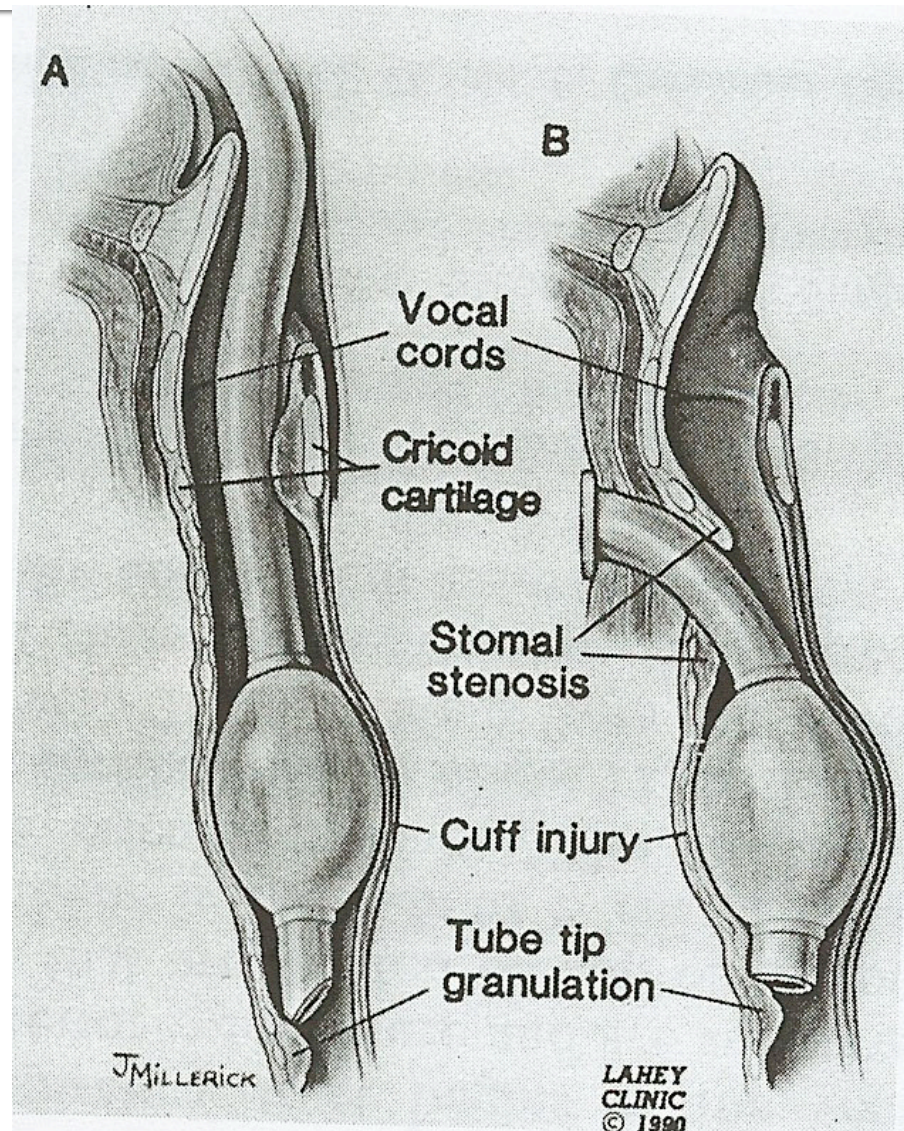


Open reconstruction of Airway Stenosis

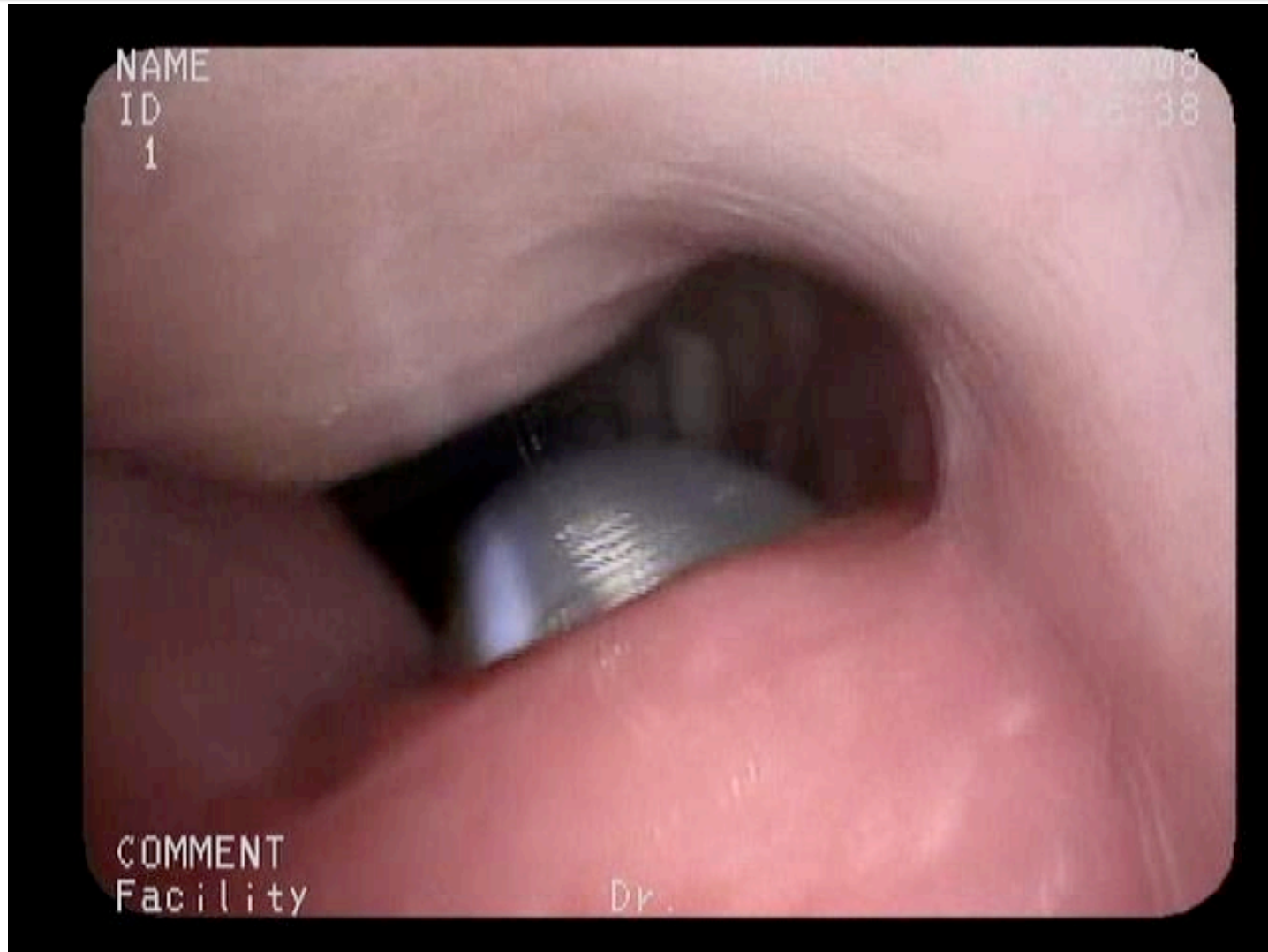
Laryngotracheal Stenosis

- Etiology
 - External trauma (MVA, surf board, assault, etc.)
 - Internal trauma (Endotracheal intubation, tracheostomy)
 - Other
 - Systemic diseases (vasculitis, etc.)
 - Chemo/XRT
 - Idiopathic

Laryngotracheal stenosis



Laryngotracheal stenosis



New Technology

- Trans-nasal “Esophagoscope”
- Expanded diagnostic endoscopy
 - Laryngoscopy
 - Bronchoscopy
 - Esophagoscopy
- 2.0 mm Working Channel
 - Biopsies
 - Injections
 - Procedures



