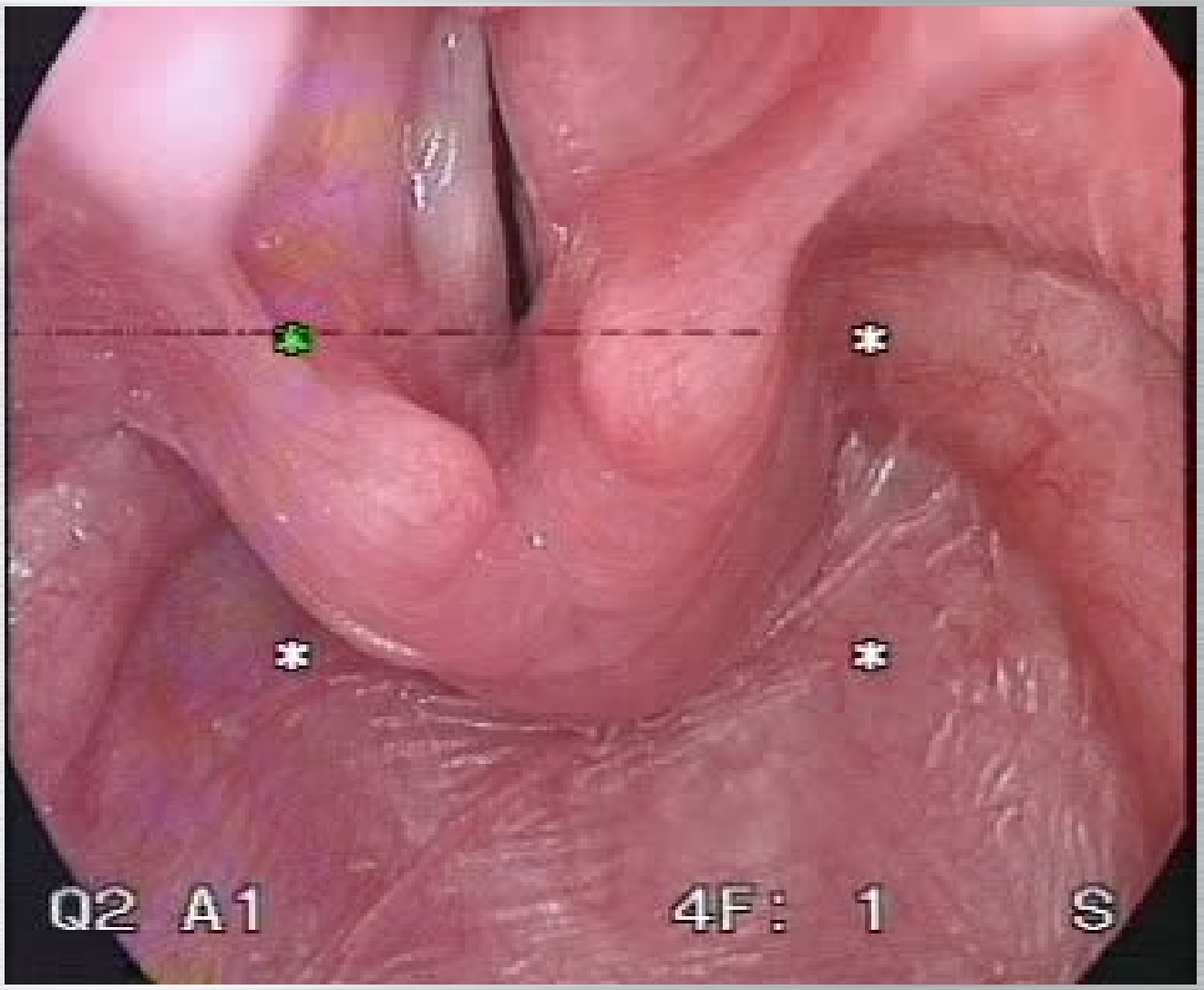


Aryepiglottoplasty

- Sheffield snip
- NOT LASER!!



Vocal cord palsy



Vocal cord palsy

? second most common cause of neonatal stridor

However, often more an incoordination

Within 1st month and often with **first breath**

Bilateral paralysis: Stridor, cyanosis, apnea

Unilateral paralysis: dysphonia.

Both: feeding problems, sternal recession

Treatment

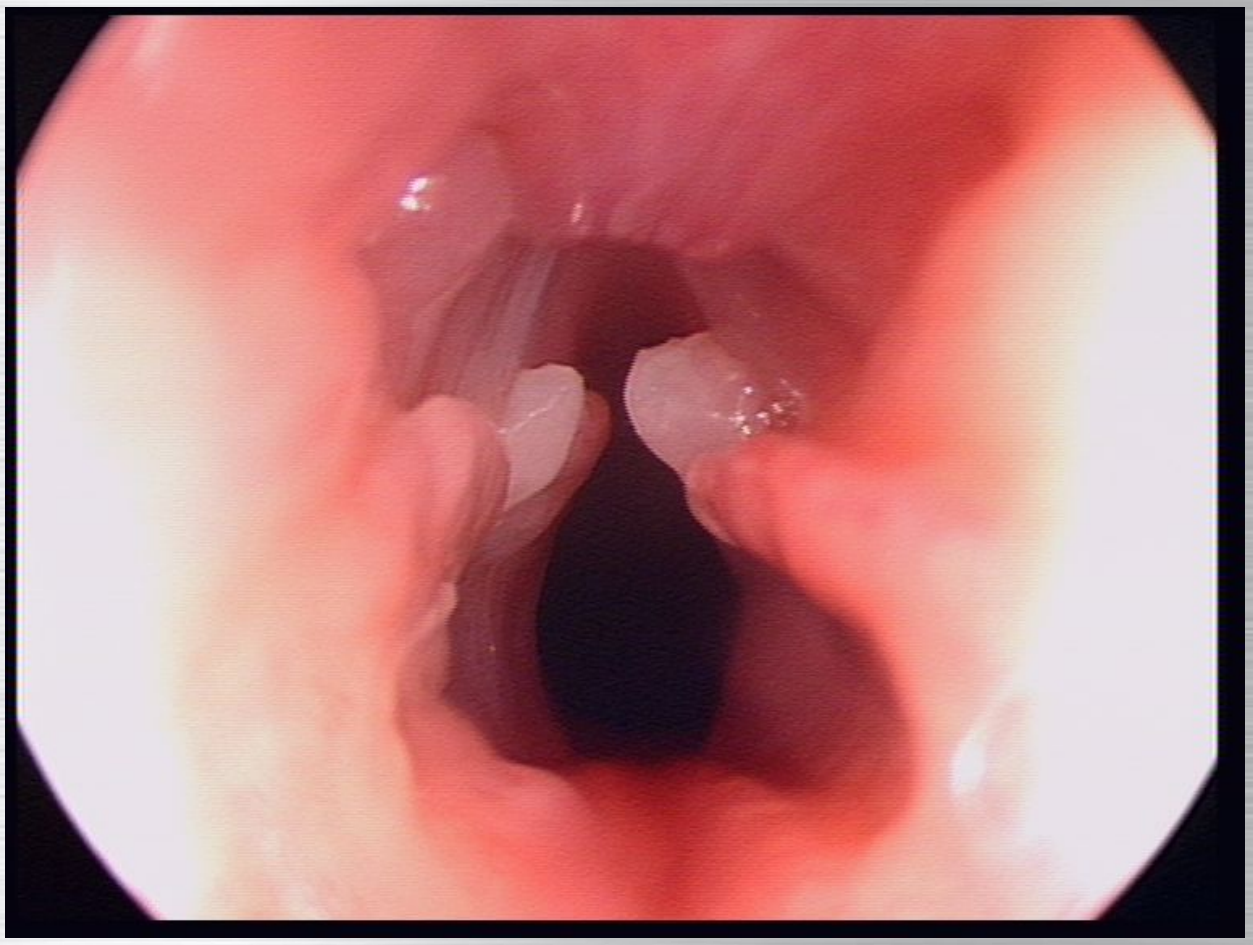
Conservative or Tracheostomy

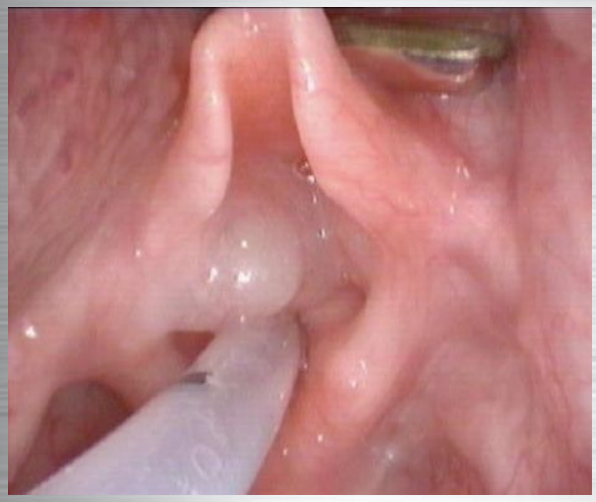
Also:

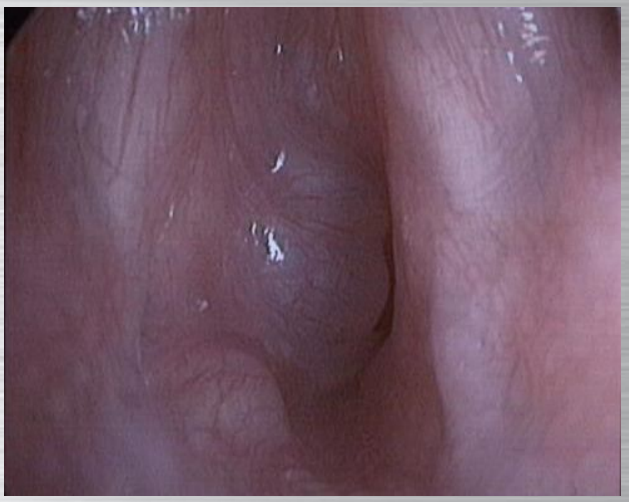
- Lateralisation: open or endoscopic
- Laser arytenoidectomy
- Posterior cricoid graft ? endoscopic
- Re-inervation

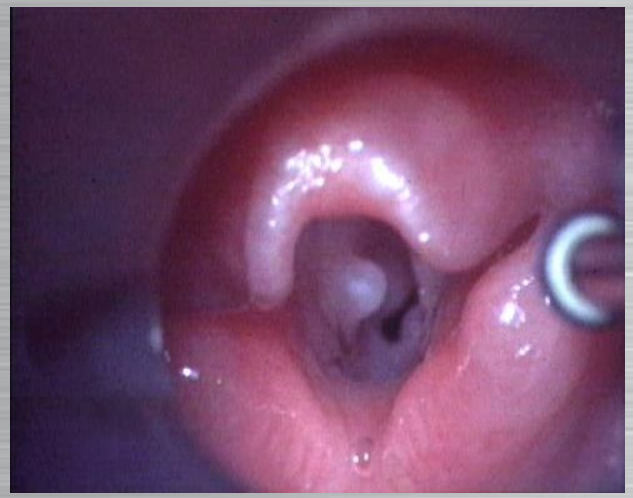
Voice vs airway

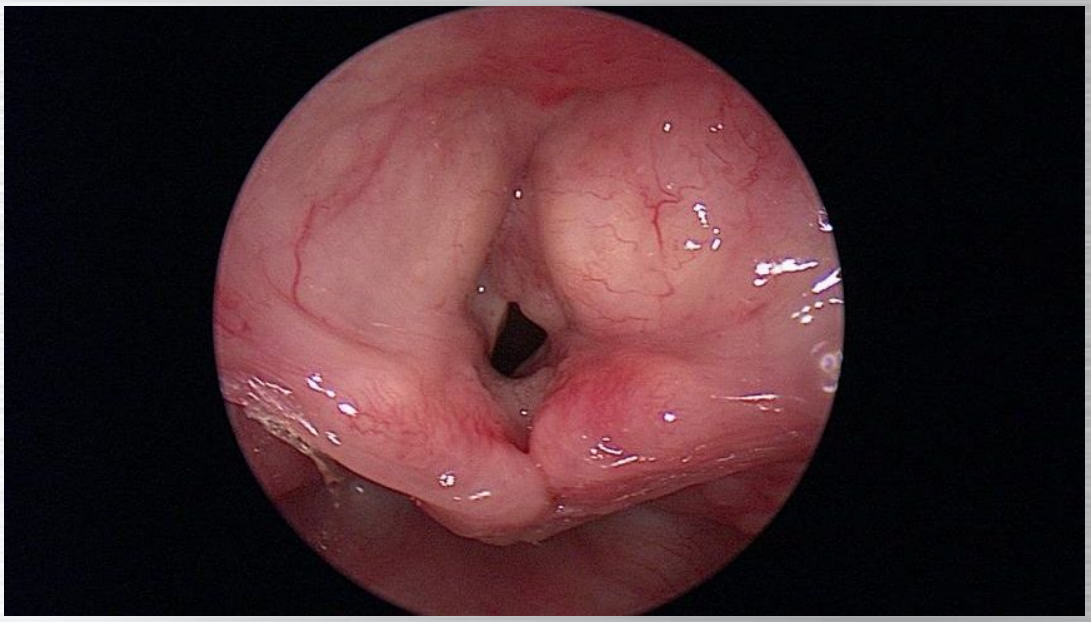
Prolonged Intubation

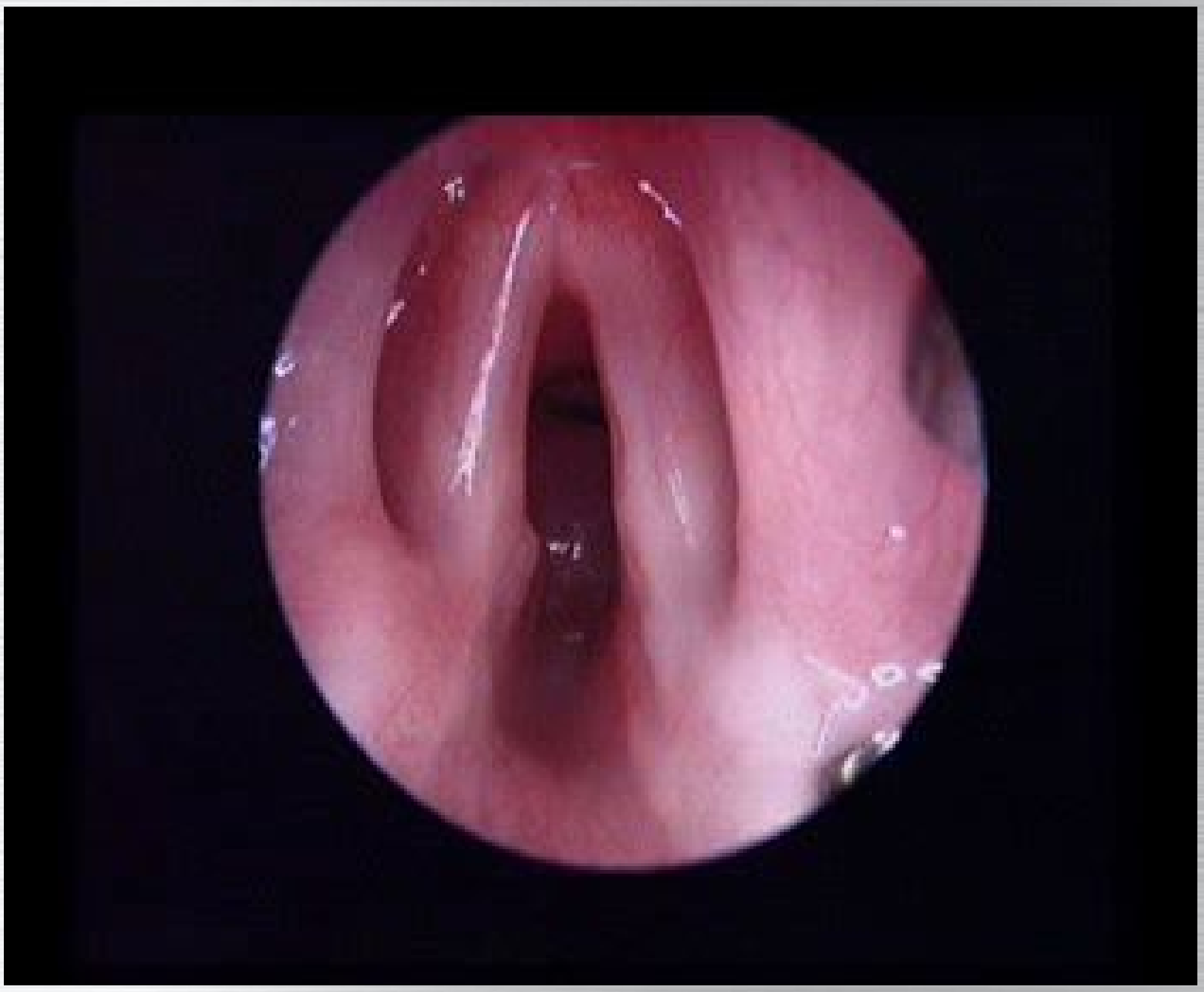


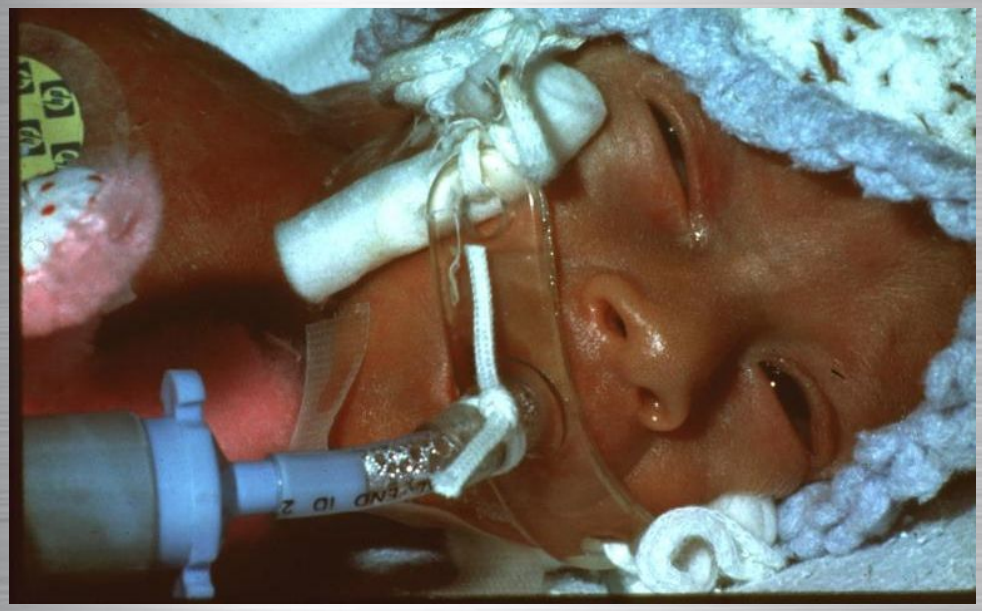


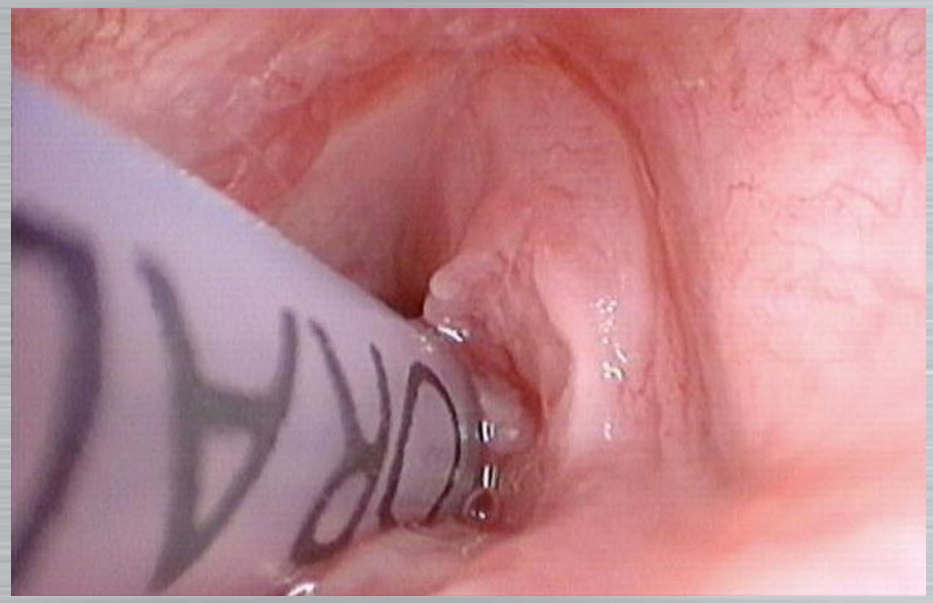


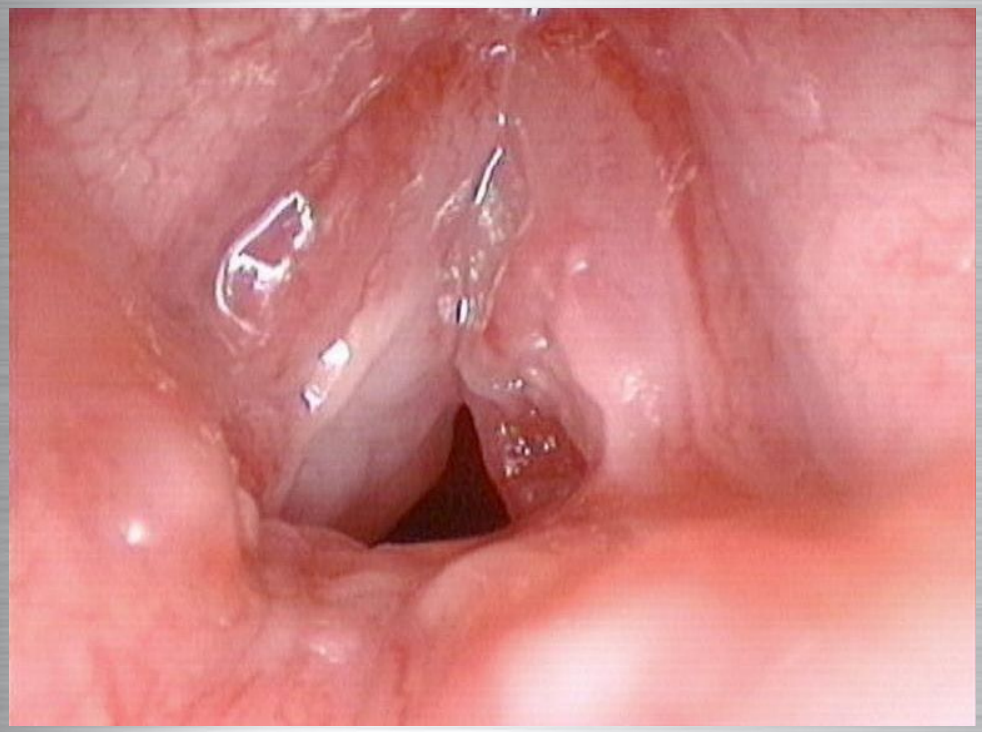


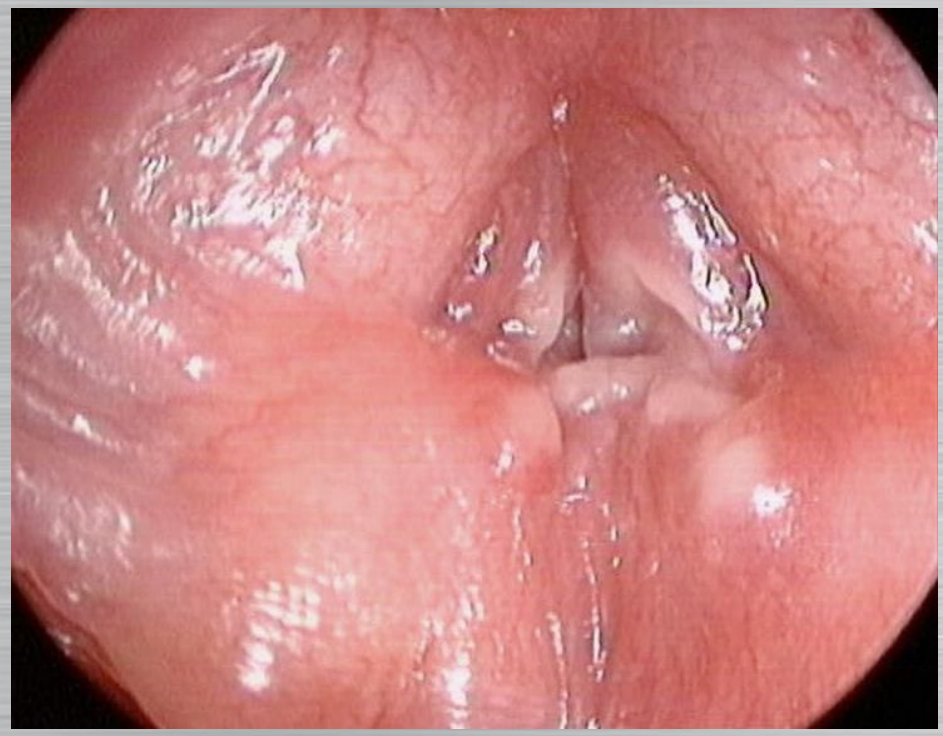




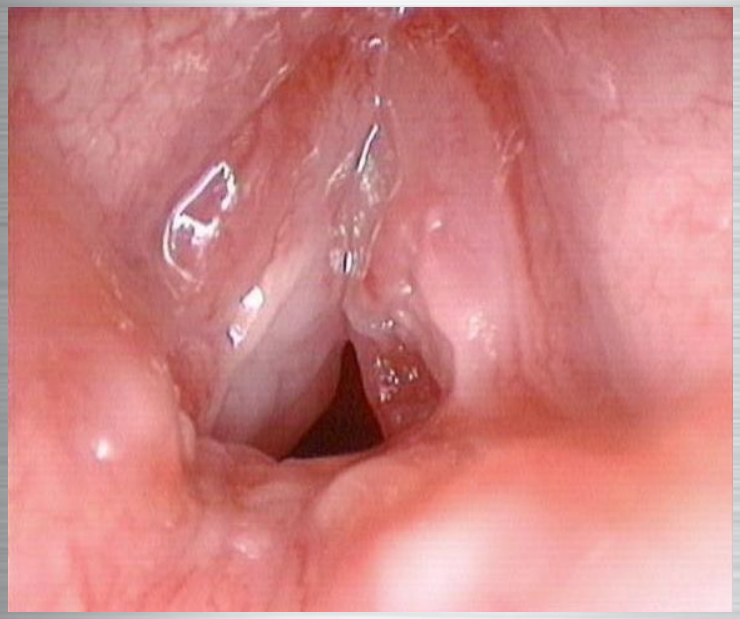


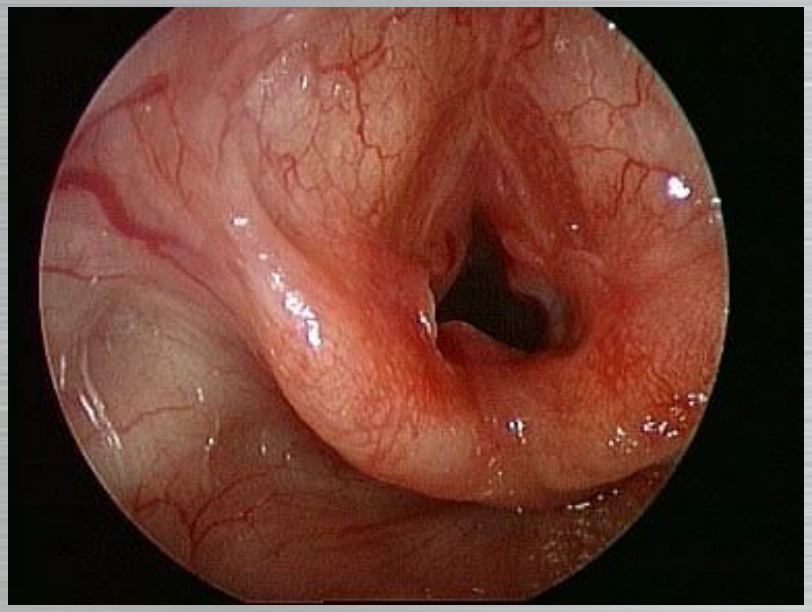




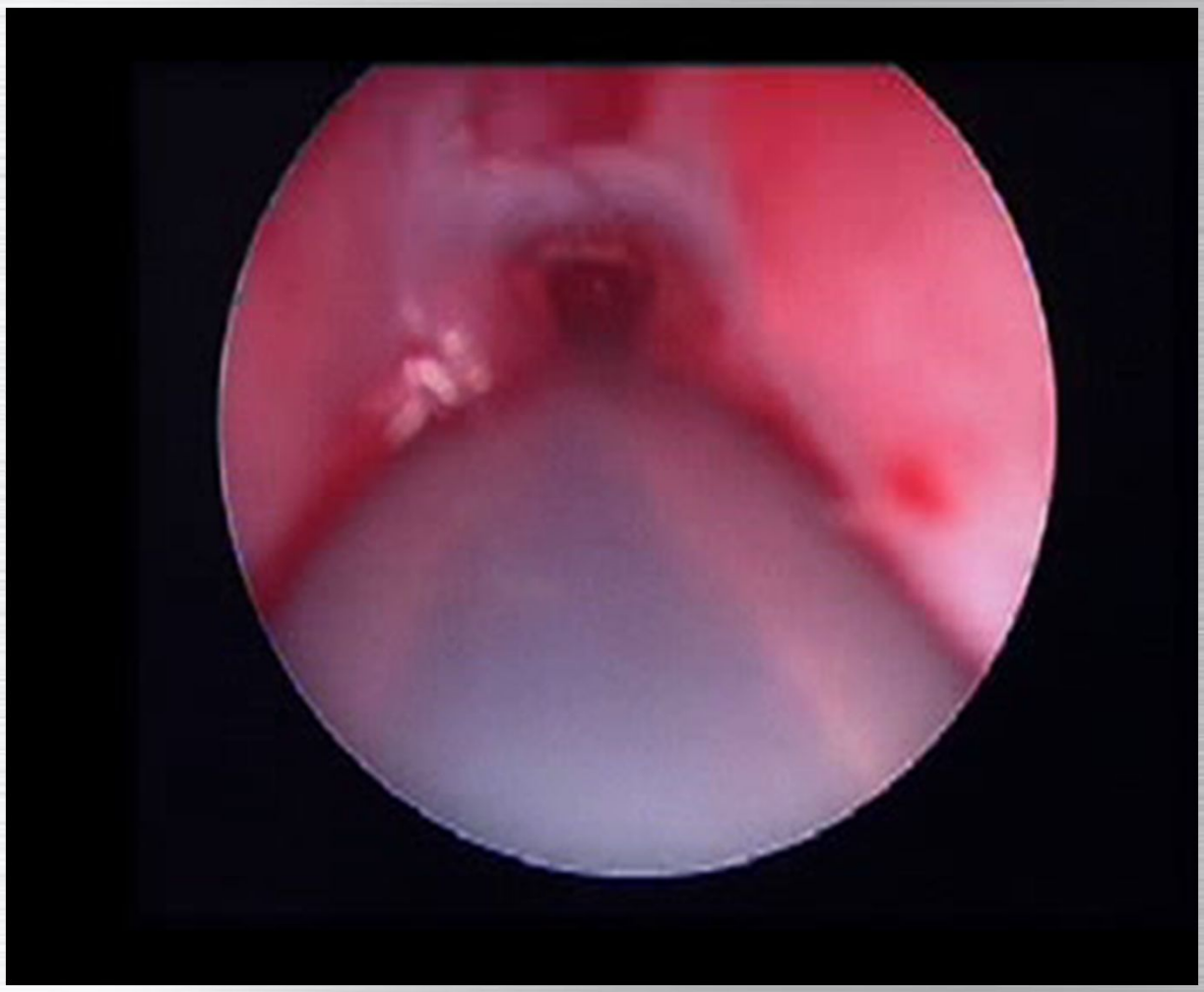


Subglotic edema - endoscopic

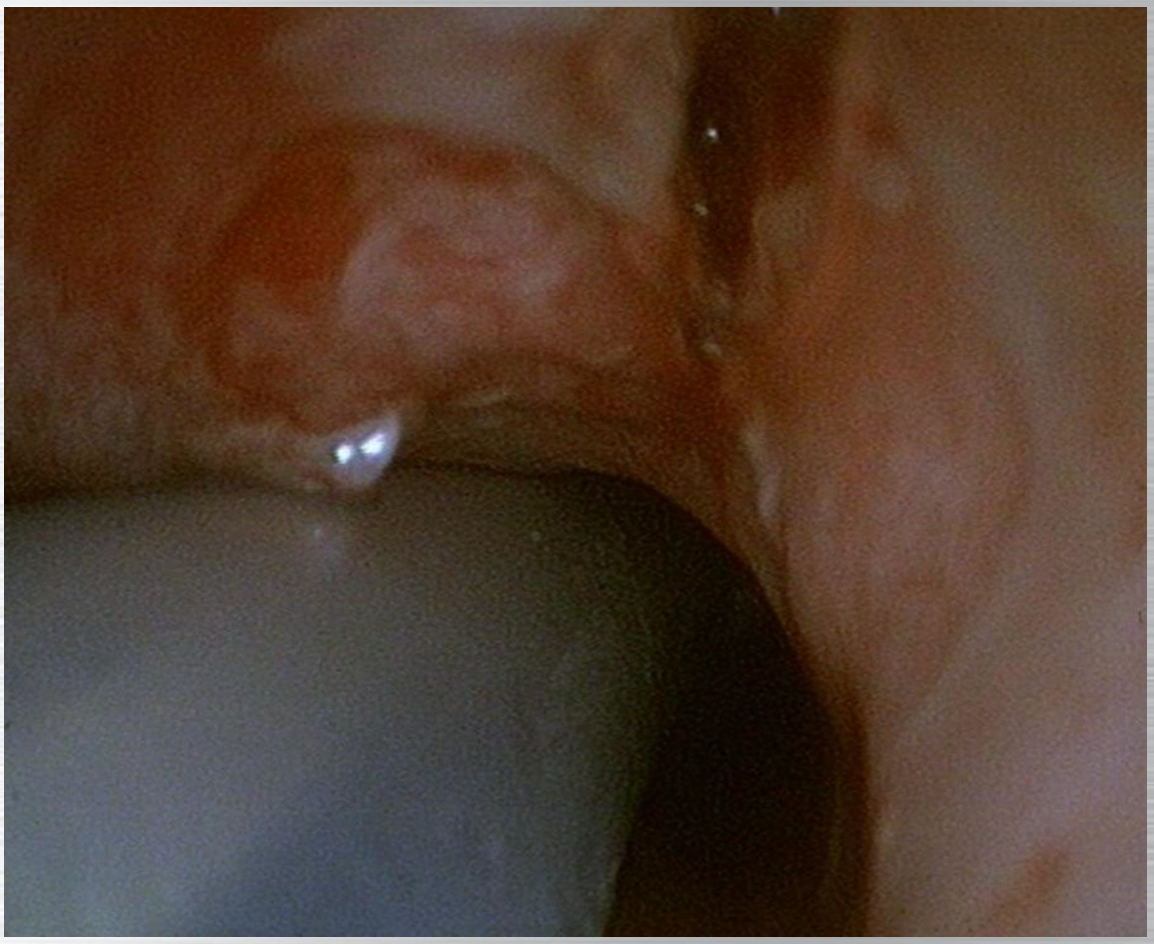




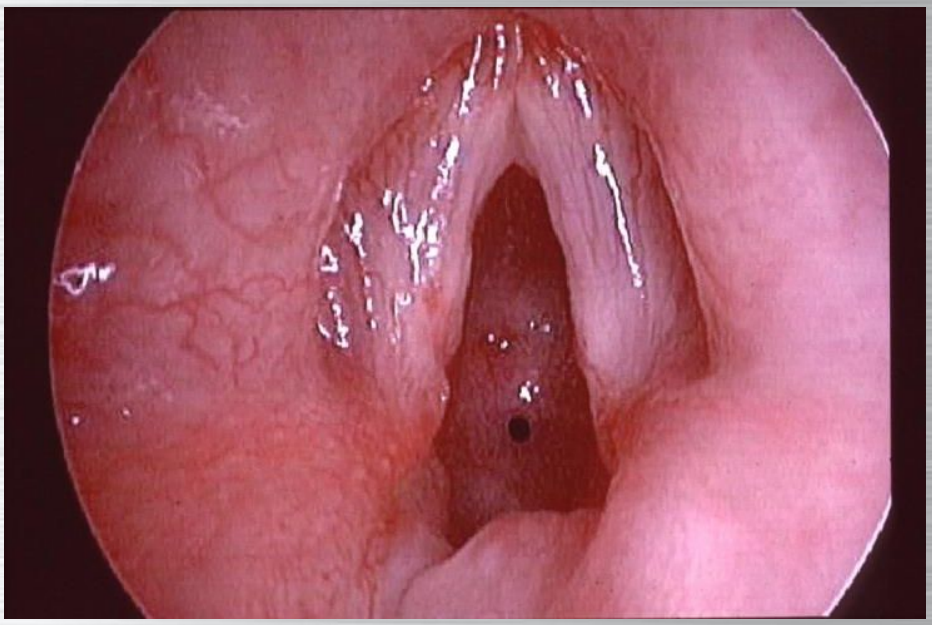
Endoscopic procedure
Cut edges of cricoid

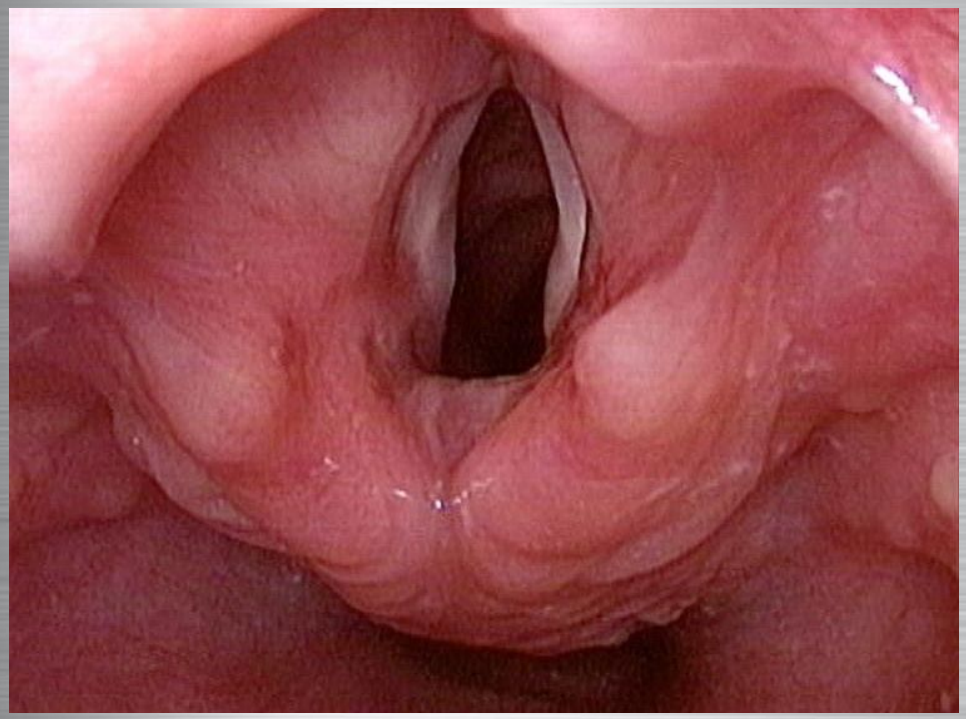
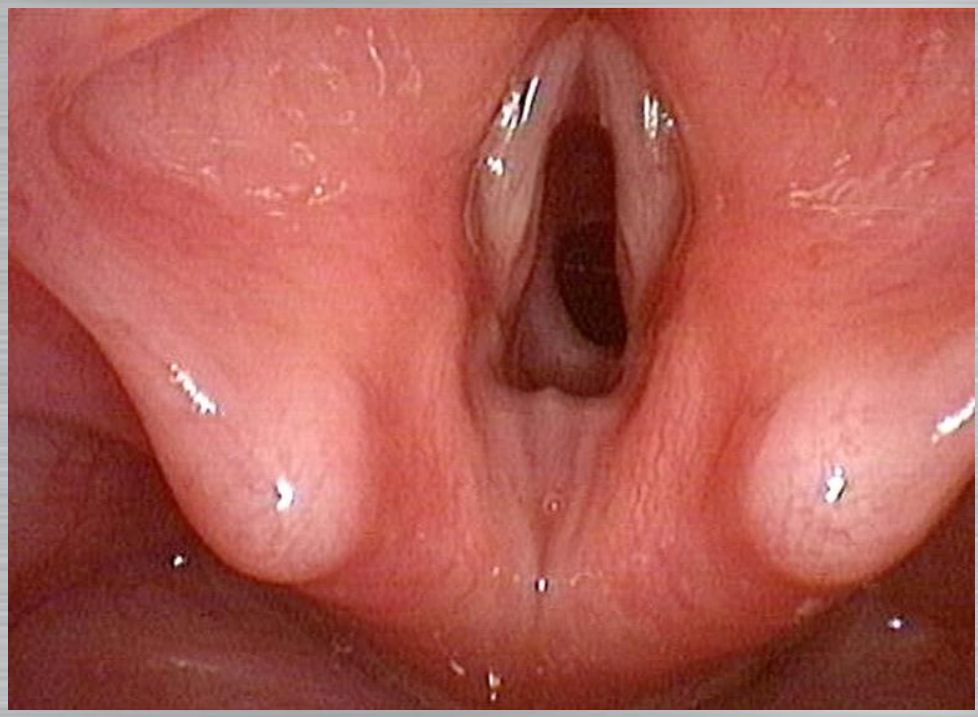
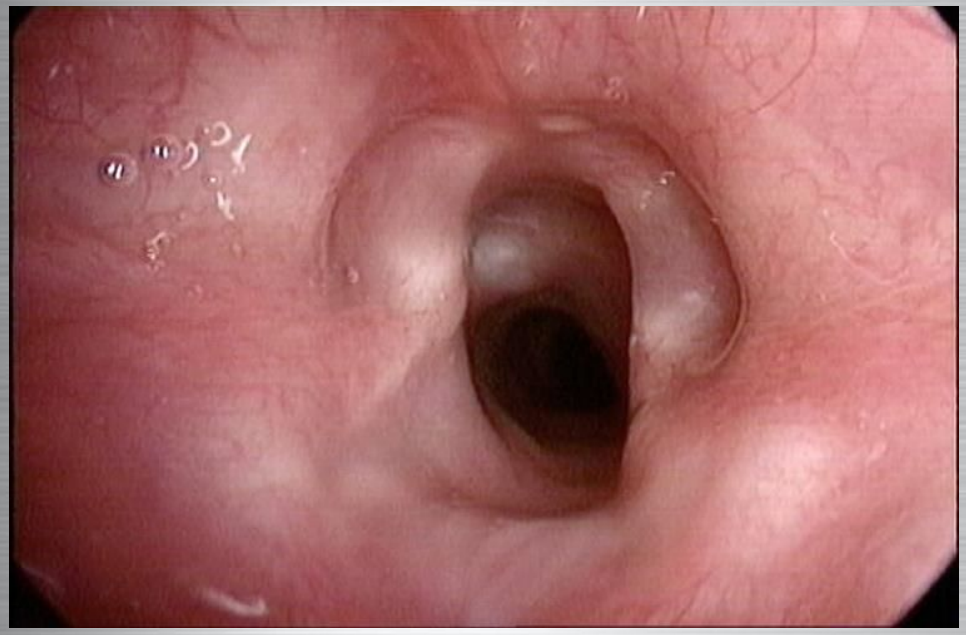
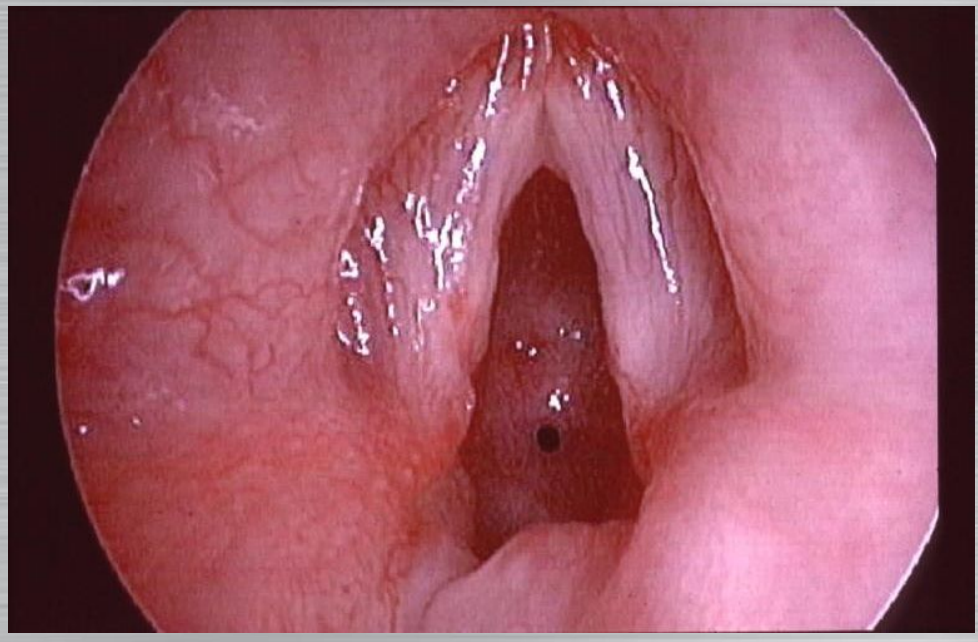


Cricoid Split: open procedure

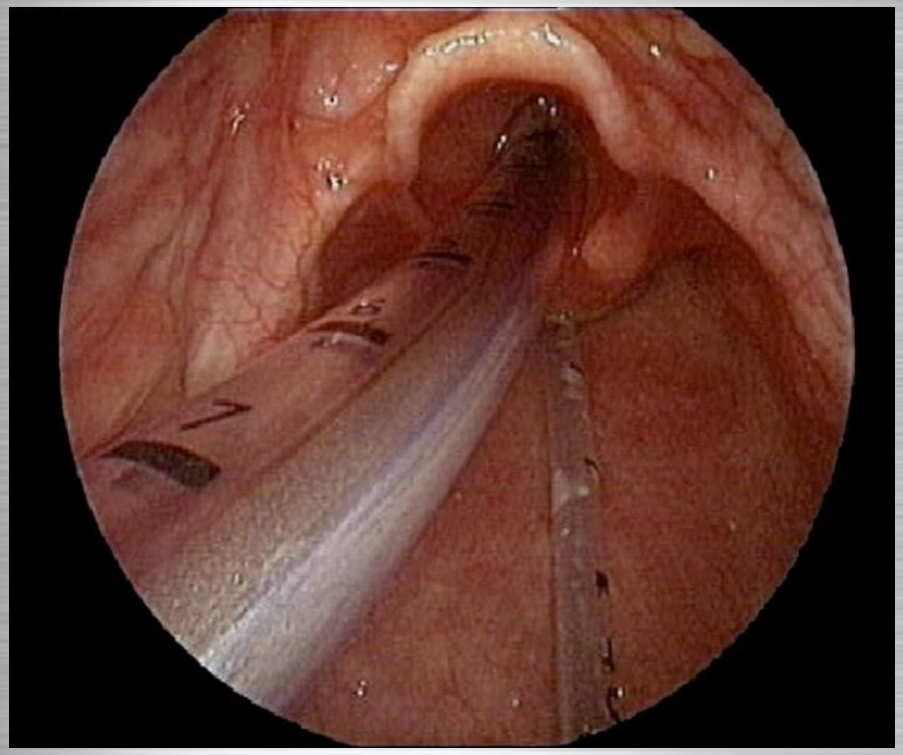


Subglottic stenosis



Staging-Sizing using ET tube

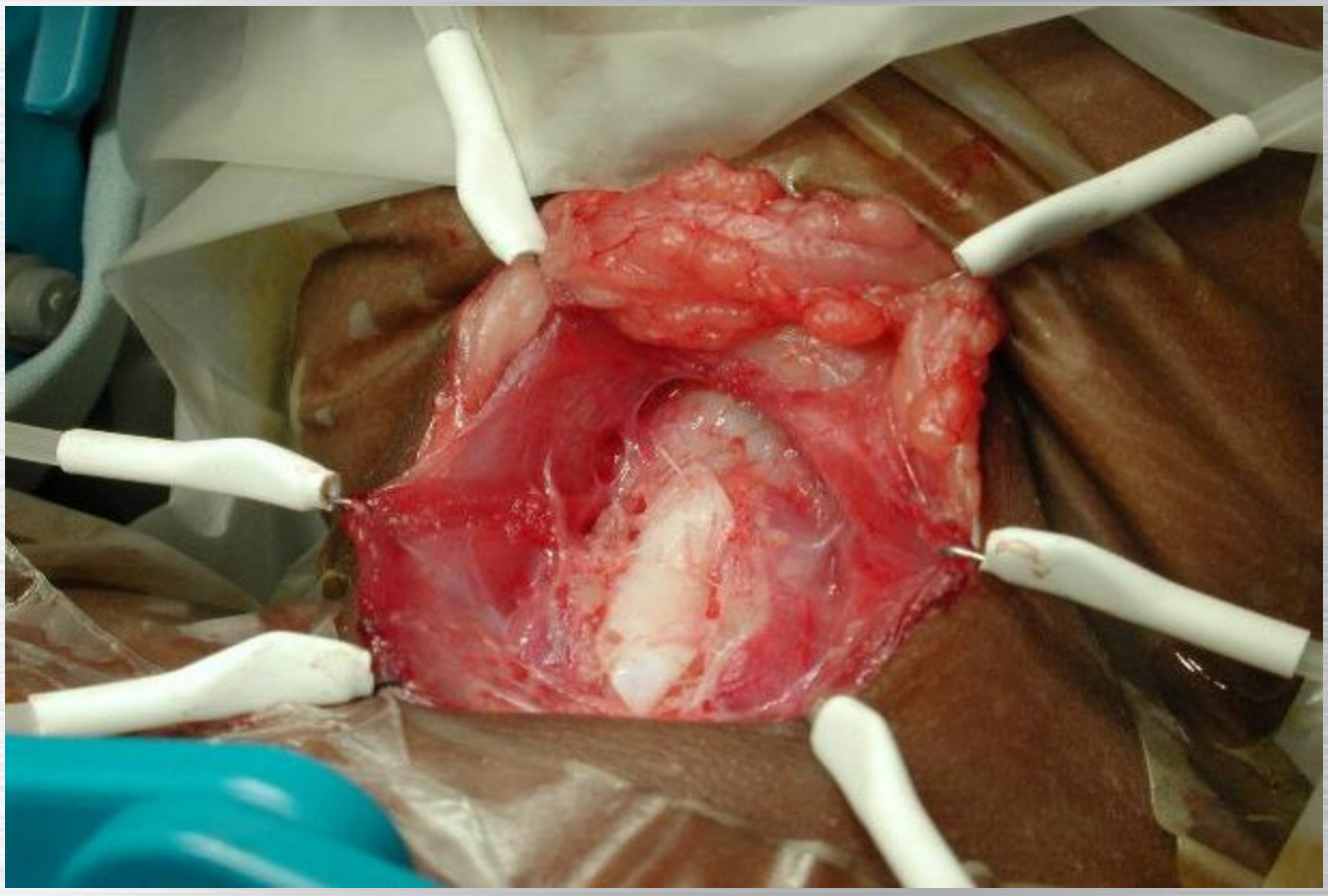


Classification	From	To
Grade I	No Obstruction	50% Obstruction
Grade II	51% Obstruction	70% Obstruction
Grade III	71% Obstruction	99% Obstruction
Grade IV	No Detectable Lumen	