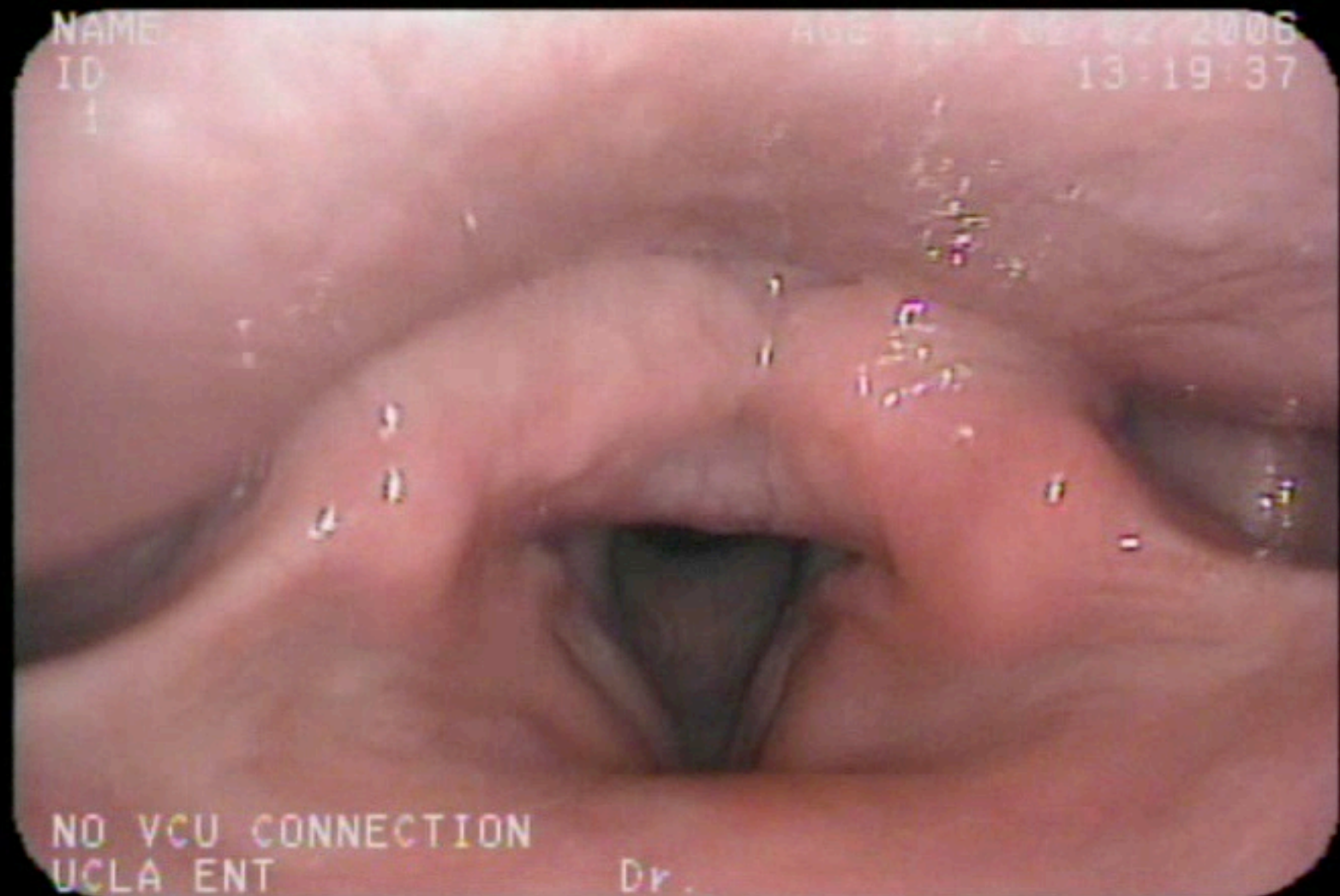
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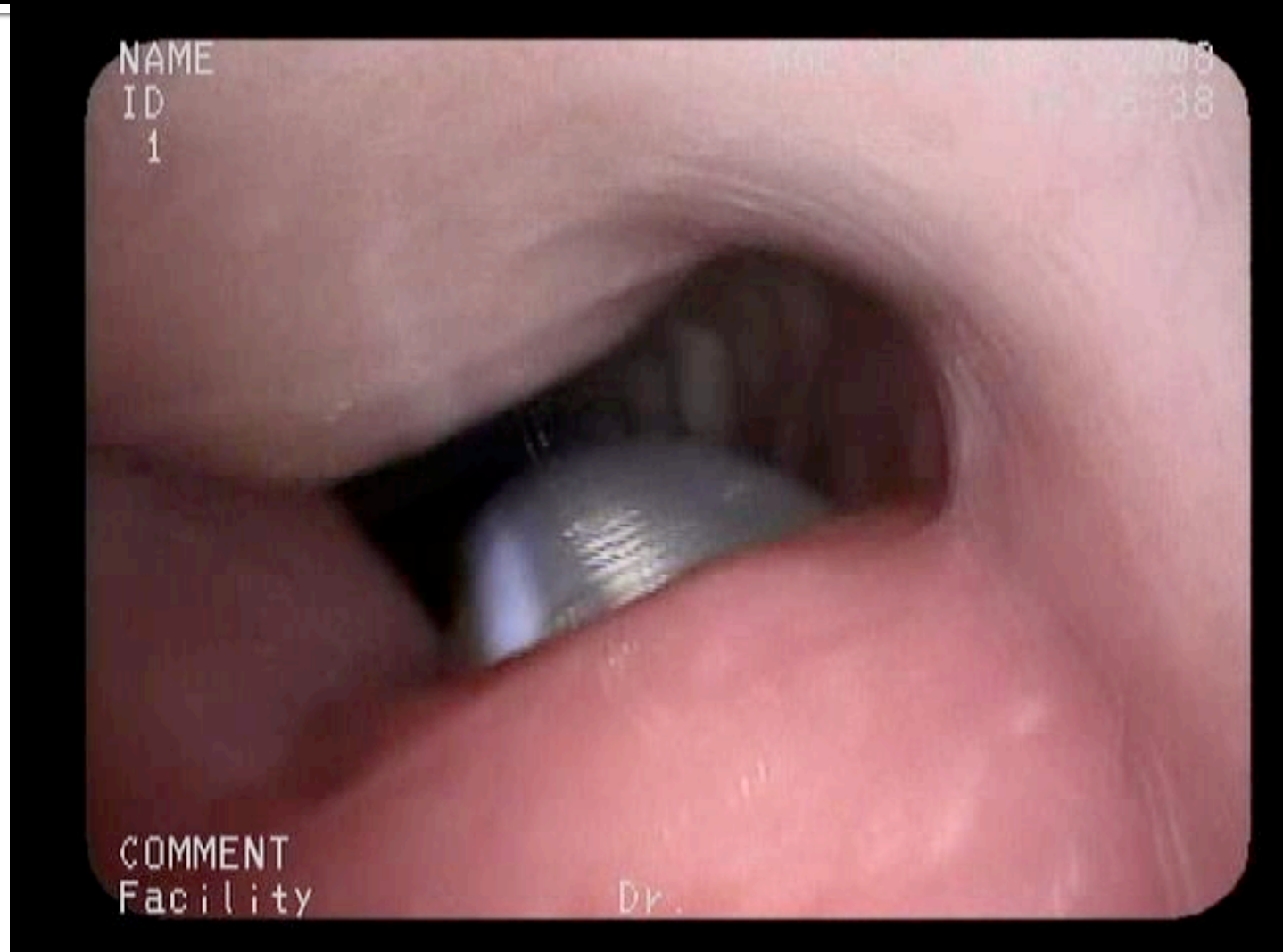
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NO VCU CONNECTION
UCLA ENT

Dr.

Not all stenosis need to be treated!

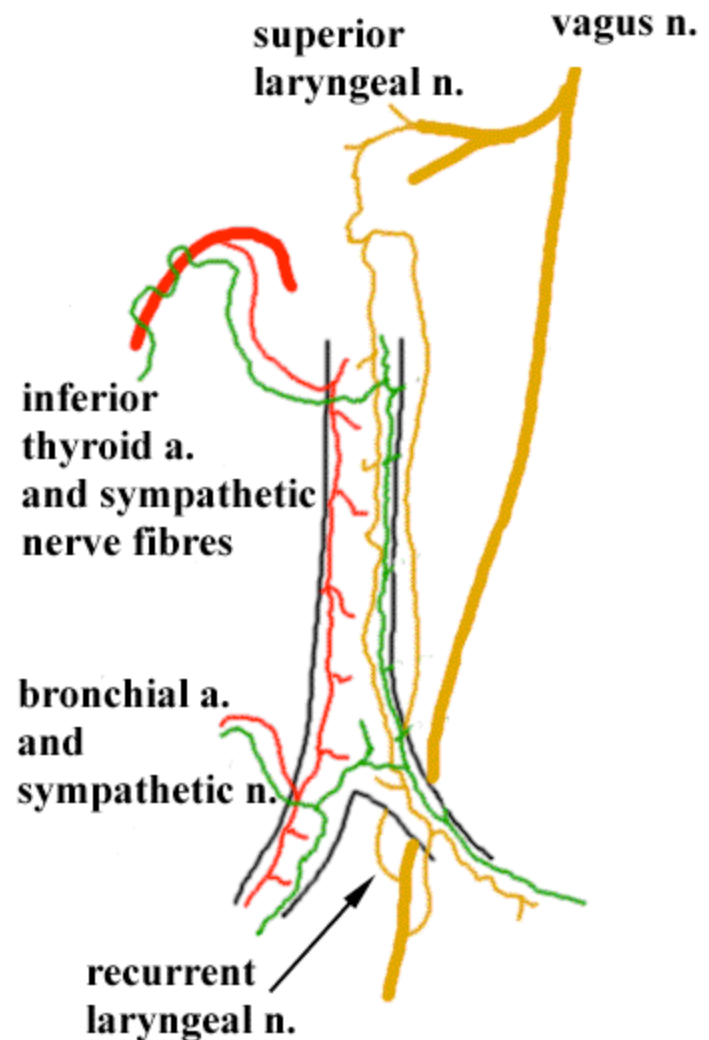


Tracheal Anatomy

- Tracheal Anatomy
 - 10-12 cm in length (adult)
 - 13-16 mm width (females) and 16-20 mm width (males)
 - 16-20 horseshoe shaped cartilage
 - Membranous:cartilaginous trachea::1:4.5