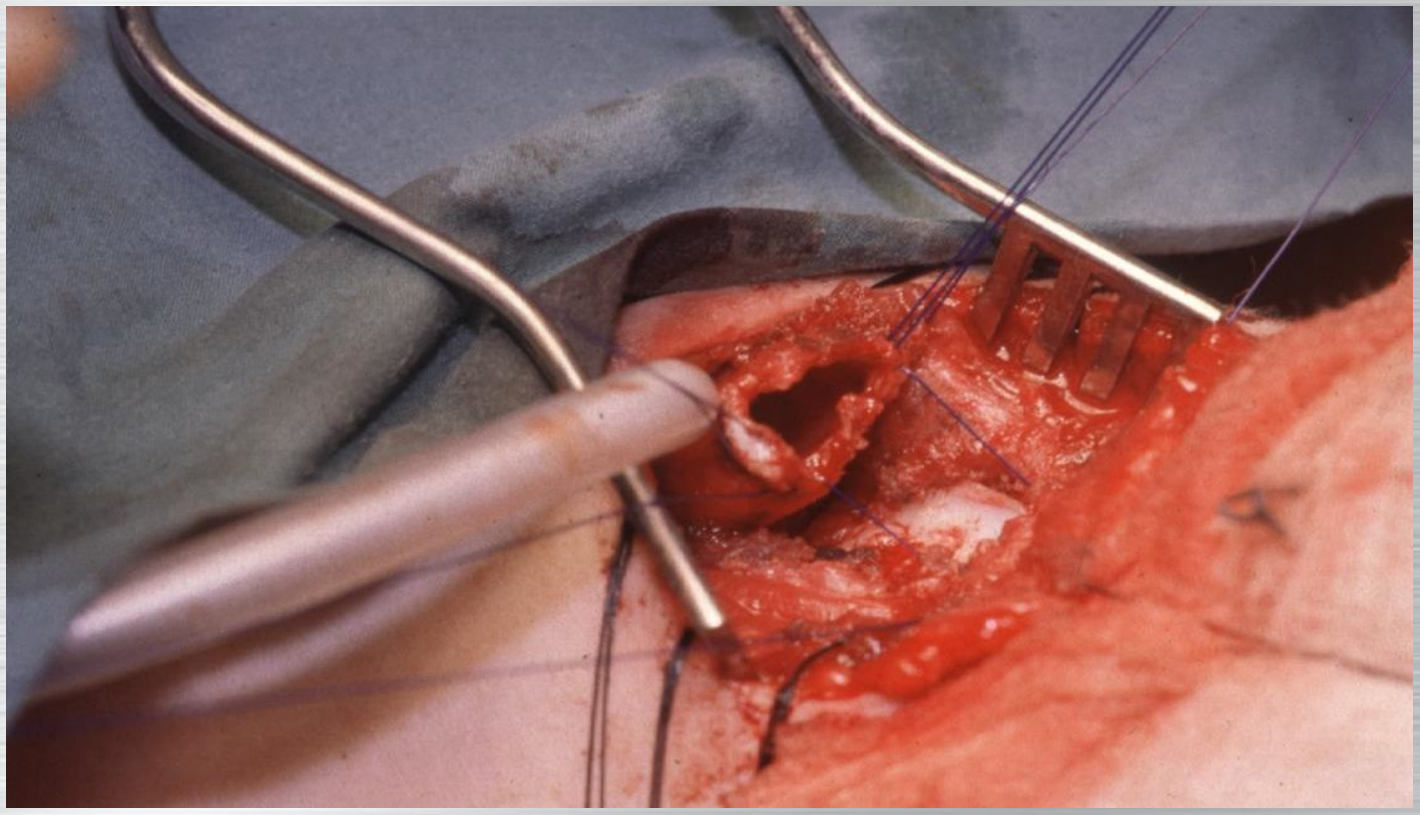
My current guidelines

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/ t tube

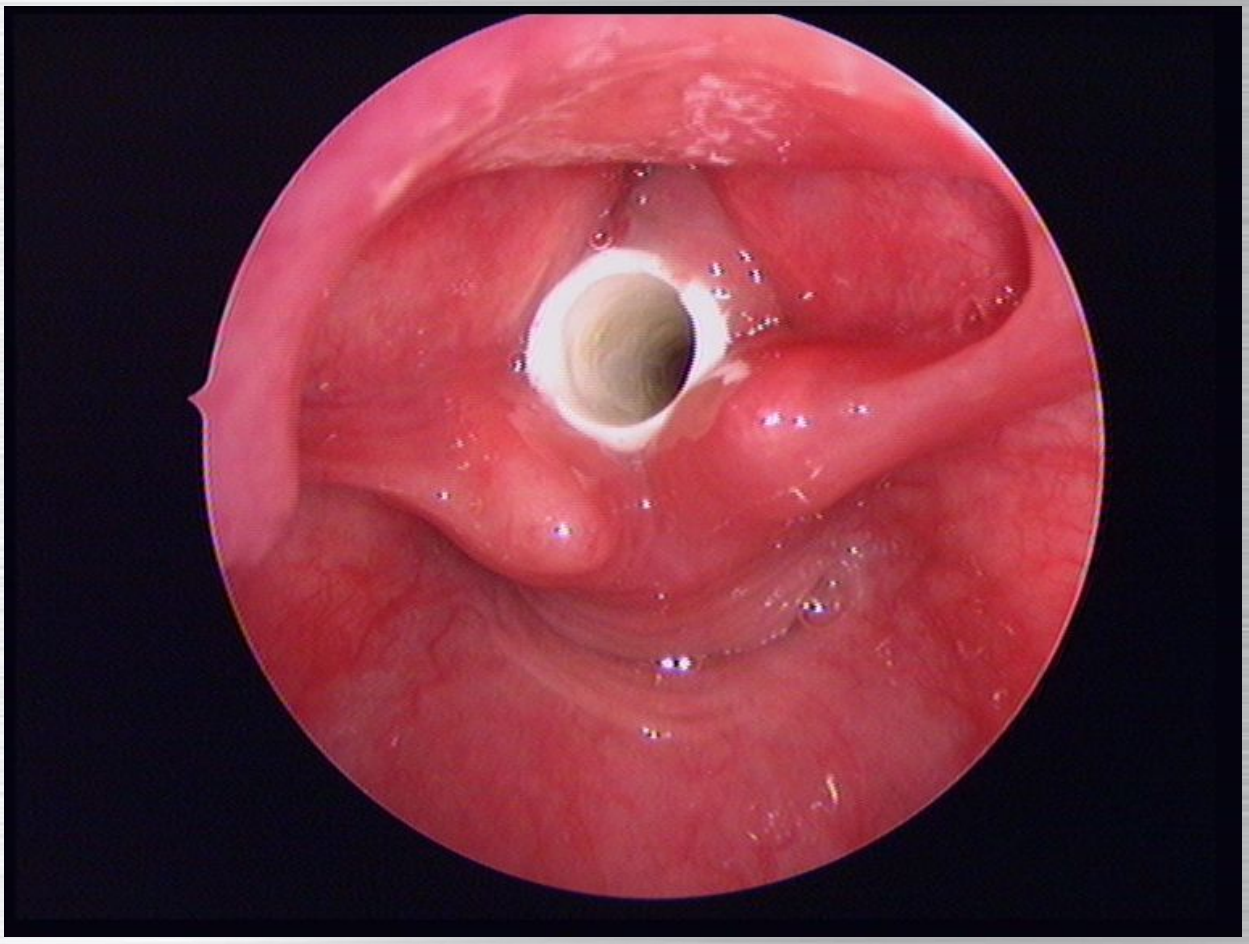
LTR Graft placement



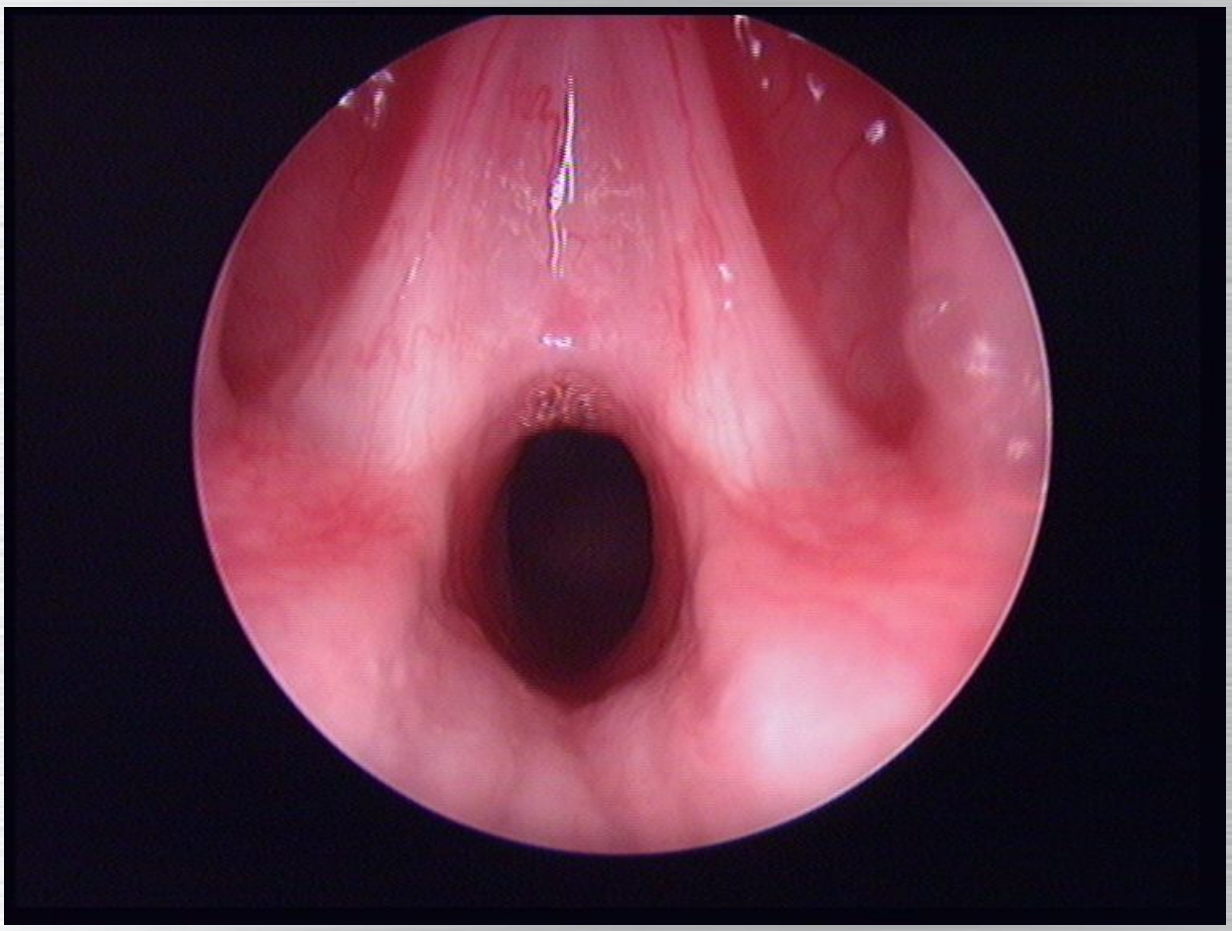
Cricotracheal resection

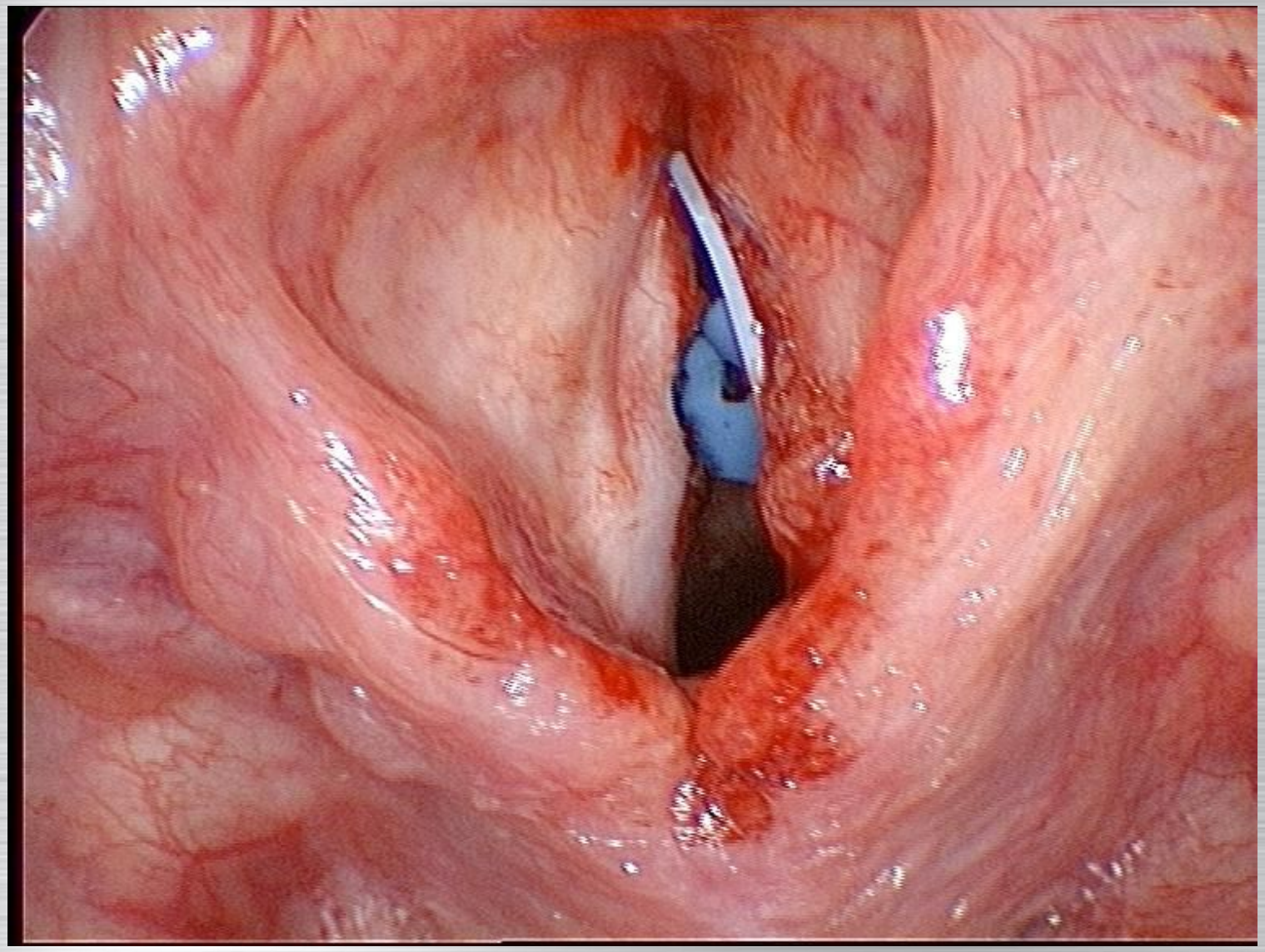


T-Tube In Situ

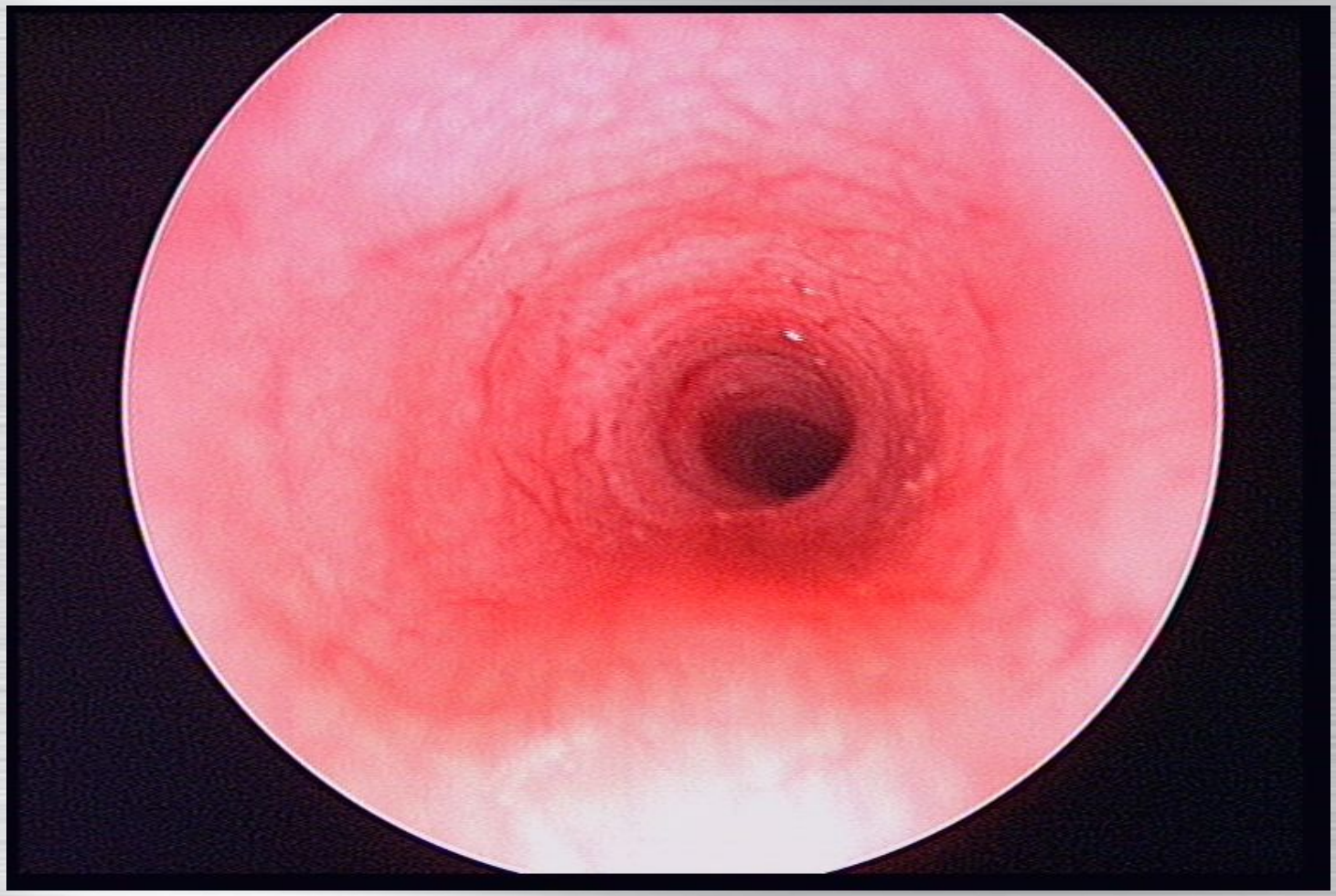


Webs

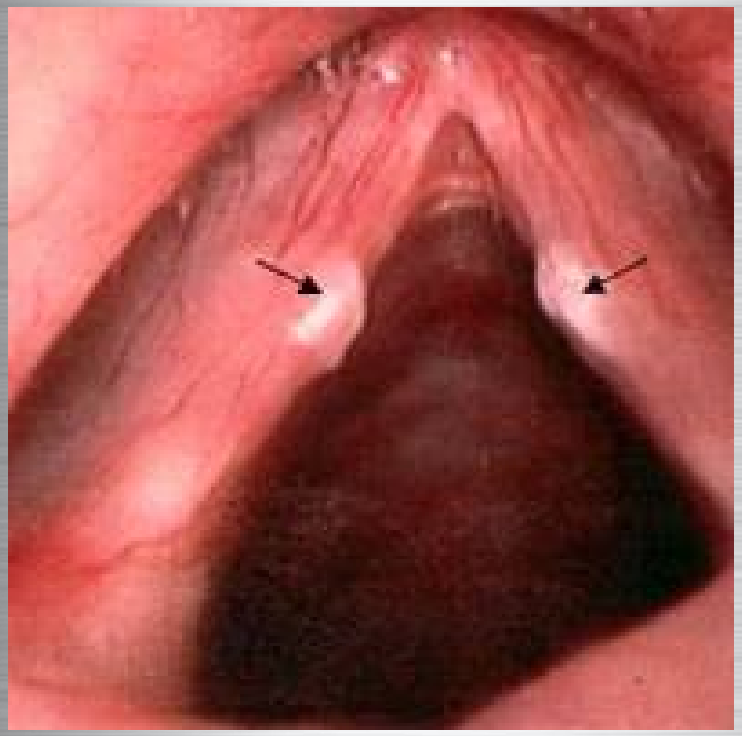


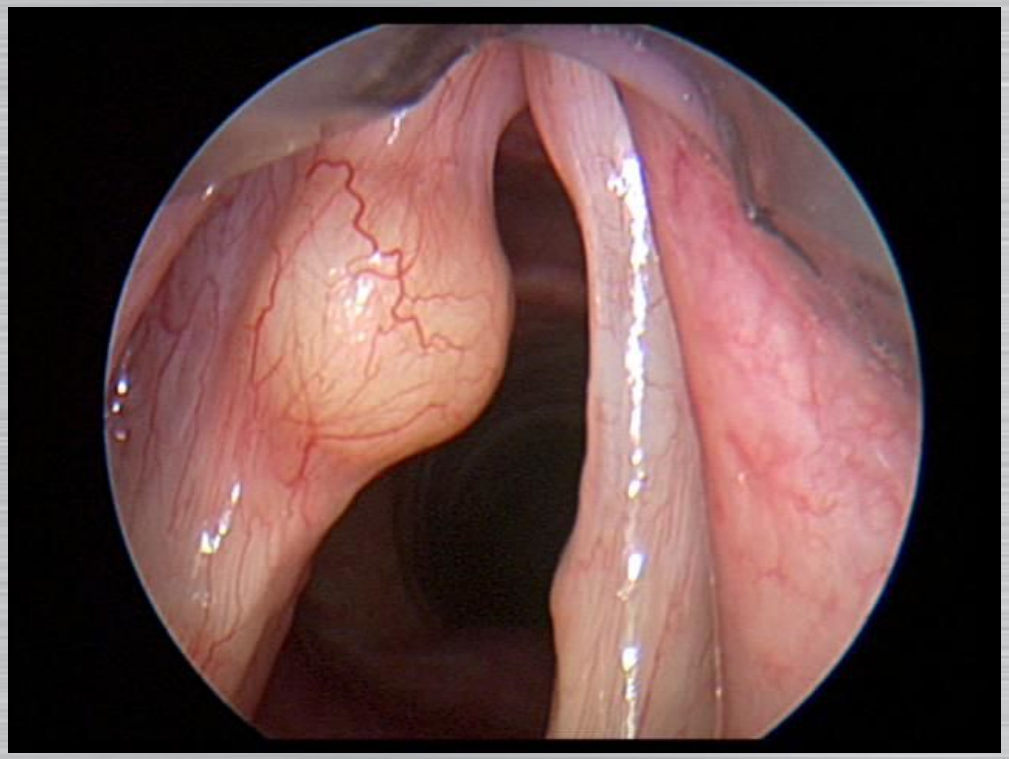


Tracheal Stenosis

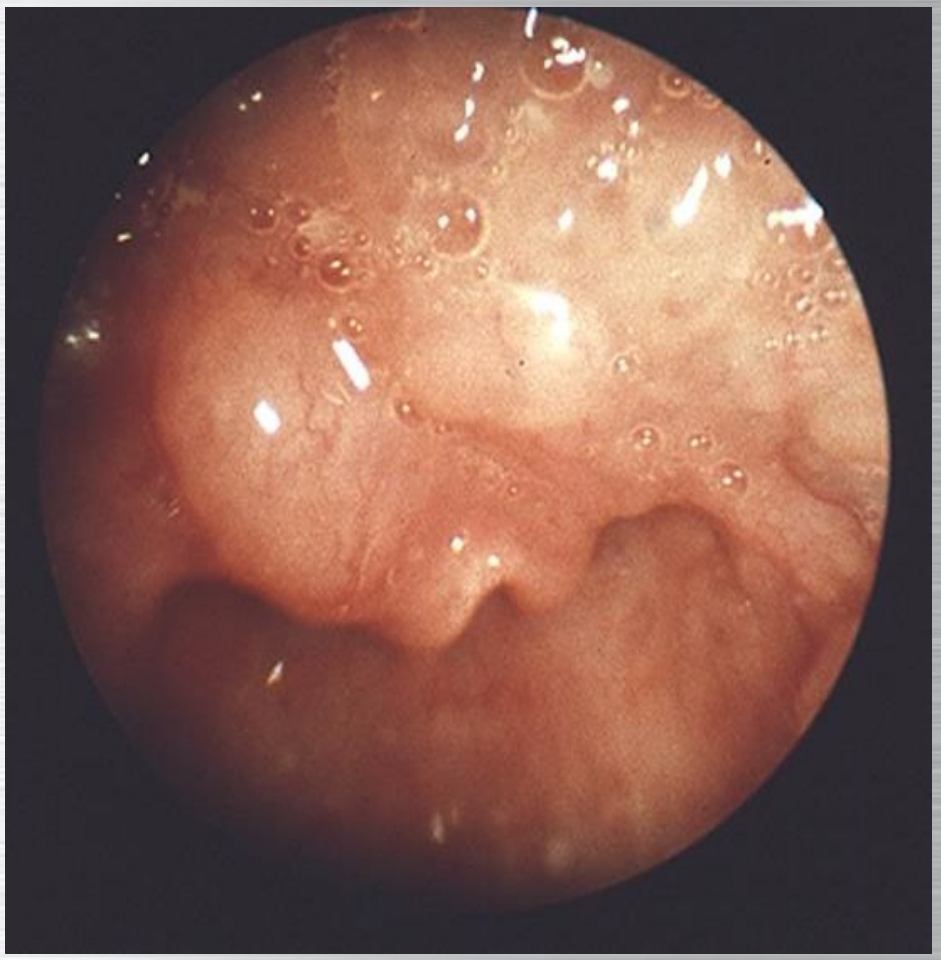


Vc nodules
vs intracordal cyst

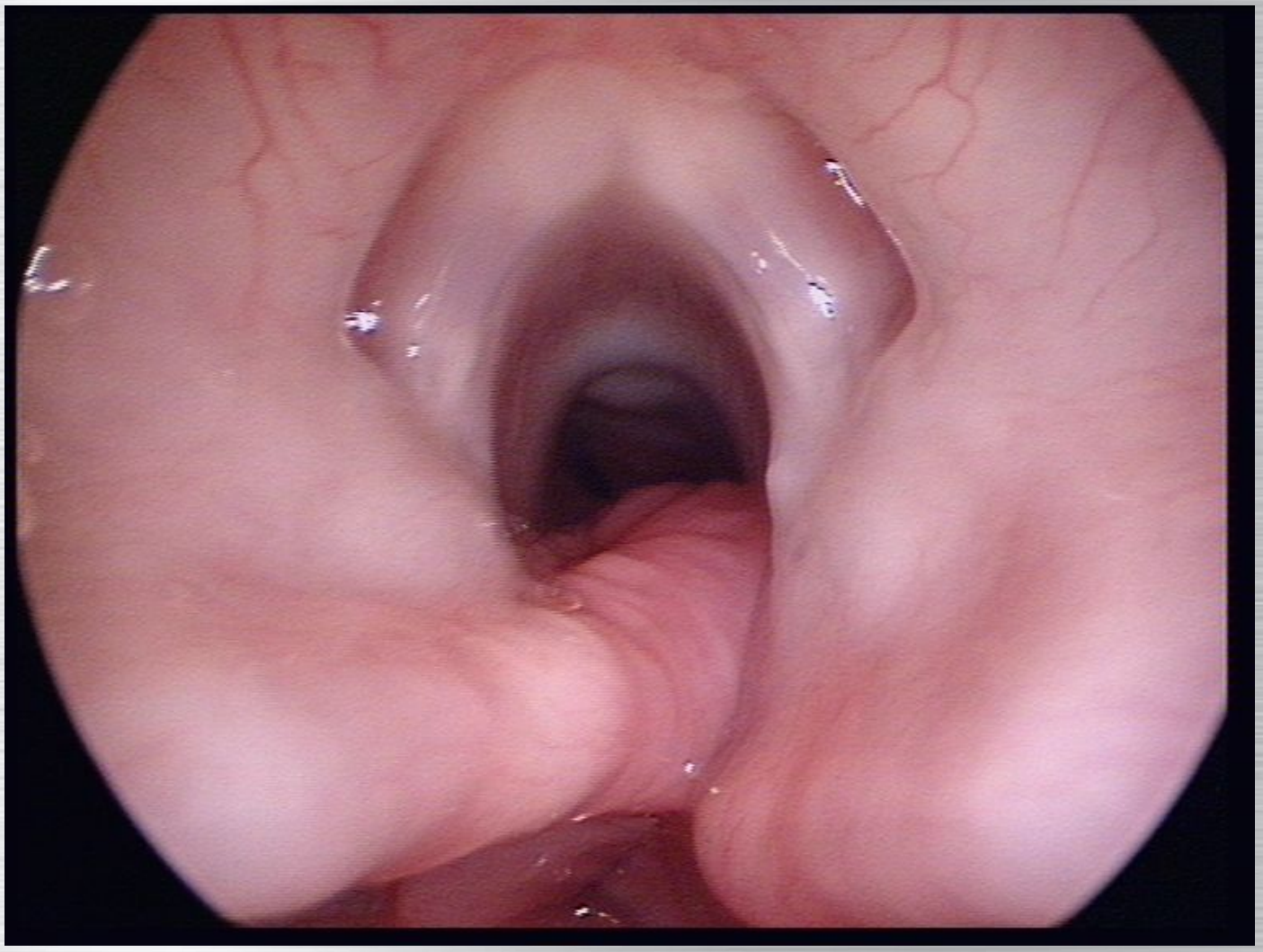




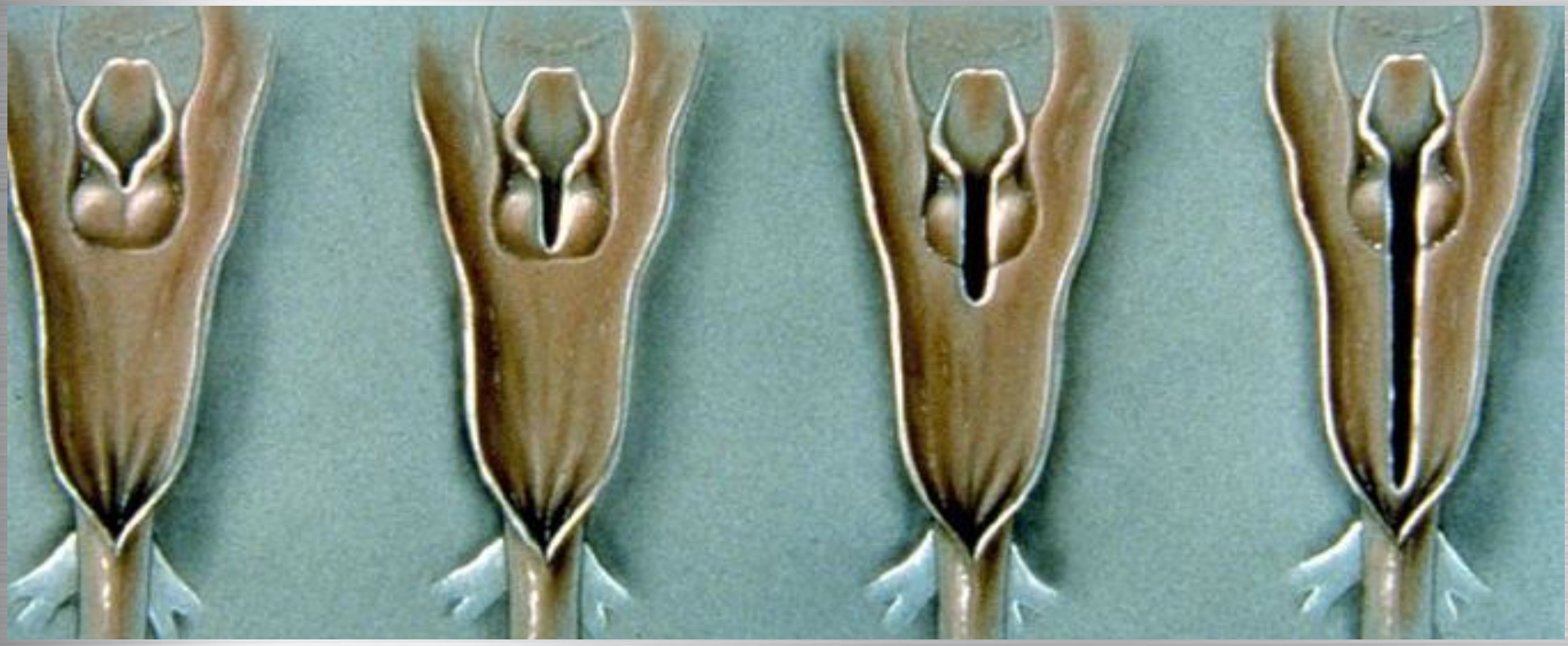
Valecullar cyst



Cleft larynx

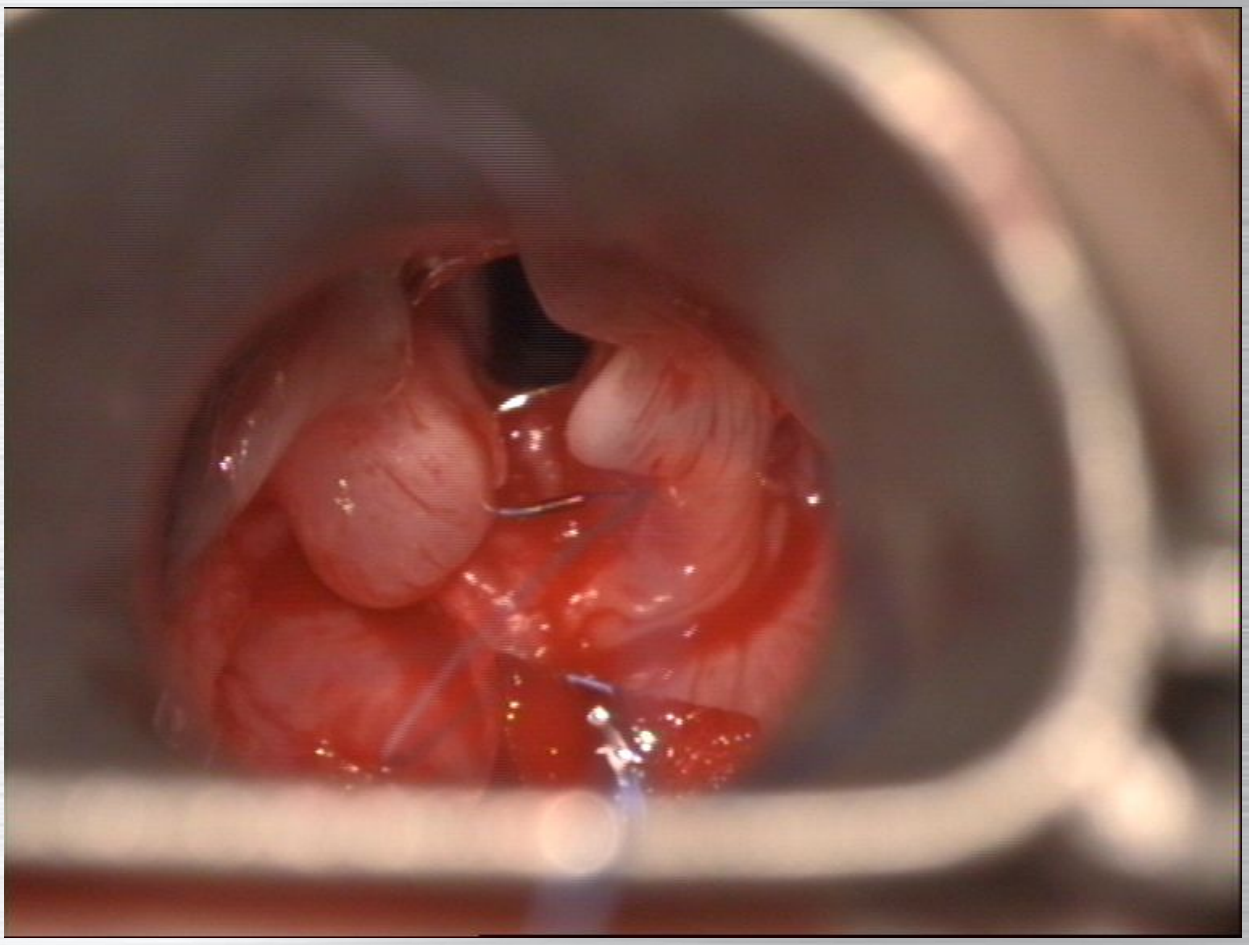