Tracheal Anatomy

- Blood supply
 - Cervical trachea supplied by superior and inferior thyroid arteries
 - Mediastinal trachea supplied by bronchial arteries
 - Extensive dissection around trachea causes ischemia



Tracheal stenosis

- 2-3 cm (4-6 rings) may be resected and reanastomosed primarily
- Tracheal resection maneuvers allow resection of more rings
 - Suprahyoid release
 - Infrahyoid release
 - Intrathoracic tracheal mobilization

Laryngeal release

- Suprahyoid release (Montgomery)
 - Muscle attachments to the superior aspect of hyoid bone are severed and central hyoid cut
 - Larynx and cervical trachea allowed to drop inferiorly
 - Can give up to 2-3 cm in length
 - Significant post-op dysphagia a possible major complication compared to infrahyoid release

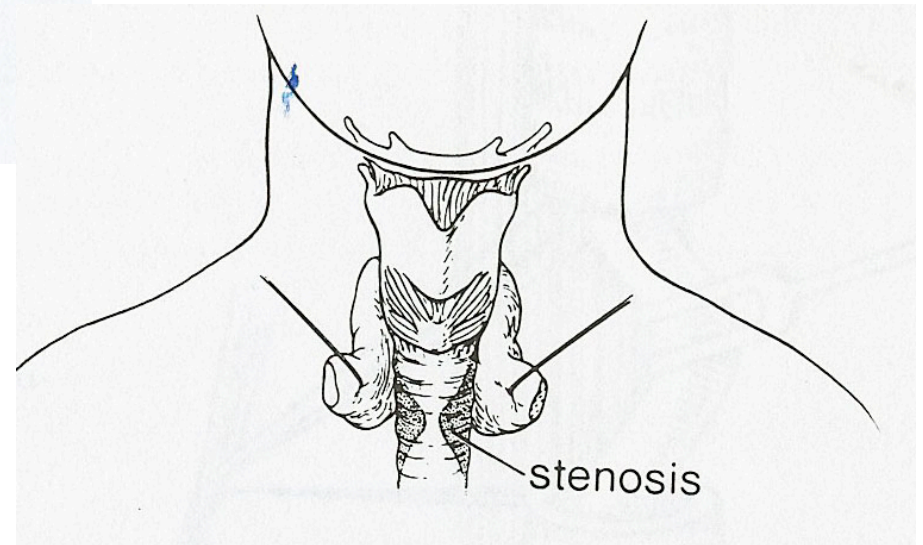
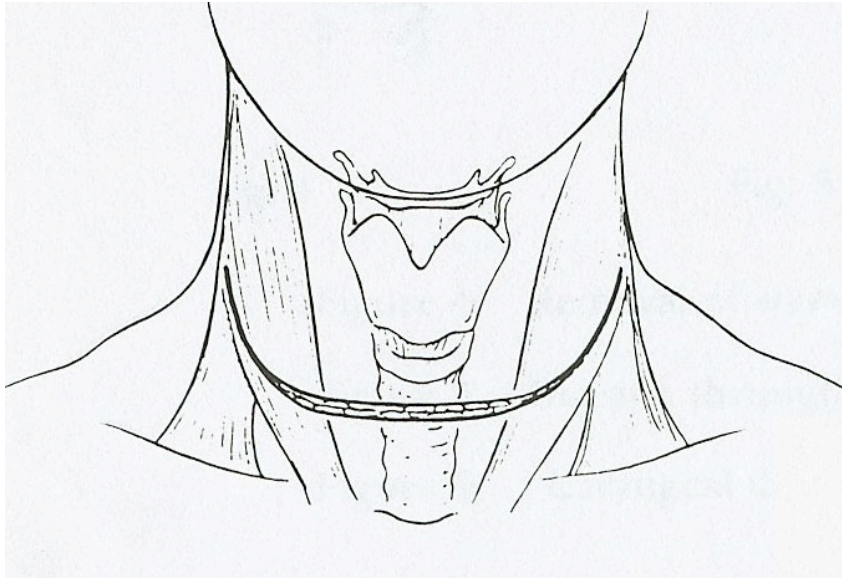
Laryngeal release

- Infrahyoid release (Dedo)
 - Inferior attachments to the hyoid are severed
 - Especially the thyrohyoid muscle and thyrohyoid membrane
 - Can add up to 2.5 cm length

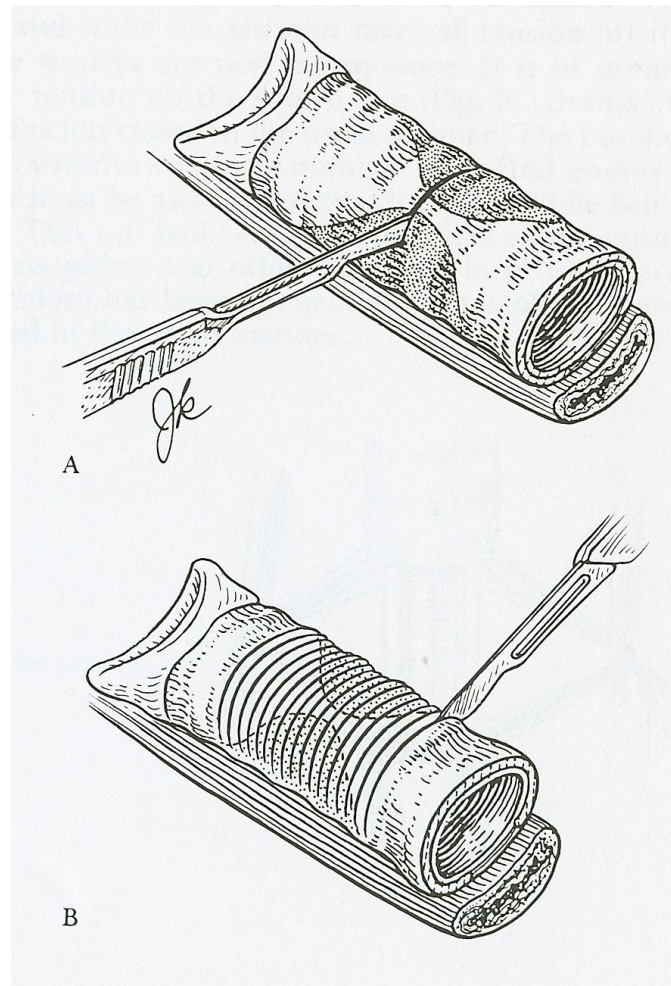
Tracheal resection

- Grillo 1964 (Intrathoracic maneuvers)
 - Division of pulmonary ligament → 3 cm (5.9 rings)
 - Division of mainstem bronchus → 2.7 cm (5.5 rings)
 - Pericardial dissection → 0.9 cm (1.6 rings)
- Up to 6.4 cm trachea (about 13 rings) can be excised with the help of release maneuvers