Laryngeal Cleft

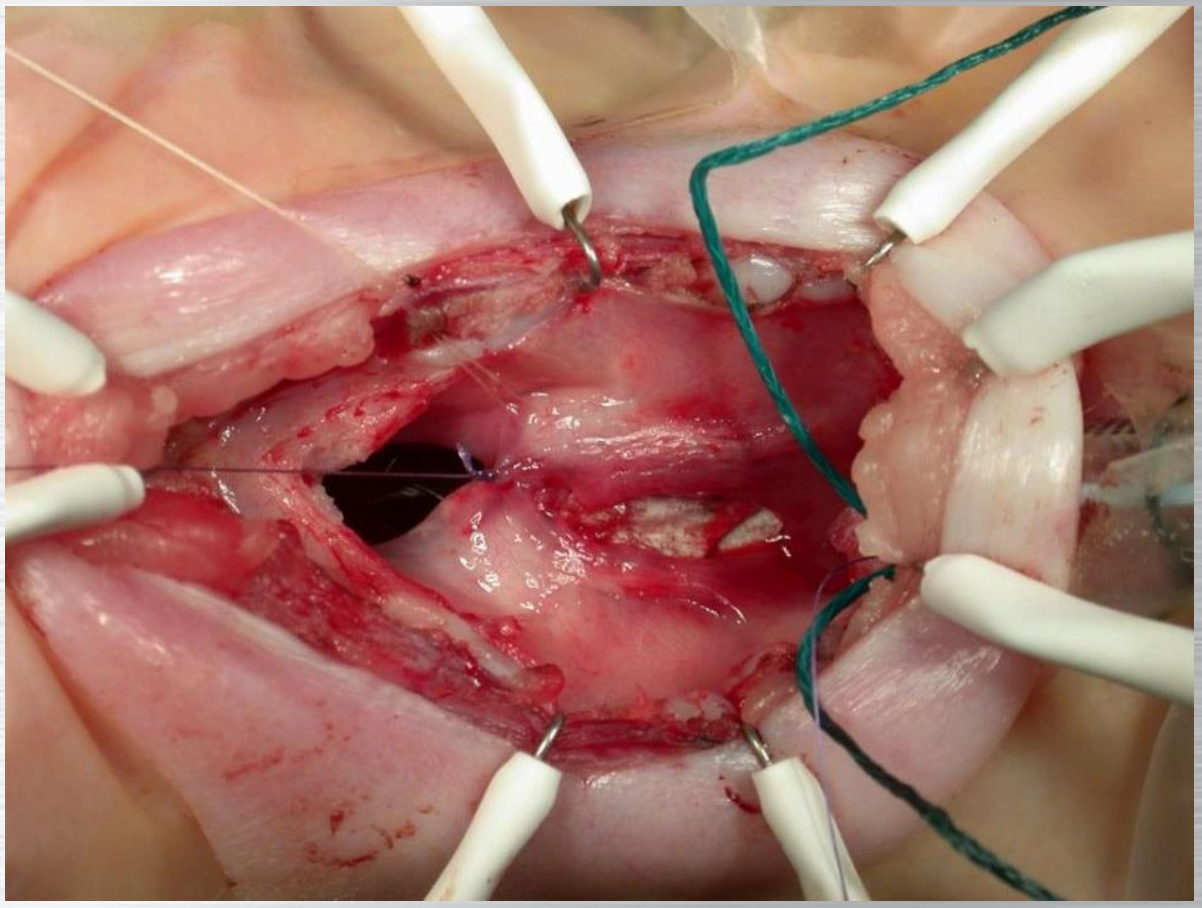


Type I	Type II	Type III	Type IV
-To VC's	- Involving cricoid	- above thoracic outlet	- below thoracic outlet

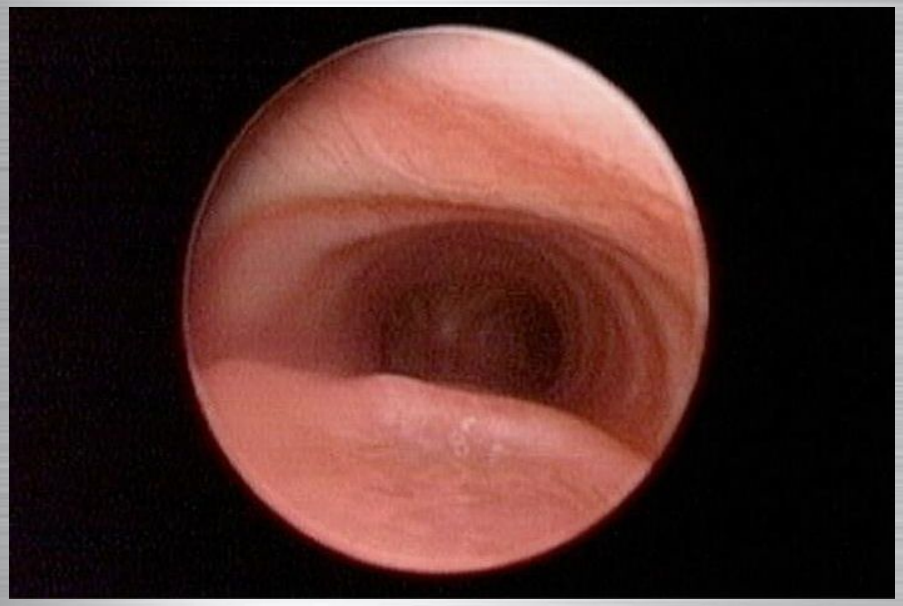
Endoscopic repair

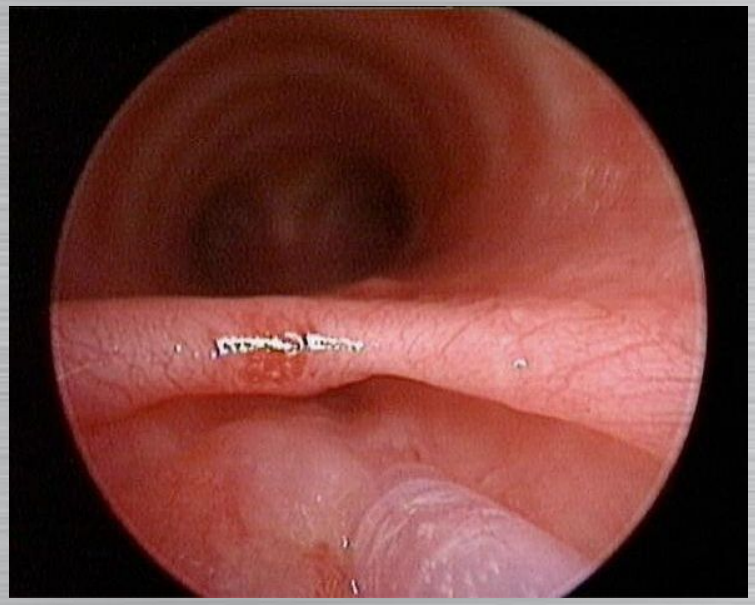


Open Repair

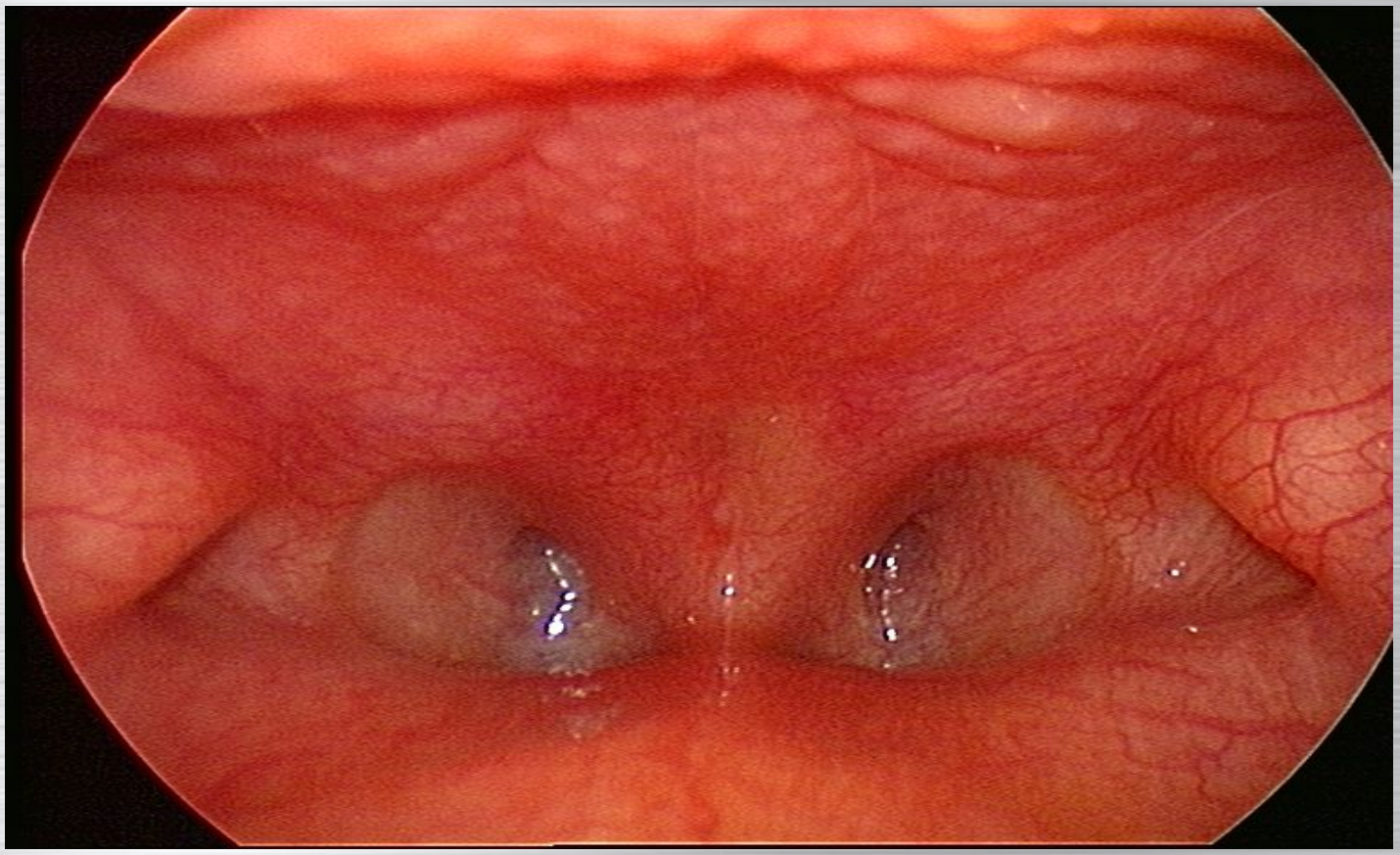


Trache Oesophageal Fistula





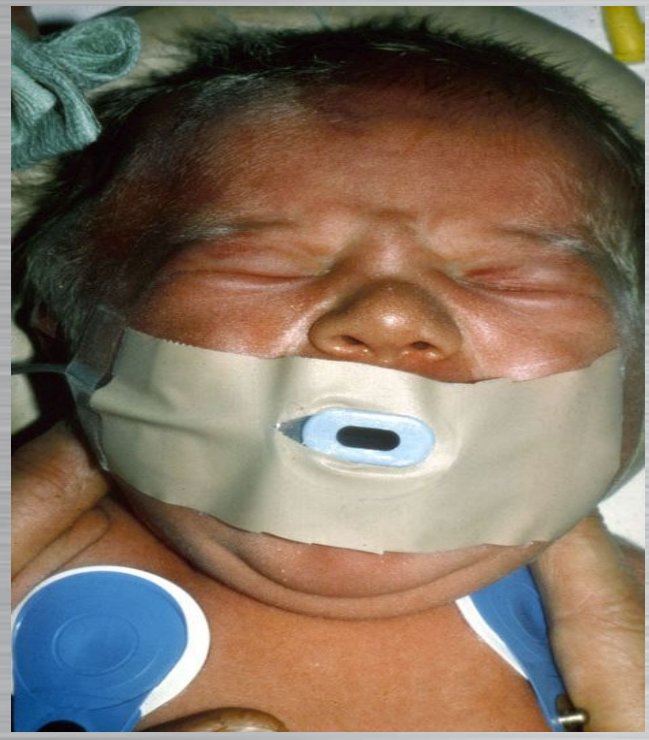
Choanal atresia



Choanal atresia

Presentation – Bilateral choanal atresia

- A neonatal respiratory emergency
- Immediate management with taped-in oral airway
- Urgent CHARGE work-up and ?CT scan
- Trans-nasal correction in first week of life



Choanal atresia

4 of the 6 'C-H-A-R-G-E' features.