Tracheal resection



Tracheal resection



Tracheal resection

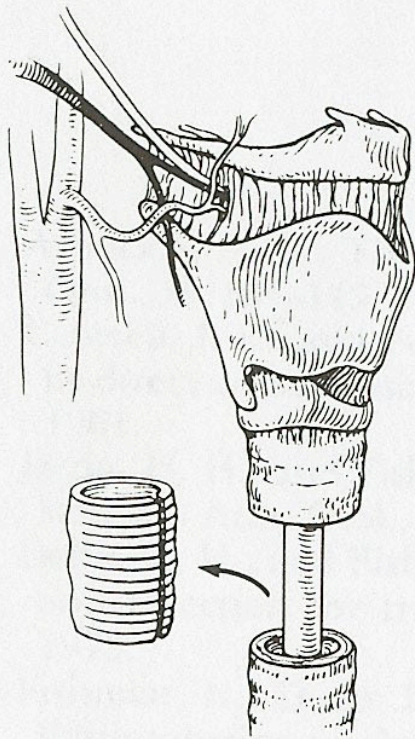


Fig. 4

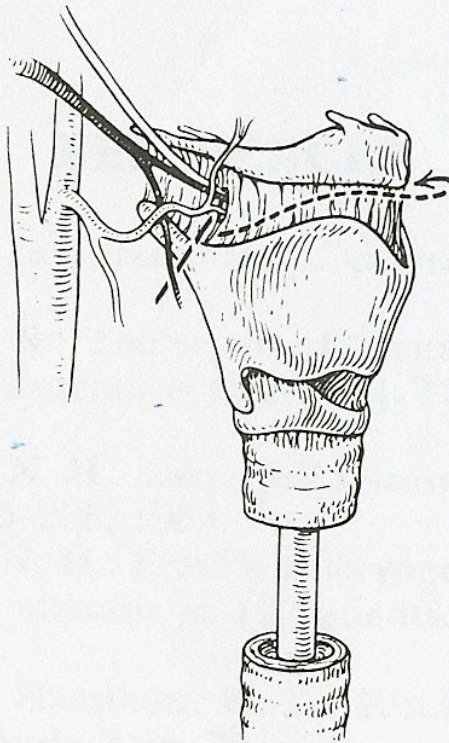


Fig. 5

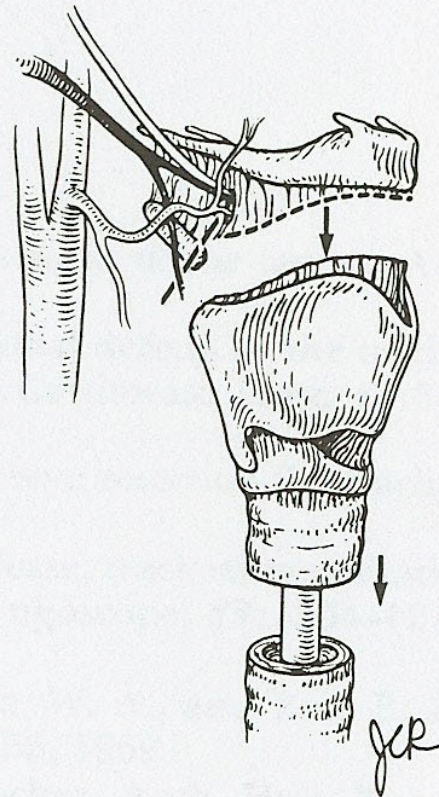