C oloboma

H eart disease

A tresia choanae

R etarded growth and development

G enital hypoplasia

E ar anomolies and/or deafness

Presentation – Unilateral choanal atresia

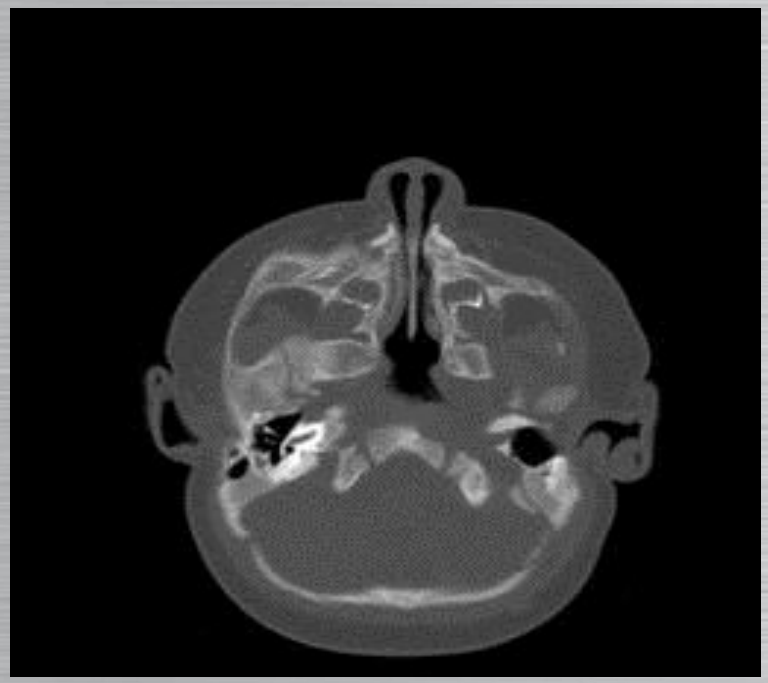
Non-urgent presentation with unilateral nasal discharge and obstruction

Routine CT scan

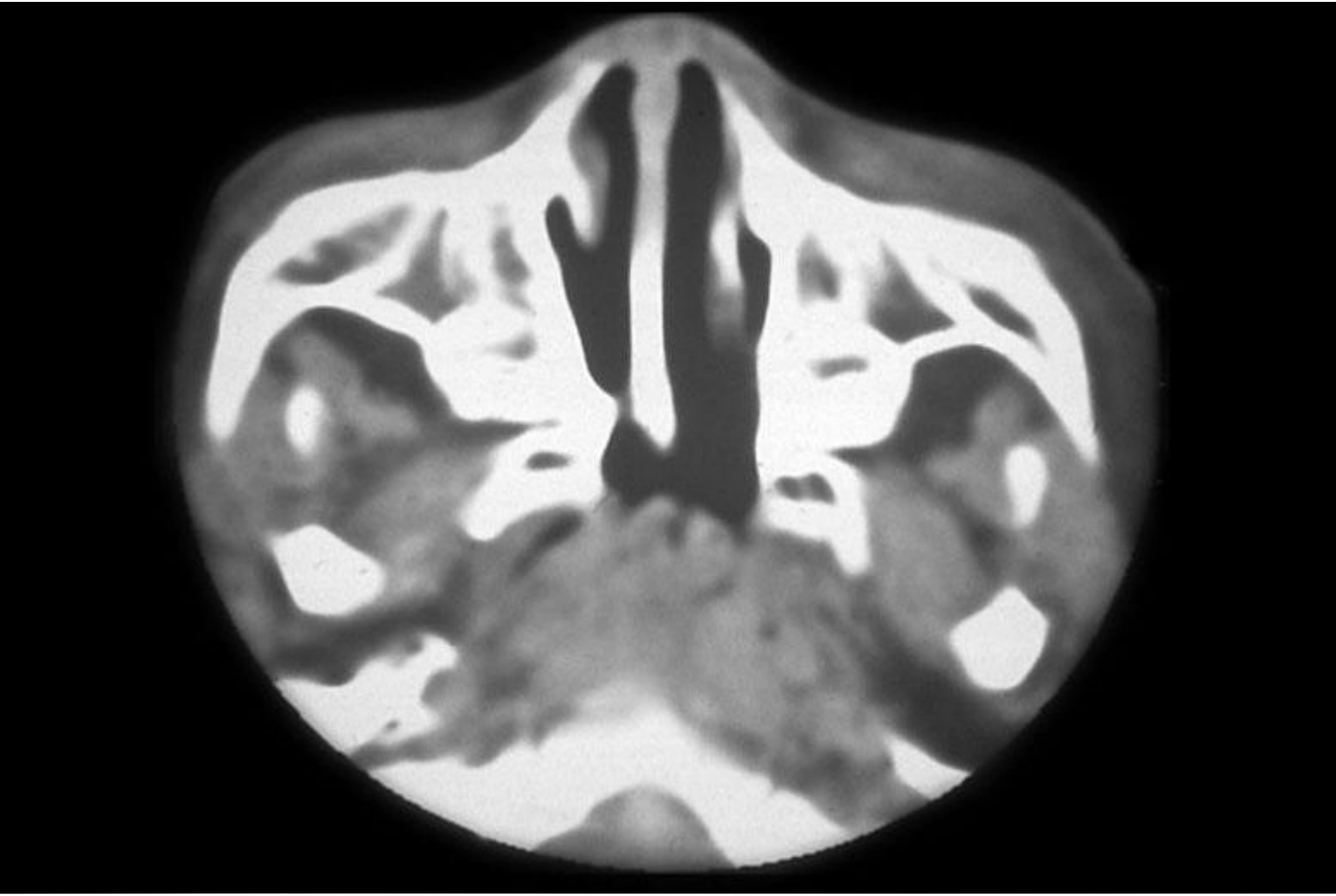
Elective correction 1-5 years

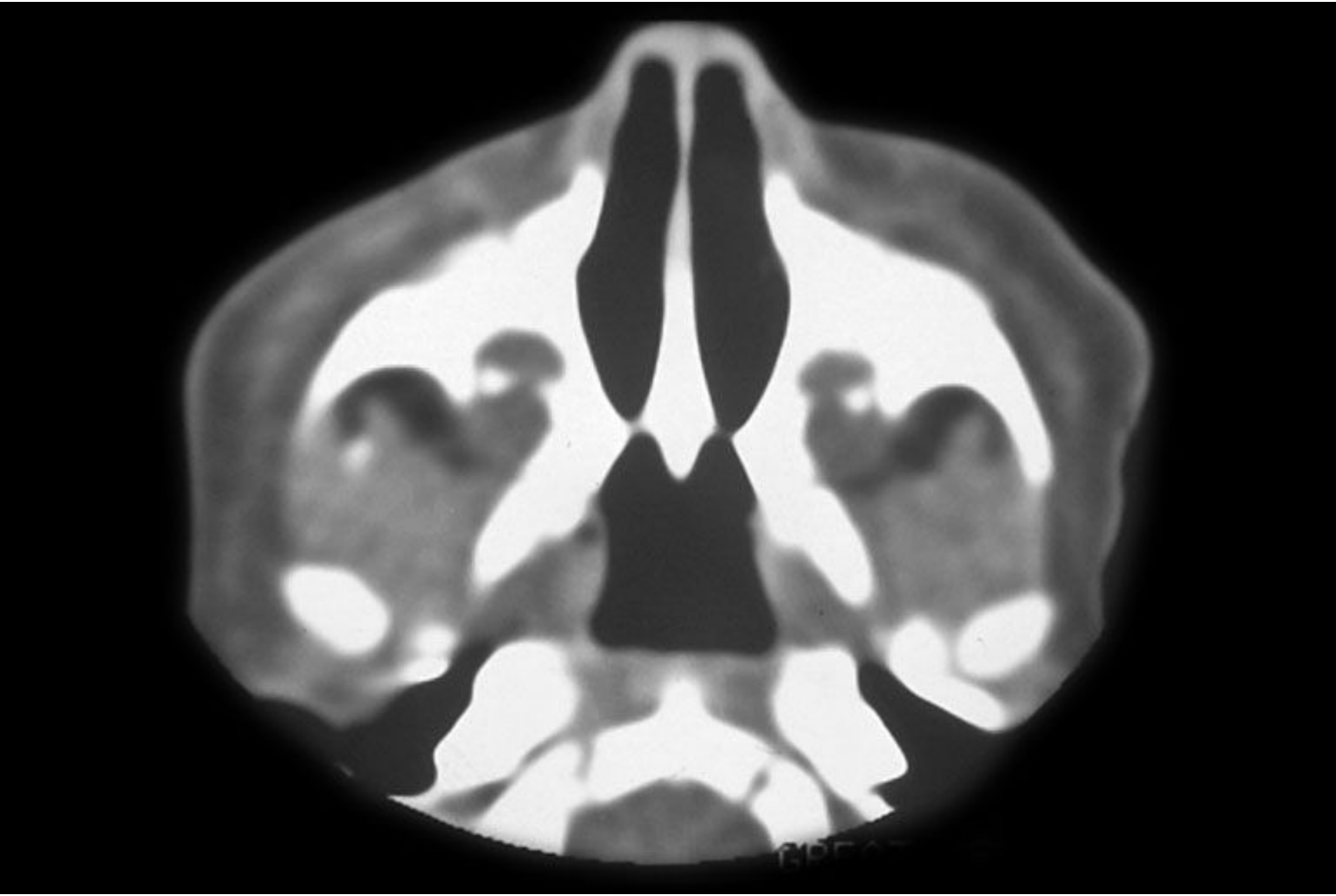
Differential diagnosis

- Neonatal rhinitis
- Masses
  - –Post nasal space
    - Teratoma
  - –Anterior nasal space
    - Glioma
    - *Midline nasal dermoid*
    - Meningocoele
- Mid nasal and pyriform aperture stenosis
- (Foreign body if unilateral)

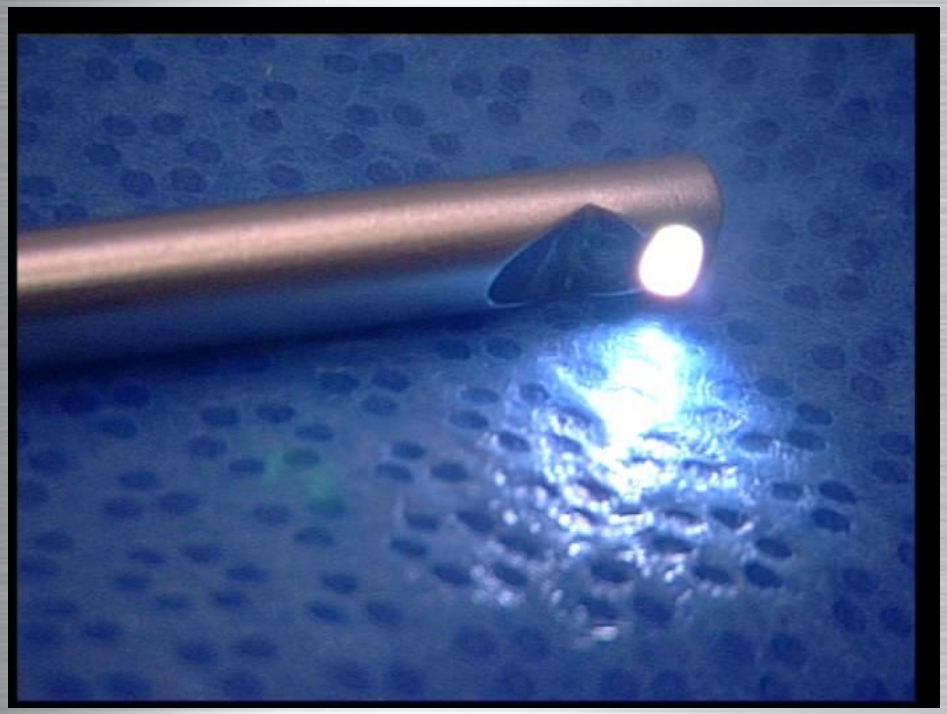


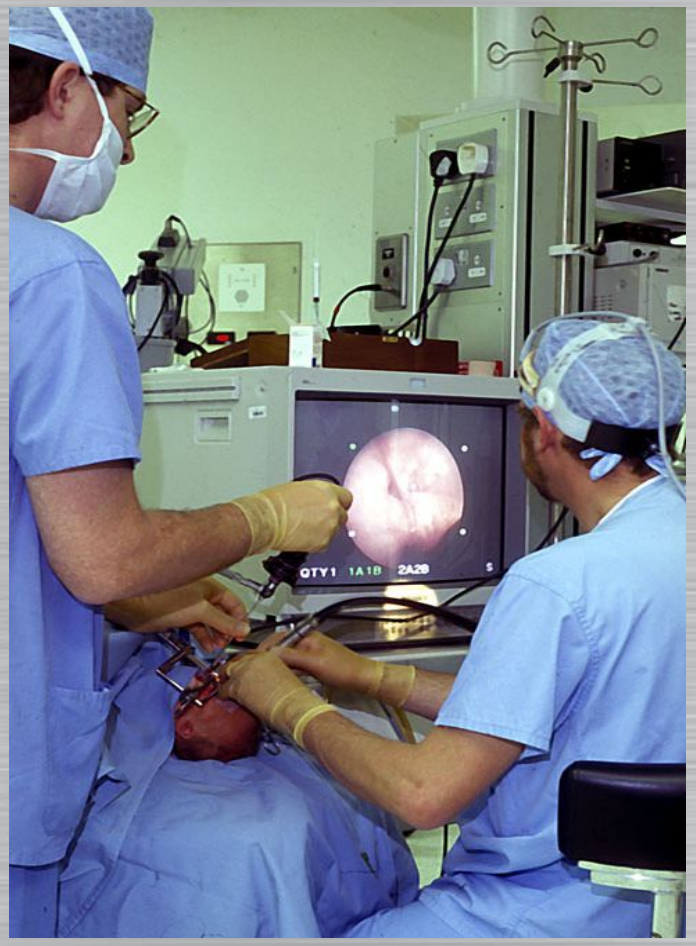
Choanal atresia



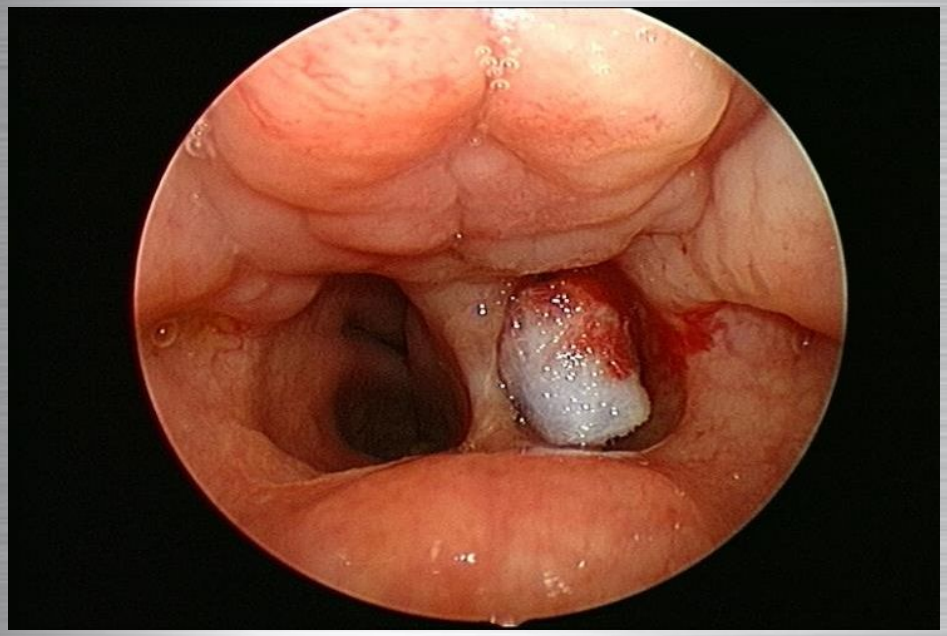


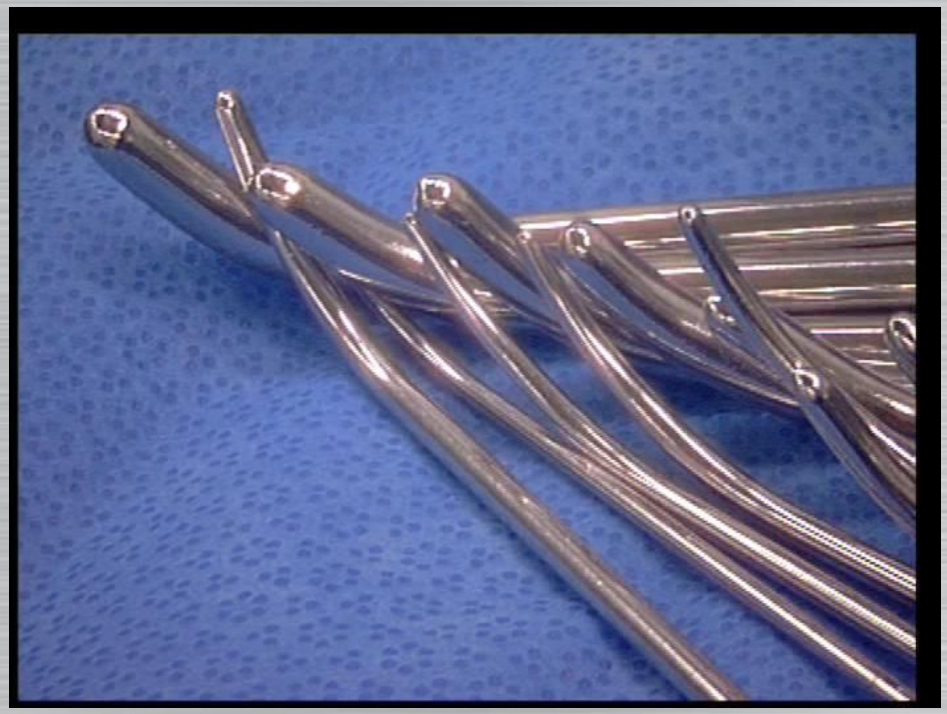
Trans nasal approach with 120° telescope



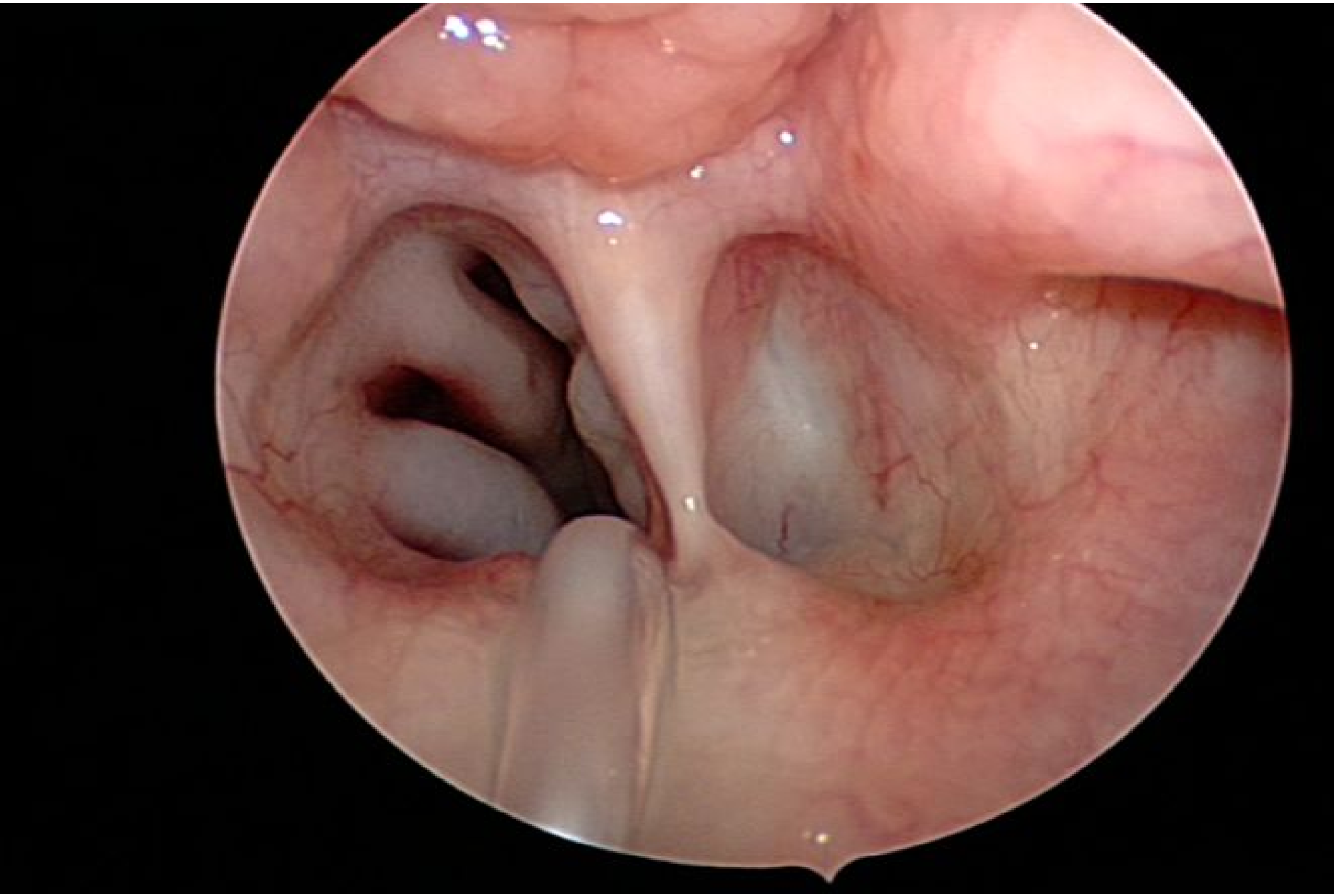


Adrenaline and dilators

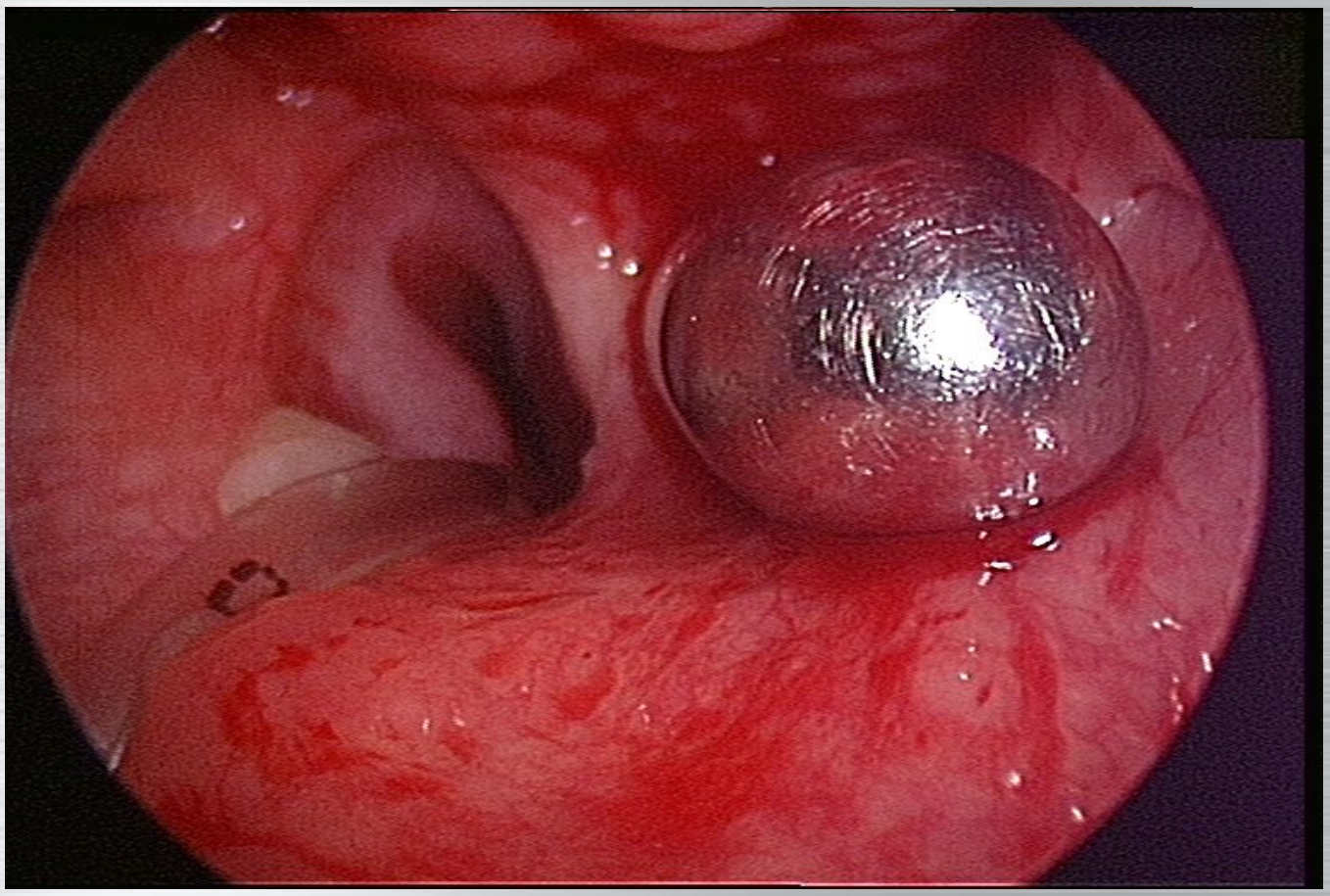




Choanal atresia



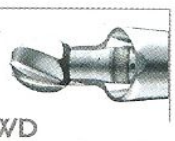
Trans nasal approach with 120° telescope - dilatation



Trans nasal approach with 120° telescope - drilling

A. Pediatric Round Bur, 2.9mm

- Length: 10cm
- Straight shaft
- Application: choanal atresia
- Operating speed: up to 5,000 RPM FWD
- 5/box

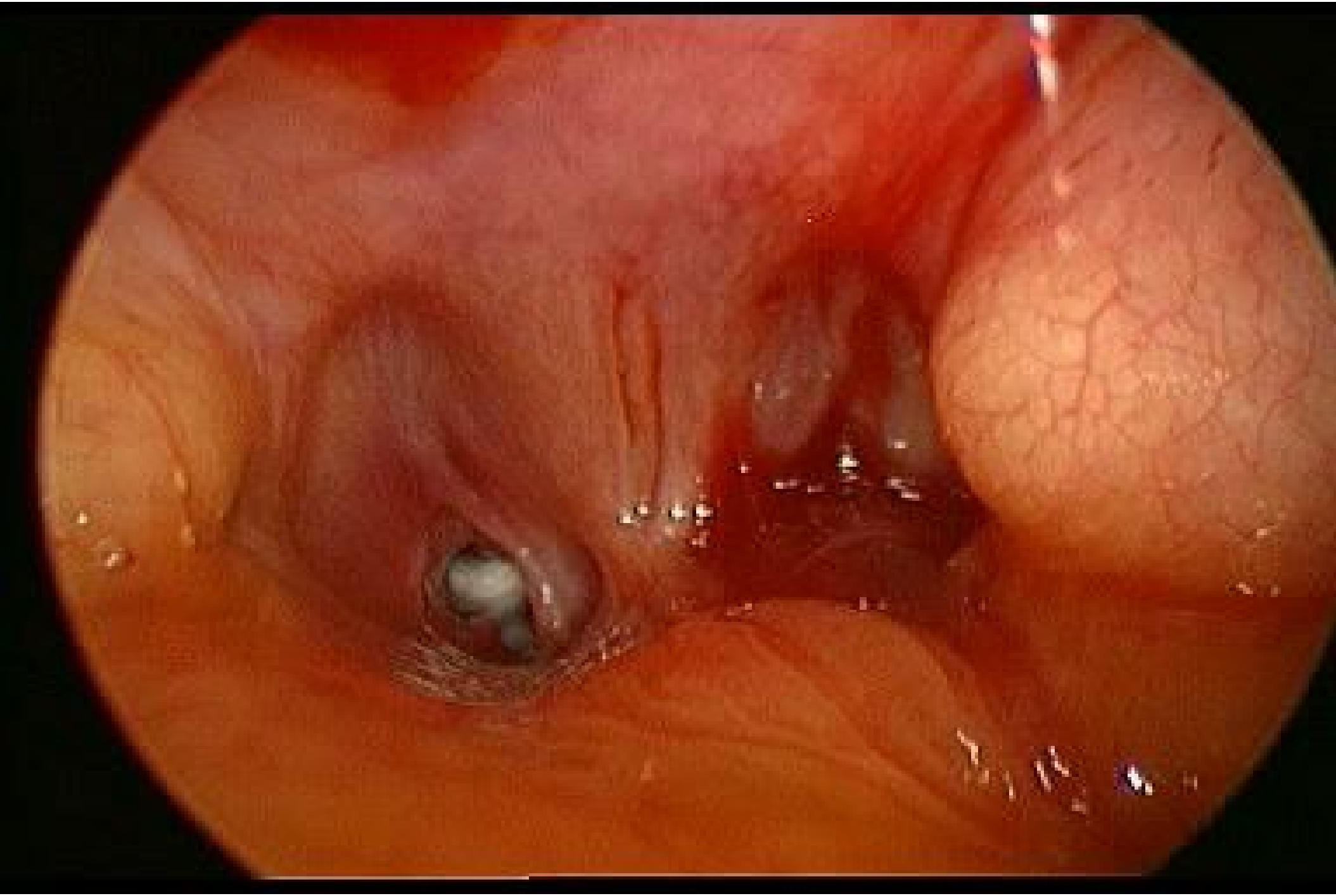


18-82960

G. Choanal Atresia Bur, High-Speed, 4mm

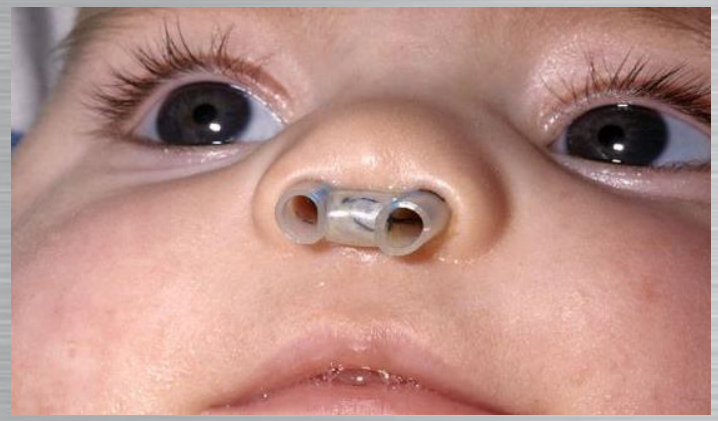
- Length: 13cm
- Curved shaft
- Cannulated suction bur tip
- Application: removal of vomer
- Operating speed: up to 12,000 RPM FWD
- 3/box
- Developed in conjunction with Gary Josephson, MD

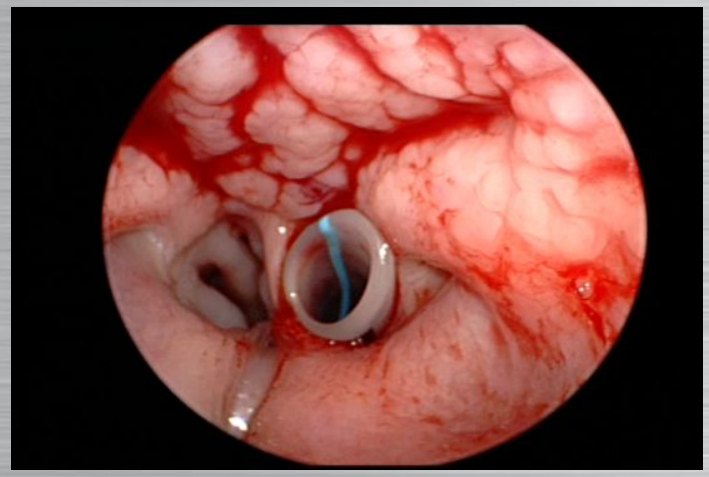
18-83673HS



Stents

- Bilateral cases
  - External bridge piece to avoid damage to columella
  - 6 weeks
  - Only dilate if needed
  - 4.5 Portex for term
- Unilateral
  - Avoid
  - Intranasal



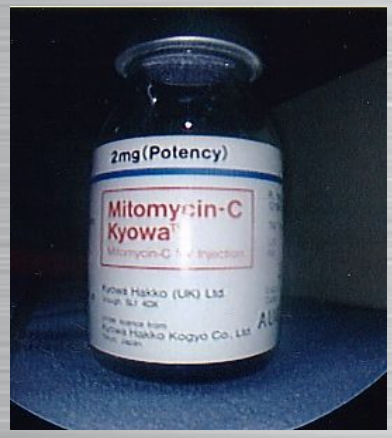


Choanal atresia

Mitomycin

Sub-cytotoxic dose inhibits fibroblasts

2 mg/ml applied topically for 4 minutes



Topical Mitomycin as an Adjunct to Choanal Atresia Repair -

Arch Otolaryngol. 2002;128:398–400.

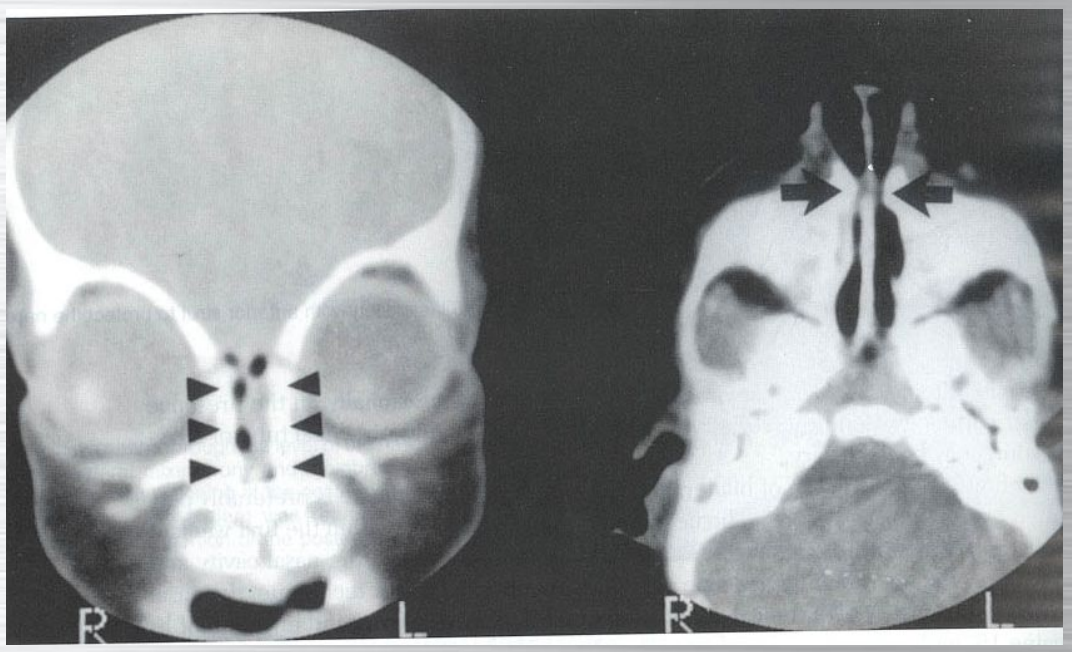
Surgical Management of Choanal Atresia Improved Outcome Using Mitomycin (0.4 mg/mL)

Arch Otolaryngol. 2001;127:1375–1380.

The expression of mRNA for some extracellular matrix proteins (elastase, hyaluronidase, and procollagen) was downregulated in the mitomycin test groups

Laryngoscope. 113(2):237–242, February 2003

Pyriform Stenosis

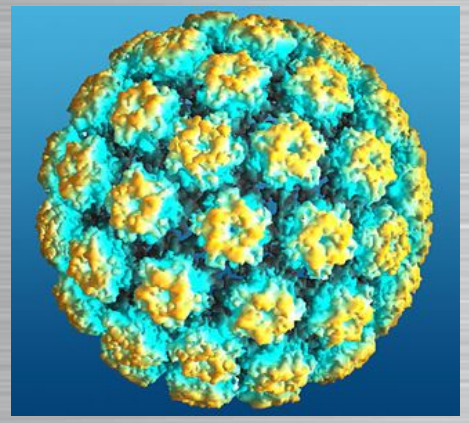


PROGRESSIVE

Definition: JRRP

- Juvenille
  - Mean age at diagnosis 3years
  - More aggressive than adult disease
- Recurrent
  - Average lifetime procedures = 21
- Respiratory
  - Usually larynx
  - If extends below larynx tends to be younger
- Papillomatosis
  - With rare dysplasia and progression to carcinoma

HPV types



6

11

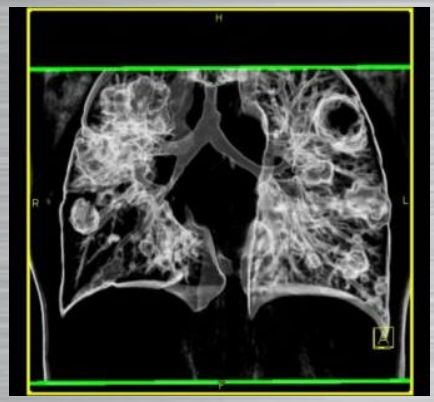
Benign genital warts/JRRP

In JRRP, 11 associated with more severe disease “Eleven Ξ Heaven”

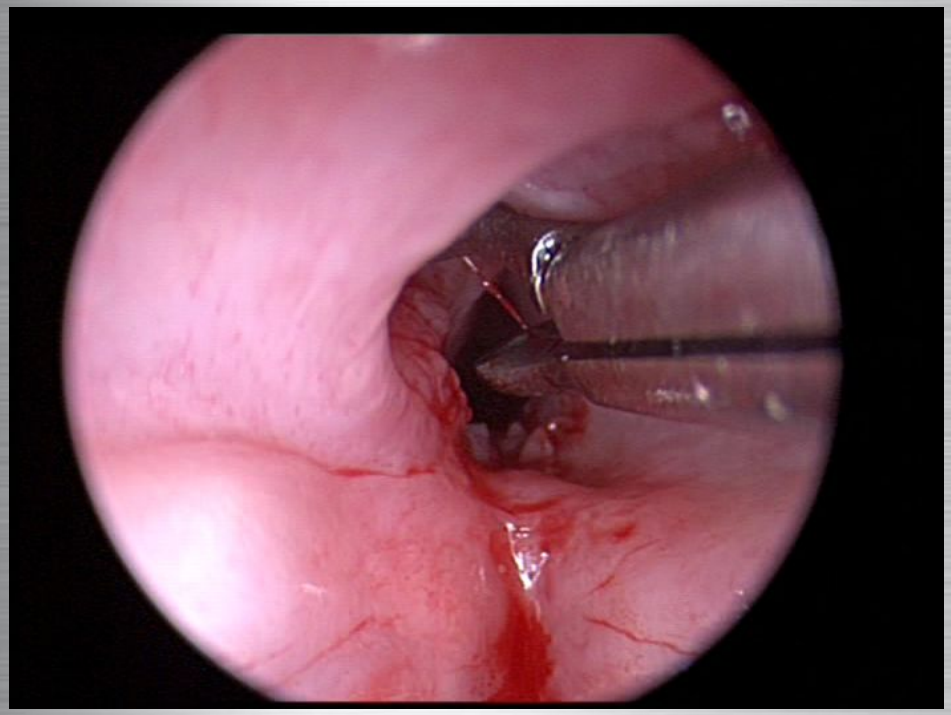
16

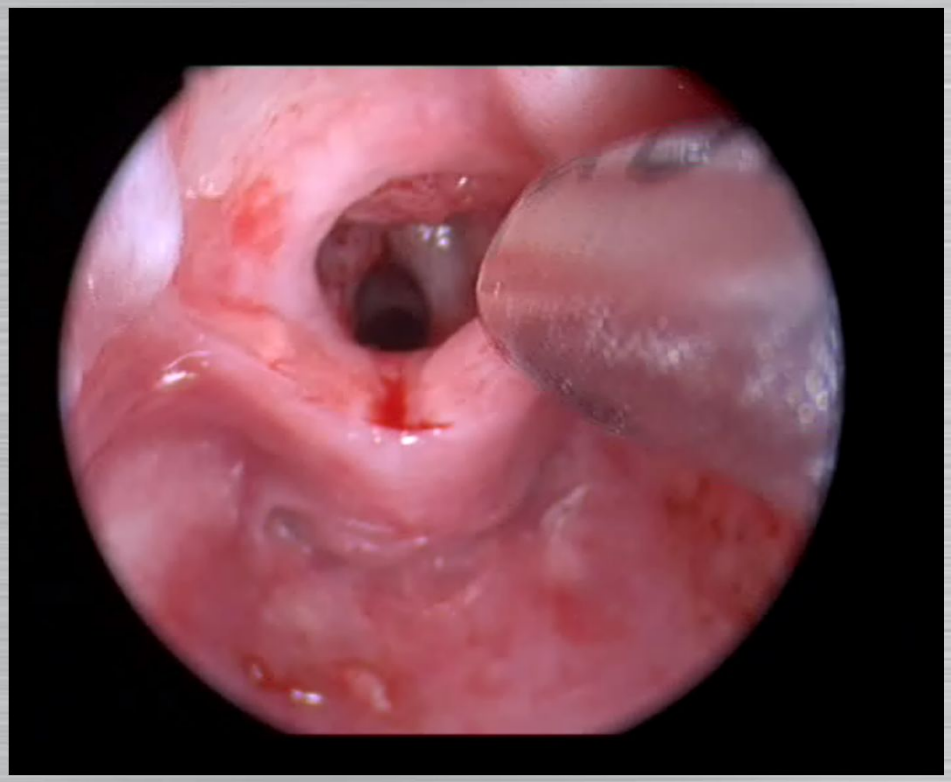
18

Cervical cancer

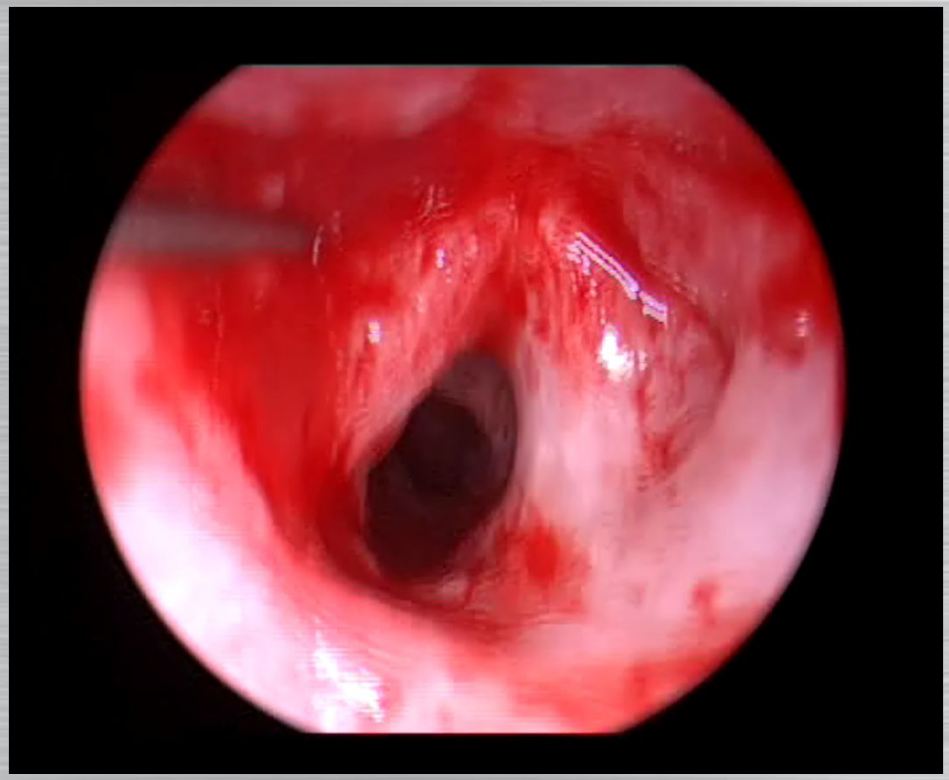


Juvenille respiratory papilloma

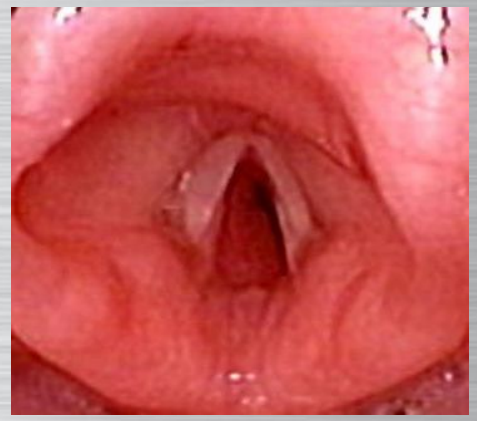




- Cidofovir
  - –5mg/ml
  - –3ml = 15mg
- Risk/Benefit

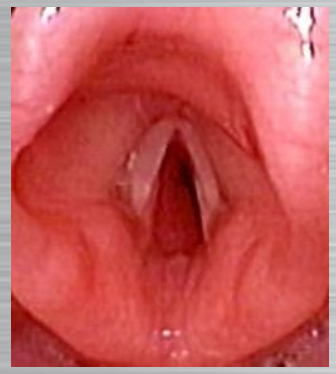


Subglottic Haemangioma



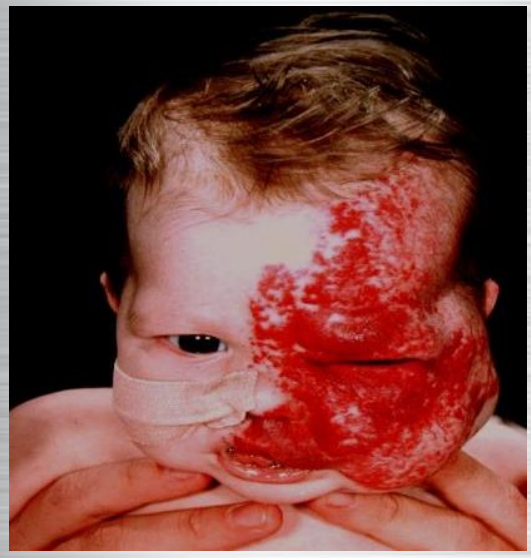
Subglottic Haemangioma

- Presentation peaks at 6 weeks
  - –stridor,
  - –feeding difficulties,
  - –FTT
- Usual site is left lateral subglottis
- Occasionally in trachea and glottis



Subglottic Haemangioma

•50% of patients with SGH have associated head and neck cutaneous haemangioma



•Diagnosis at endoscopy

•Can be biopsied safely as capillary not cavernous haemangioma

Management

–*Cutaneous* usually regress by 6-8 years

–*Subglottic* involute sufficiently so that most are asymptomatic by 2-3 years

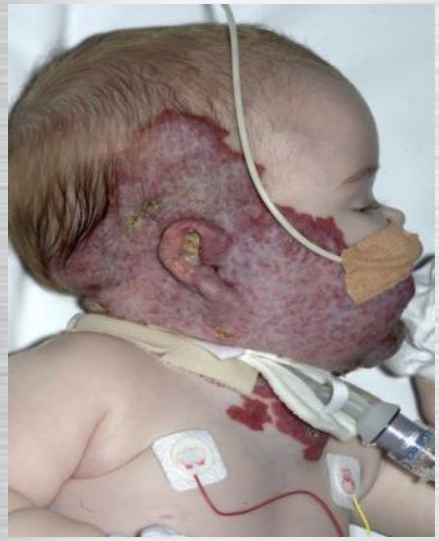
- Observation
  - 50 - 70% will need a tracheostomy until about 18 months
- Medical treatments
- Surgical treatments

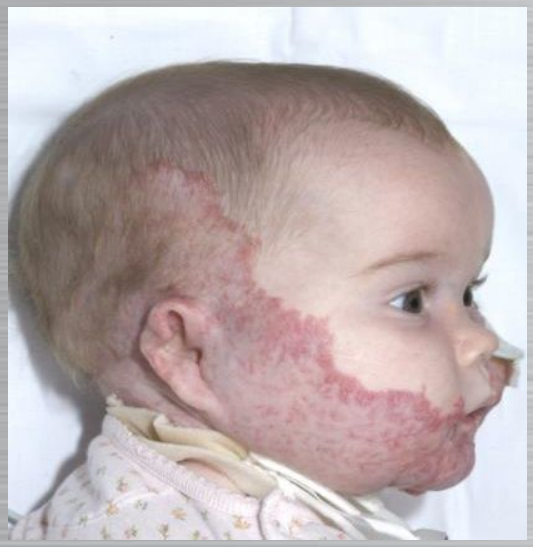
Management

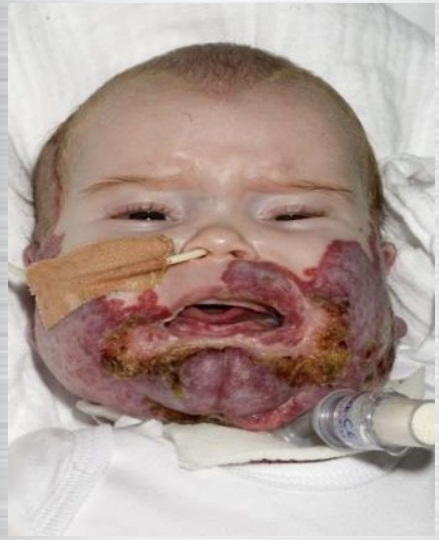
- Interferon
- Steroids
- Propranalol

- Tracheostomy
- Laser KTP/$C0_2$
- Steroid injection
- Open excision
- Microdebrider

First GOS patient: SGH,trachy after debulk, July 2008







Propranolol

Week1 **1**mg/kg/day divided into 3 doses.

Week 2: ↑ **2**mg/kg/day divided into 3 doses

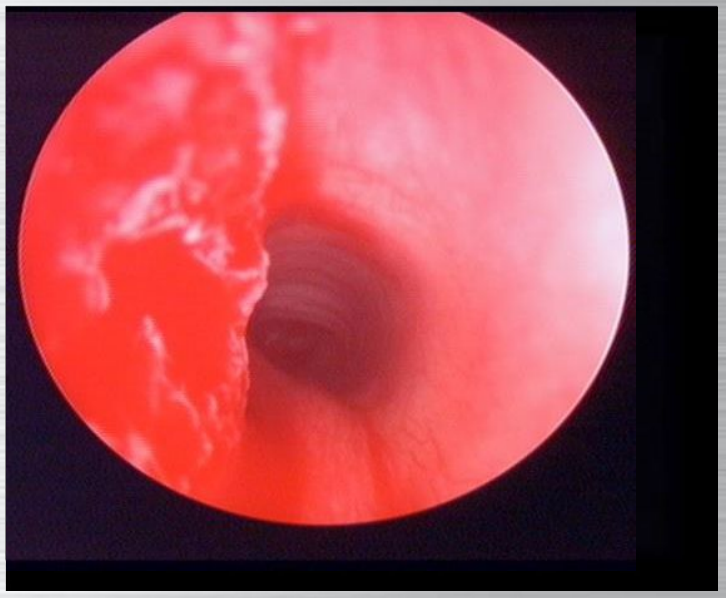
Up to 9/12 adjust by weight

From 9/12 no weight adjustment

?12/12 ½ dose every week.

Subglottic Haemangioma

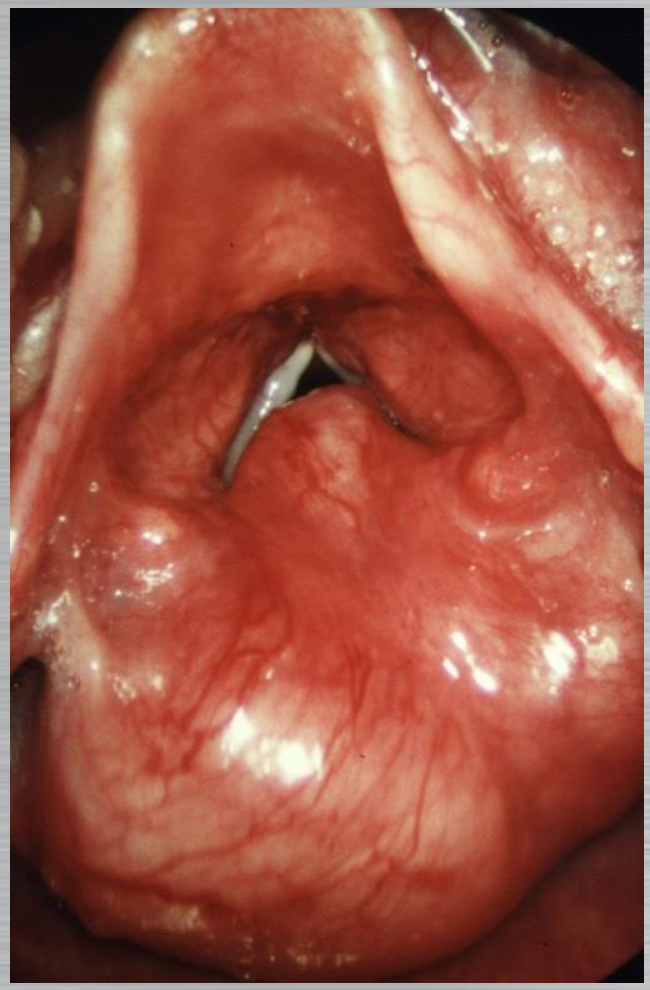
- Endoscopic resection of haemangioma



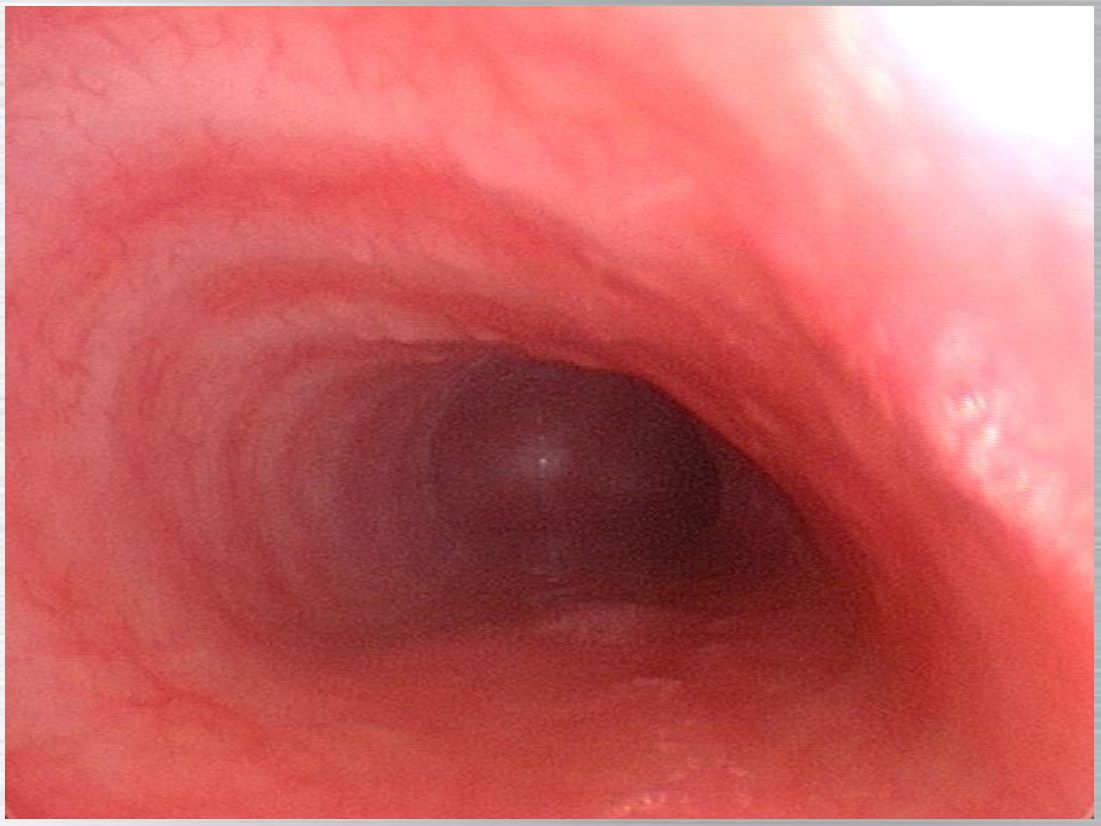
Tumours

- RRP commonest
- Chondroma

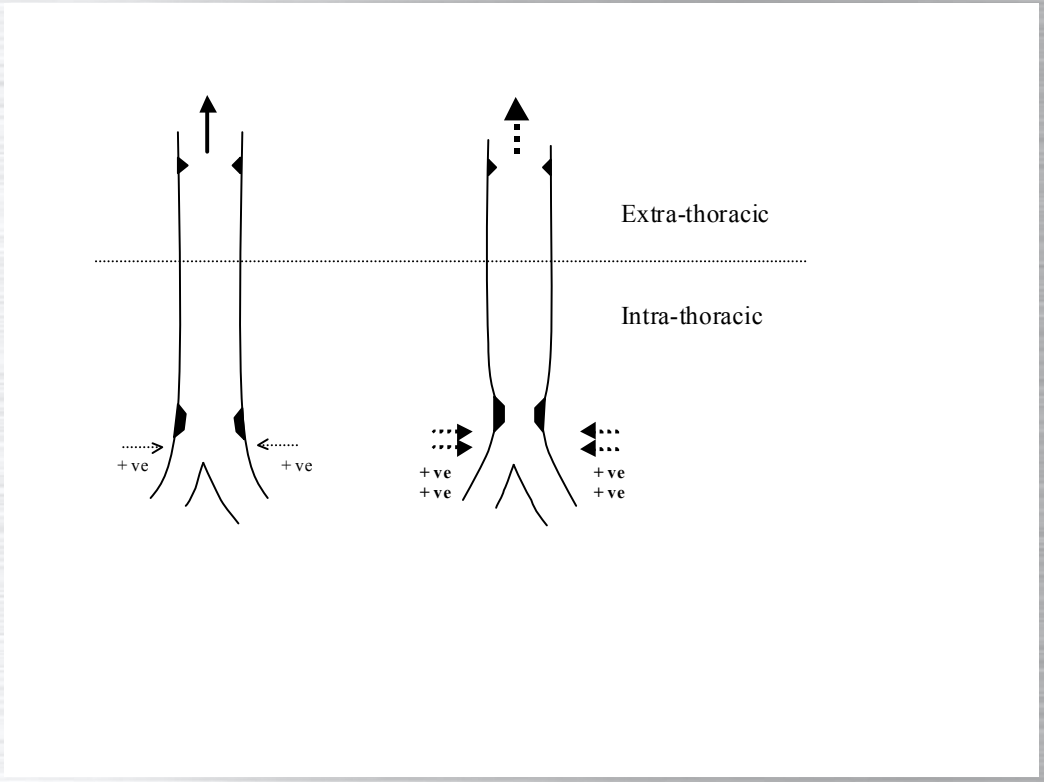
- Squamous Ca 2nd RRP
- Rhabdomyosarcoma
- Lymphoma
- Vascular - disappears



Tracheobronchomalacia

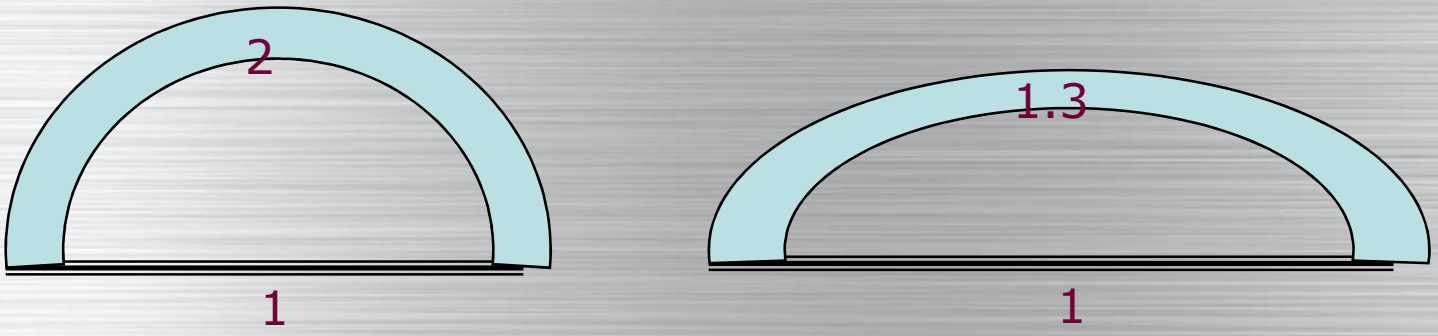


Collapse and increasing obstruction on expiration with intra thoracic obstruction



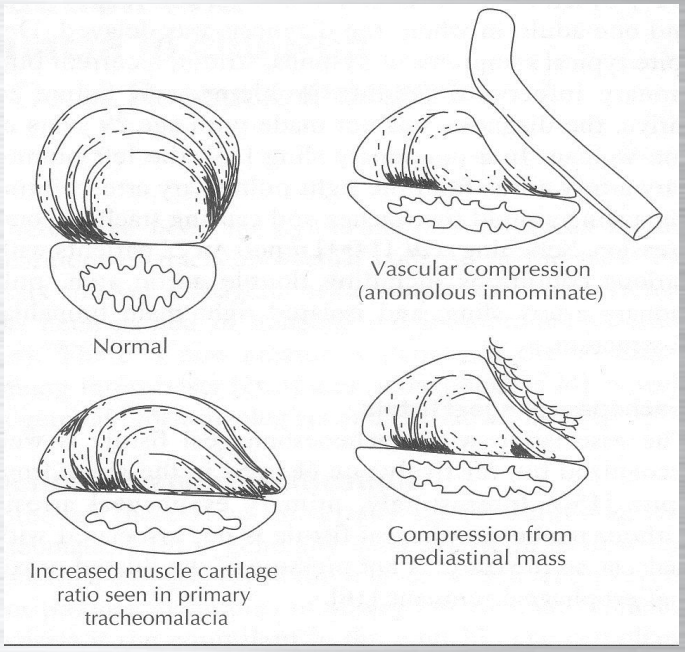
Primary Tracheobronchomalacia

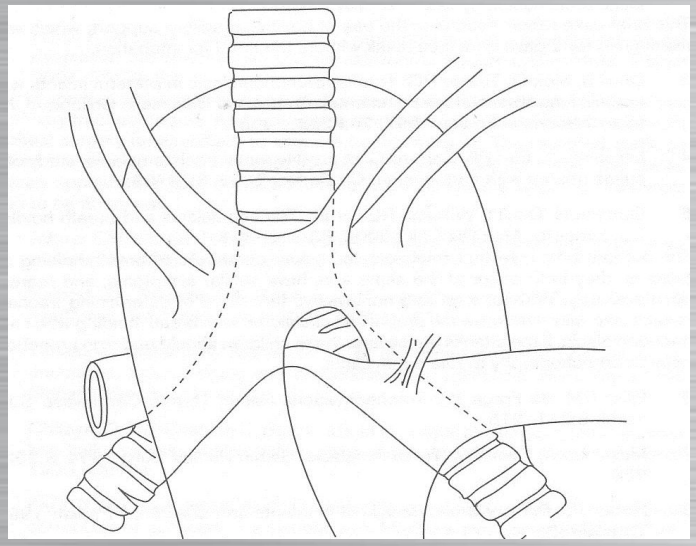
Cartilage to muscle Ratio should be 2:1



Secondary Tracheobronchomalacia

- Compression





Tracheobronchomalacia Diagnosis

Cyanotic episodes

Cough

Aspiration

Expiratory

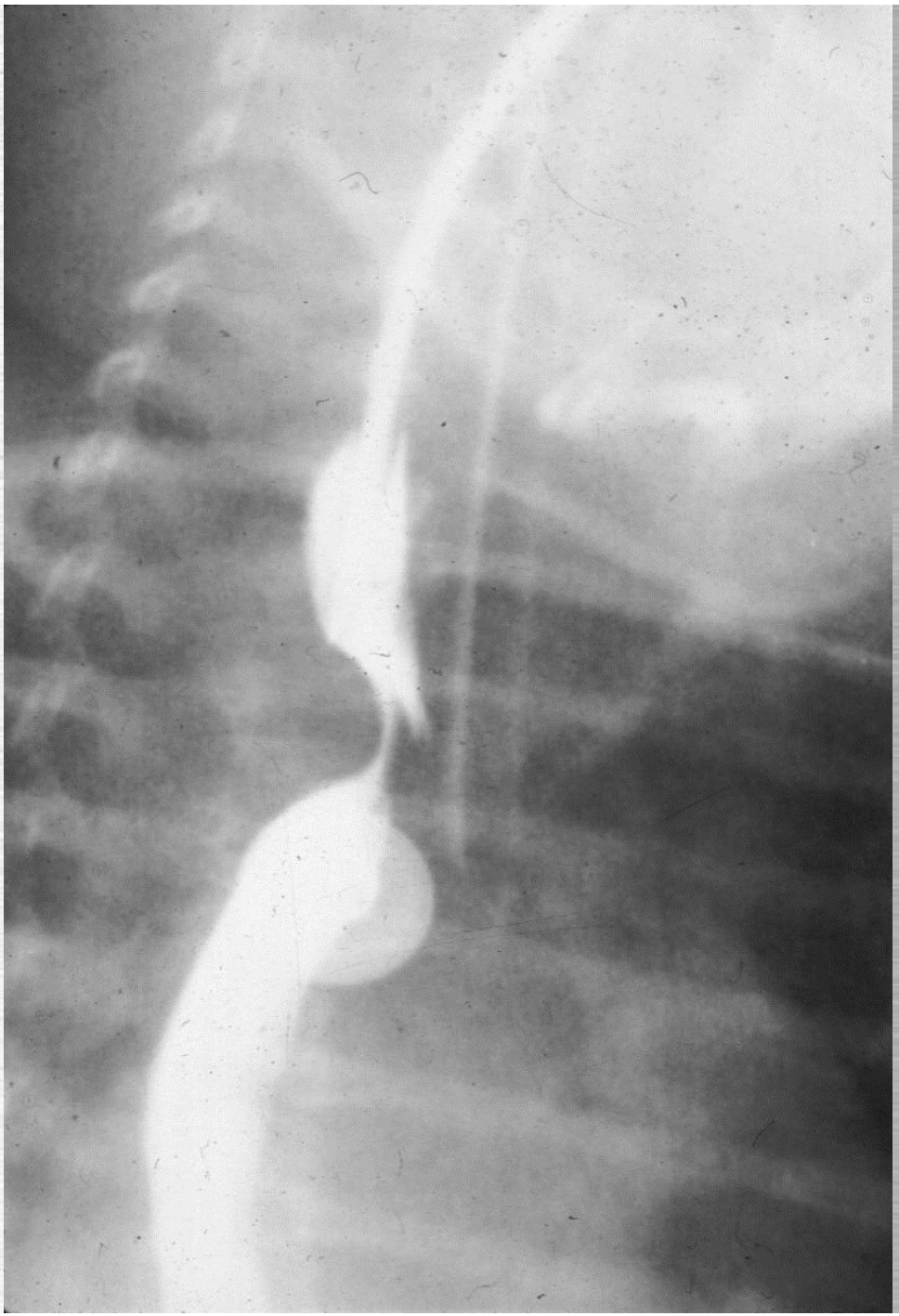
MLB

–Avoid physical or airway splinting (underdiagnosis)

–Coughing (overdiagnosis)

•Bronchography

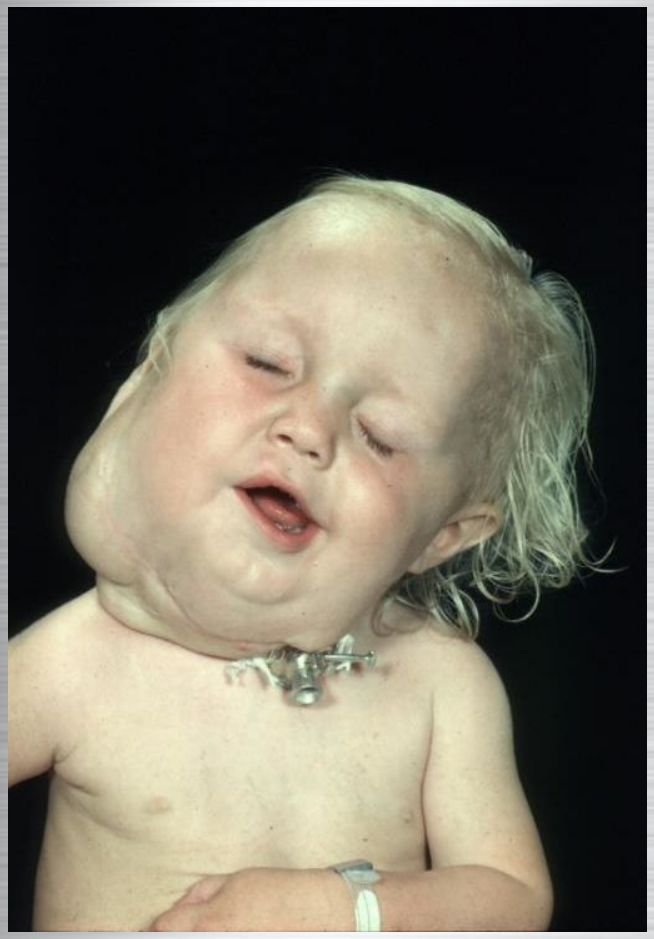
•stridor

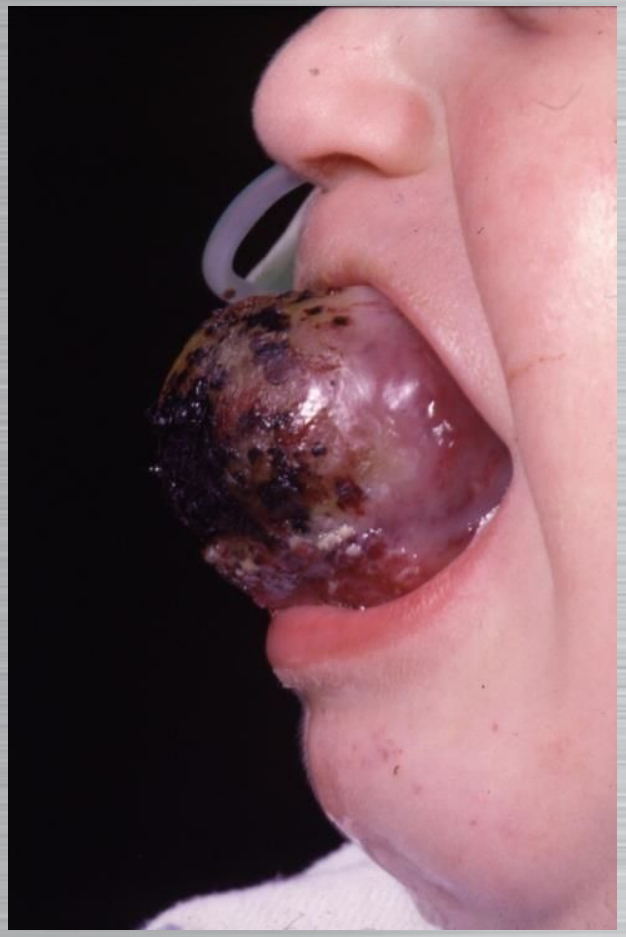


Tracheobronchomalacia

- Prognosis
  - –Usually improves by 18 months
  - –Can be severe (fatal)
- Treatment
  - –Aortopexy
  - –Bronchopexy
  - –Stents

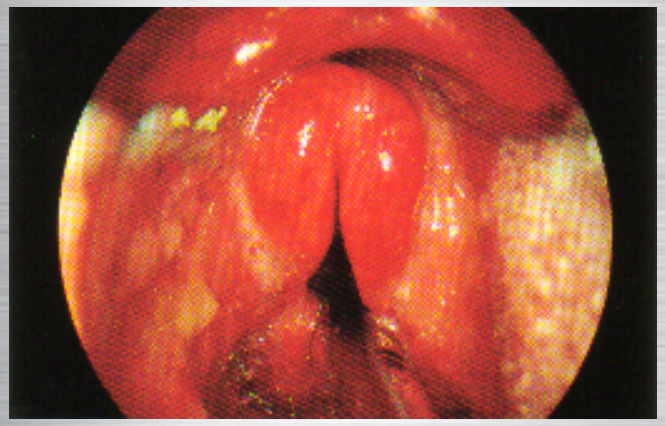
Cystic Hygroma

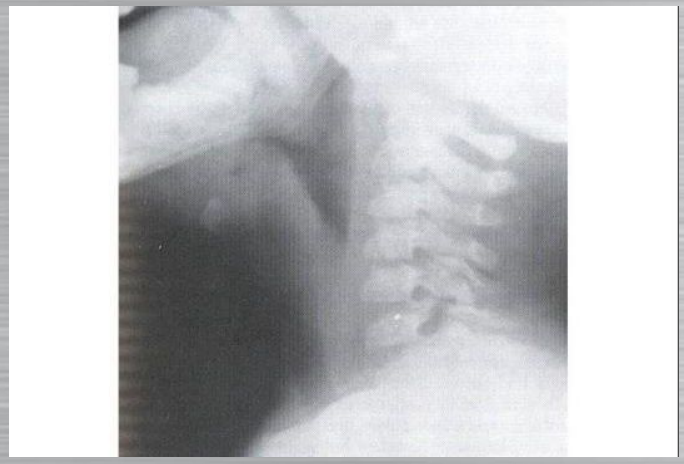




ACUTE

Acute Epiglottitis





H. Infuenzae type b

Age 3 – 6 years

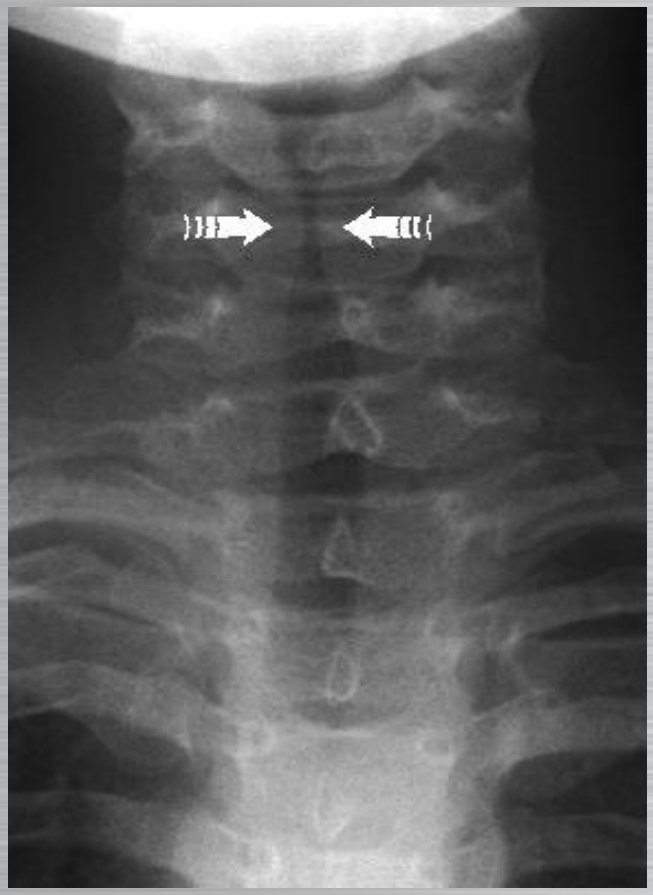
Sore throat, drooling, fever

Upright position, neck extended

Intubate in OT

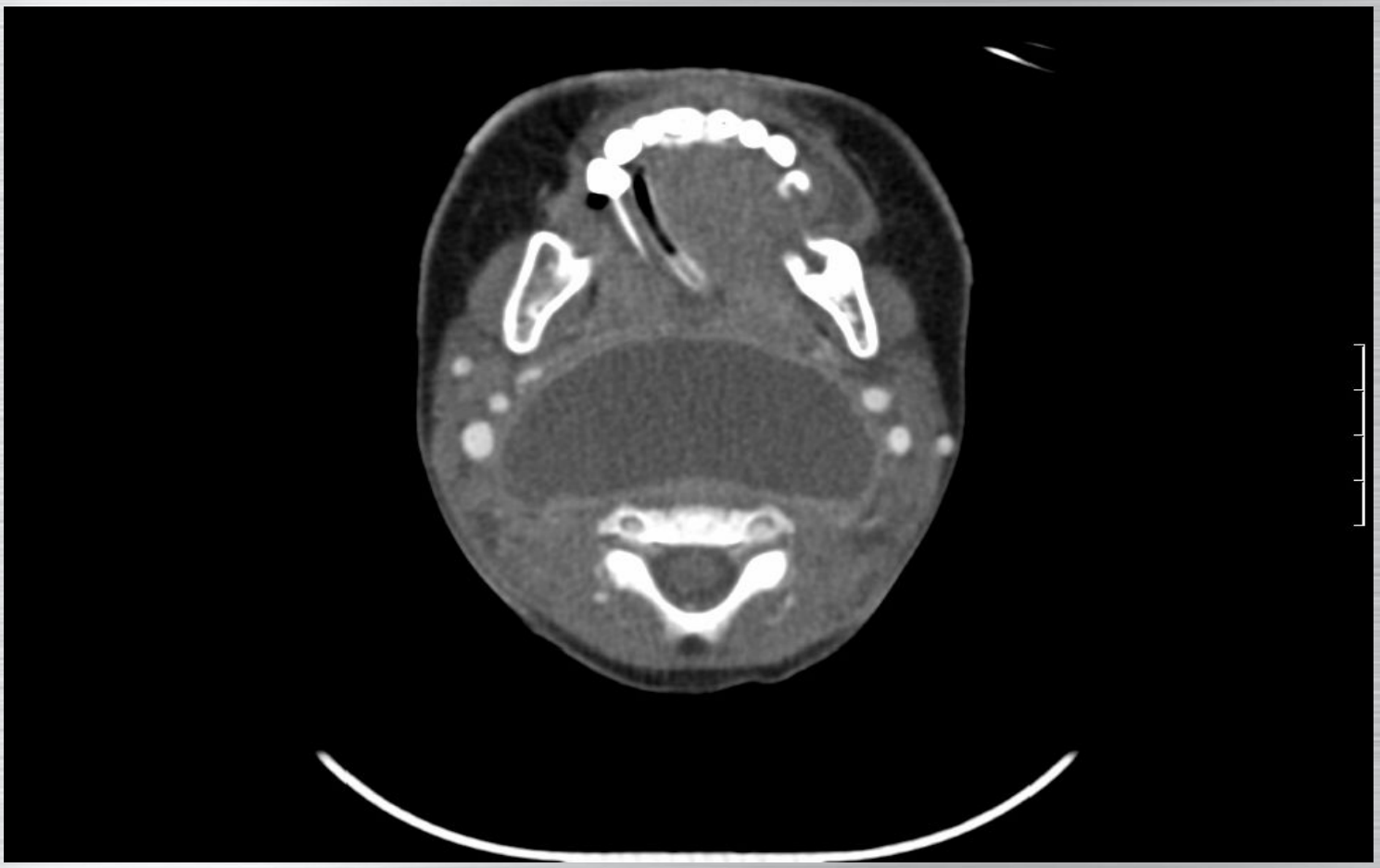
Laryngotracheobronchitis (Croup)

- Parainfluenza virus
- Ages 3 months to 3 years
- Barking cough
- Progresses slowly
- Rarely requires intubation



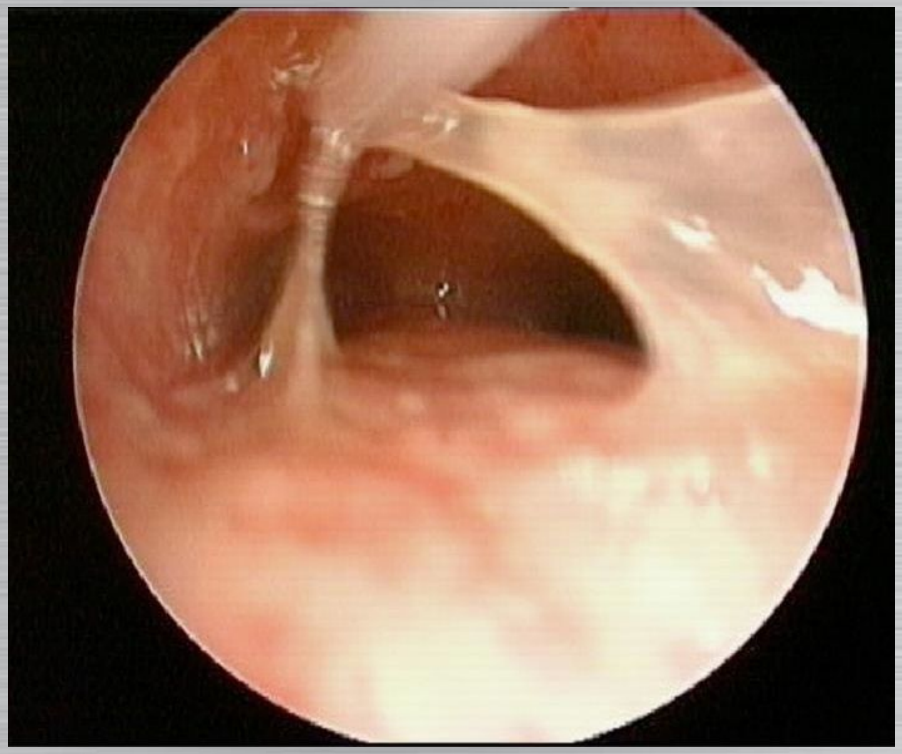
Steeple sign

Retropharyngeal Abscess

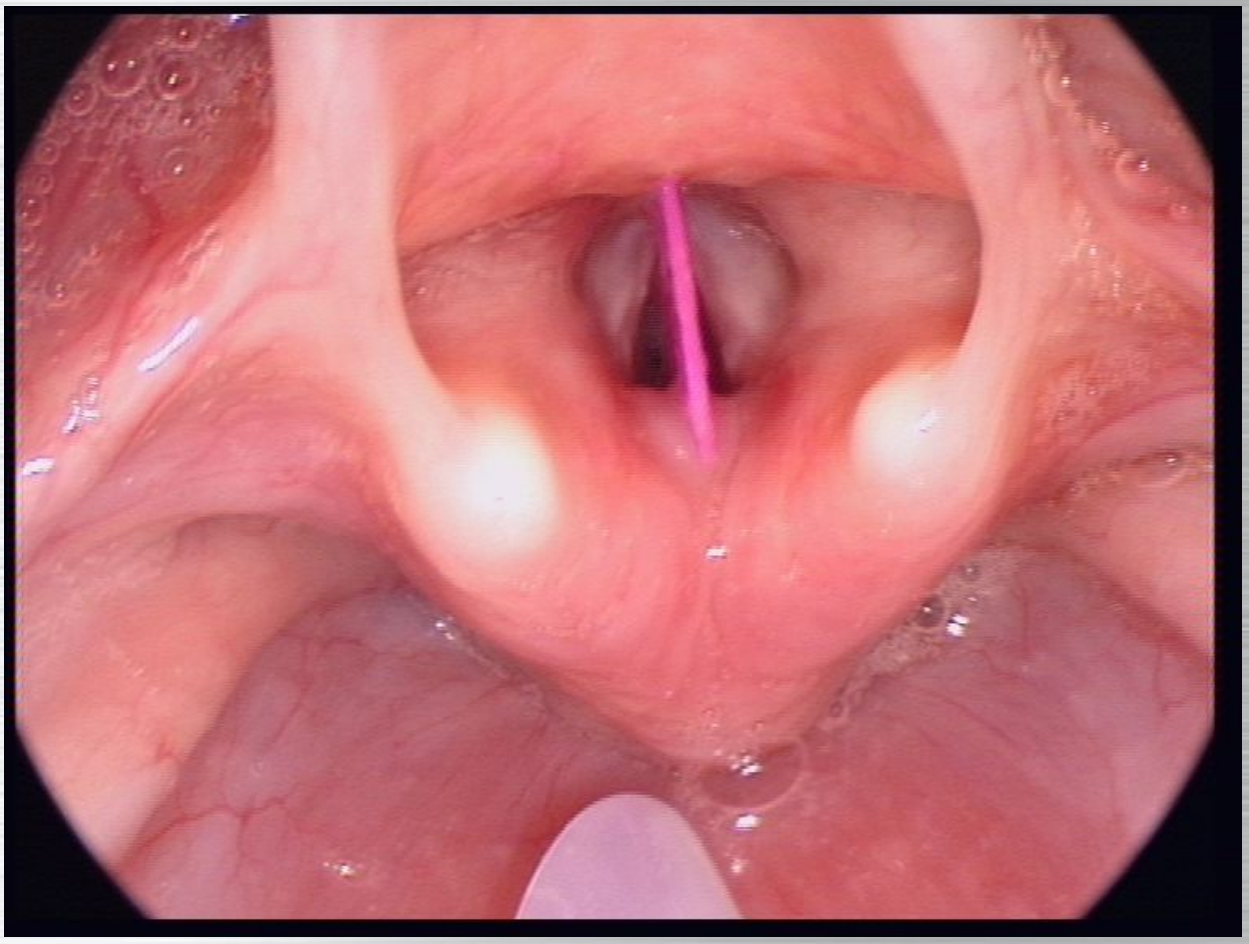


Bacterial tracheitis

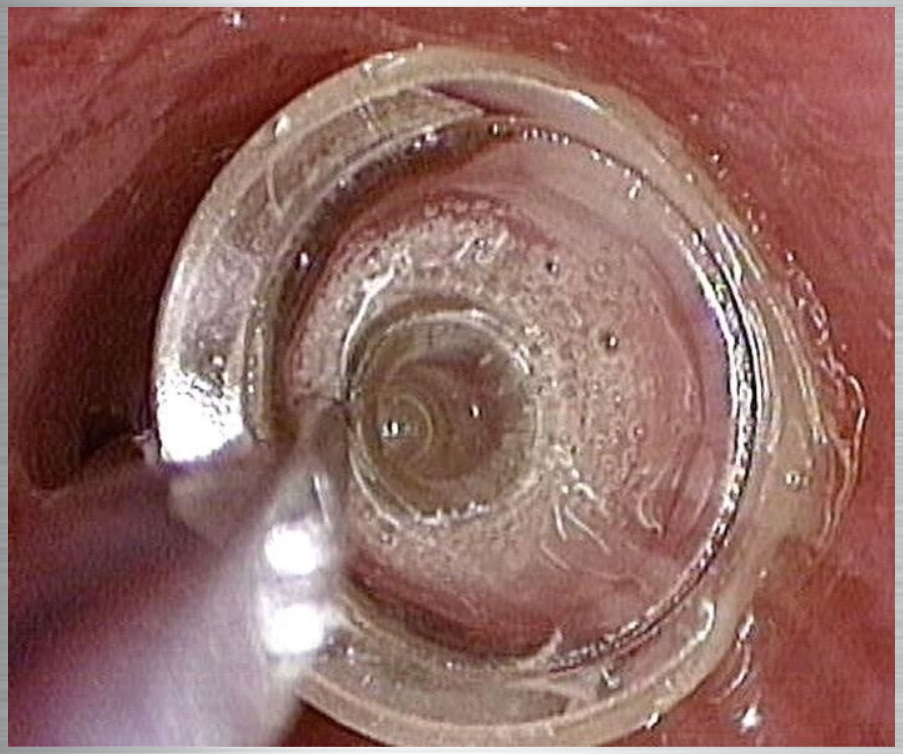
- Staph Aureus
- H. Flu

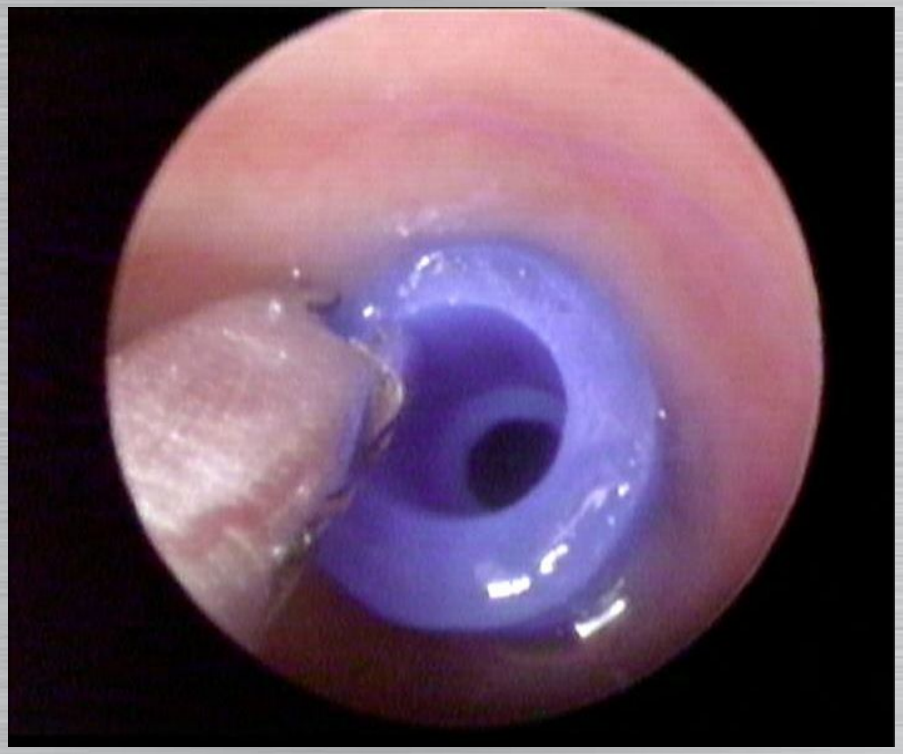


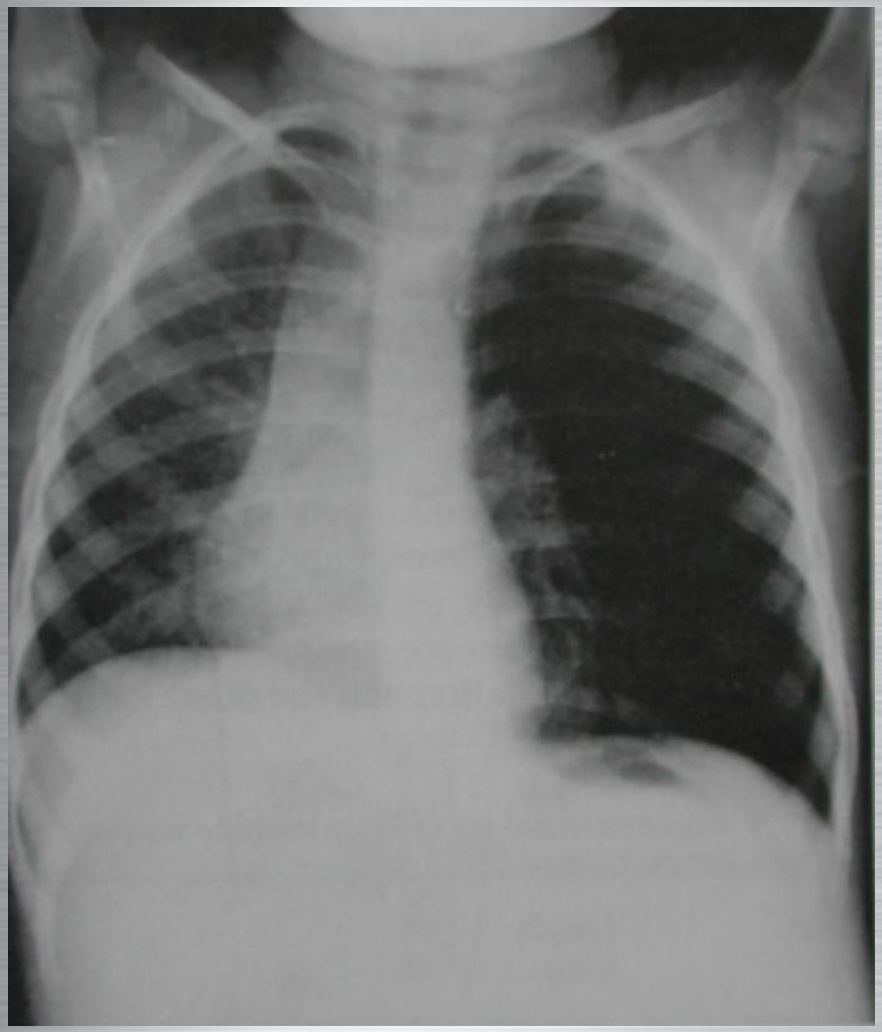
Laryngeal FB



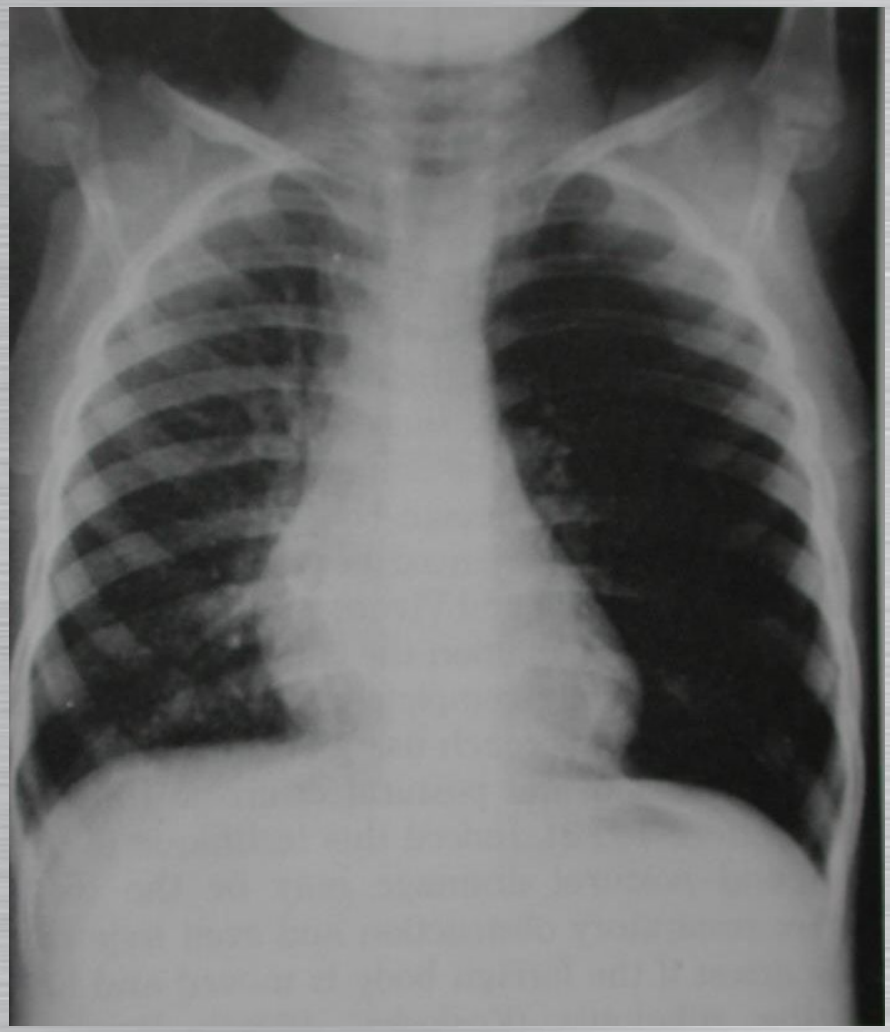
Bronchial Foreign bodies







Expiration



Inspiration