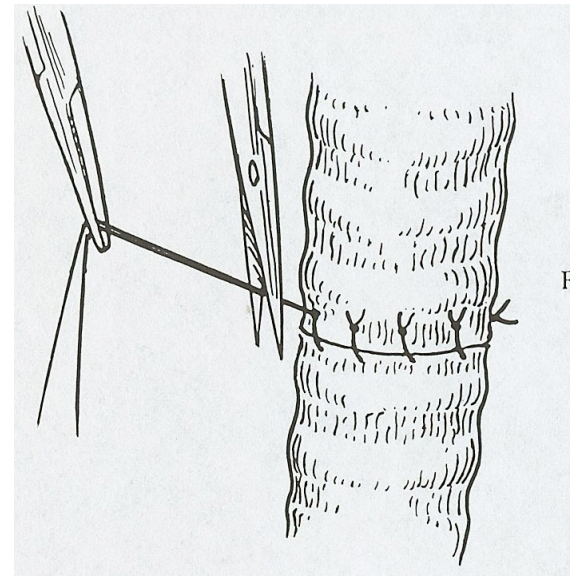
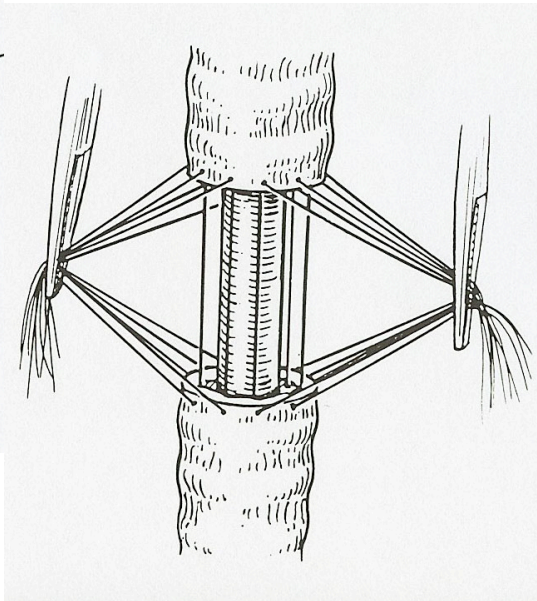
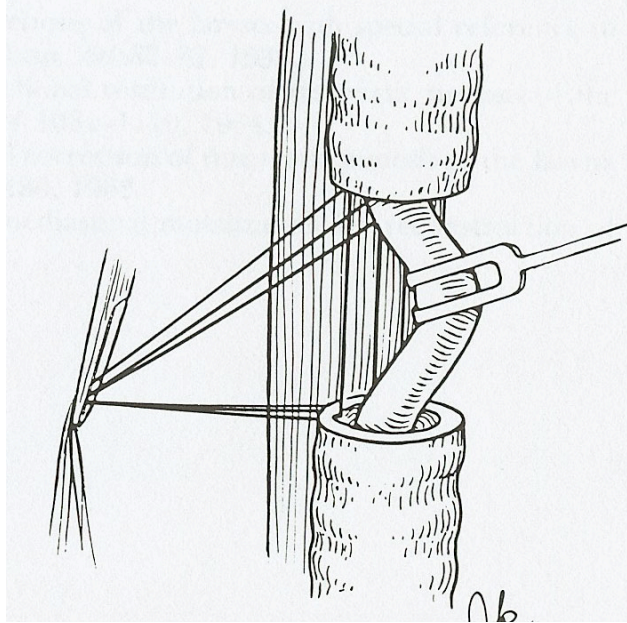
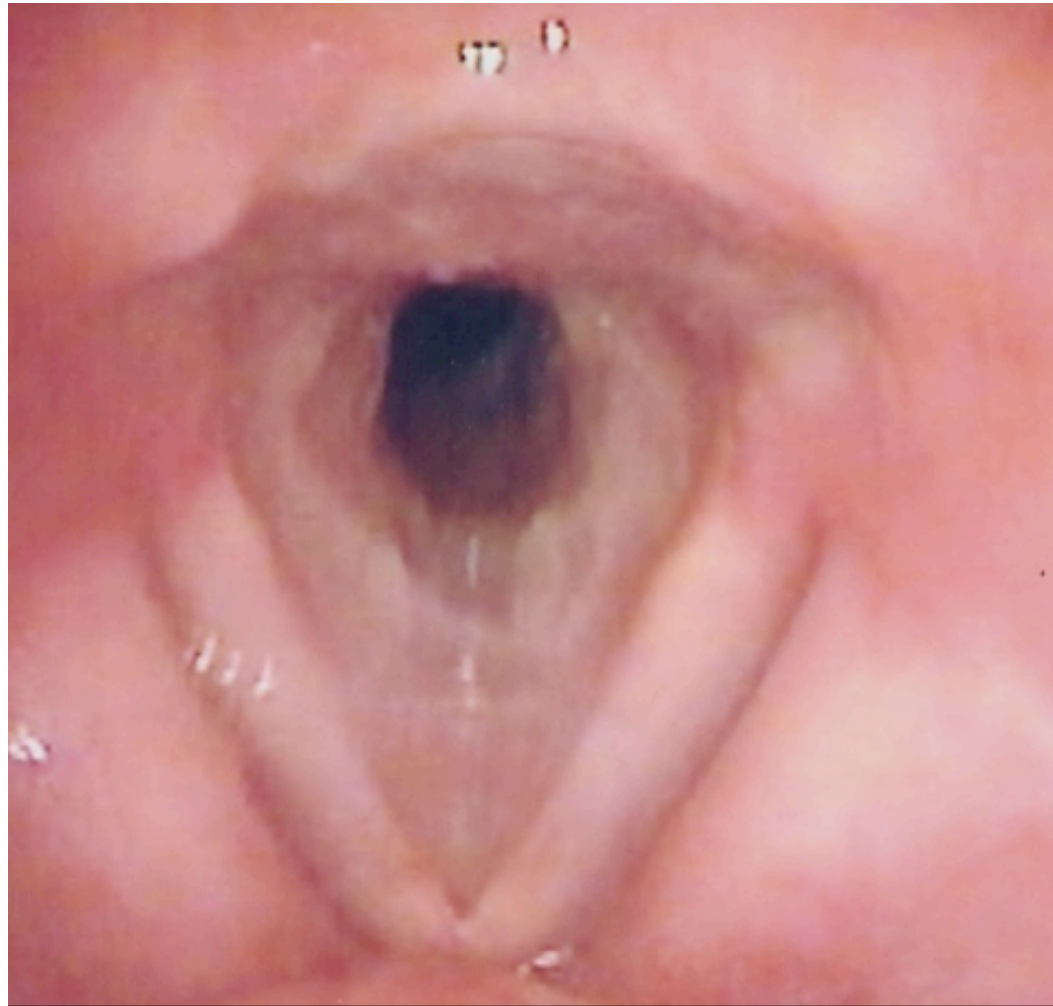


Fig. 6

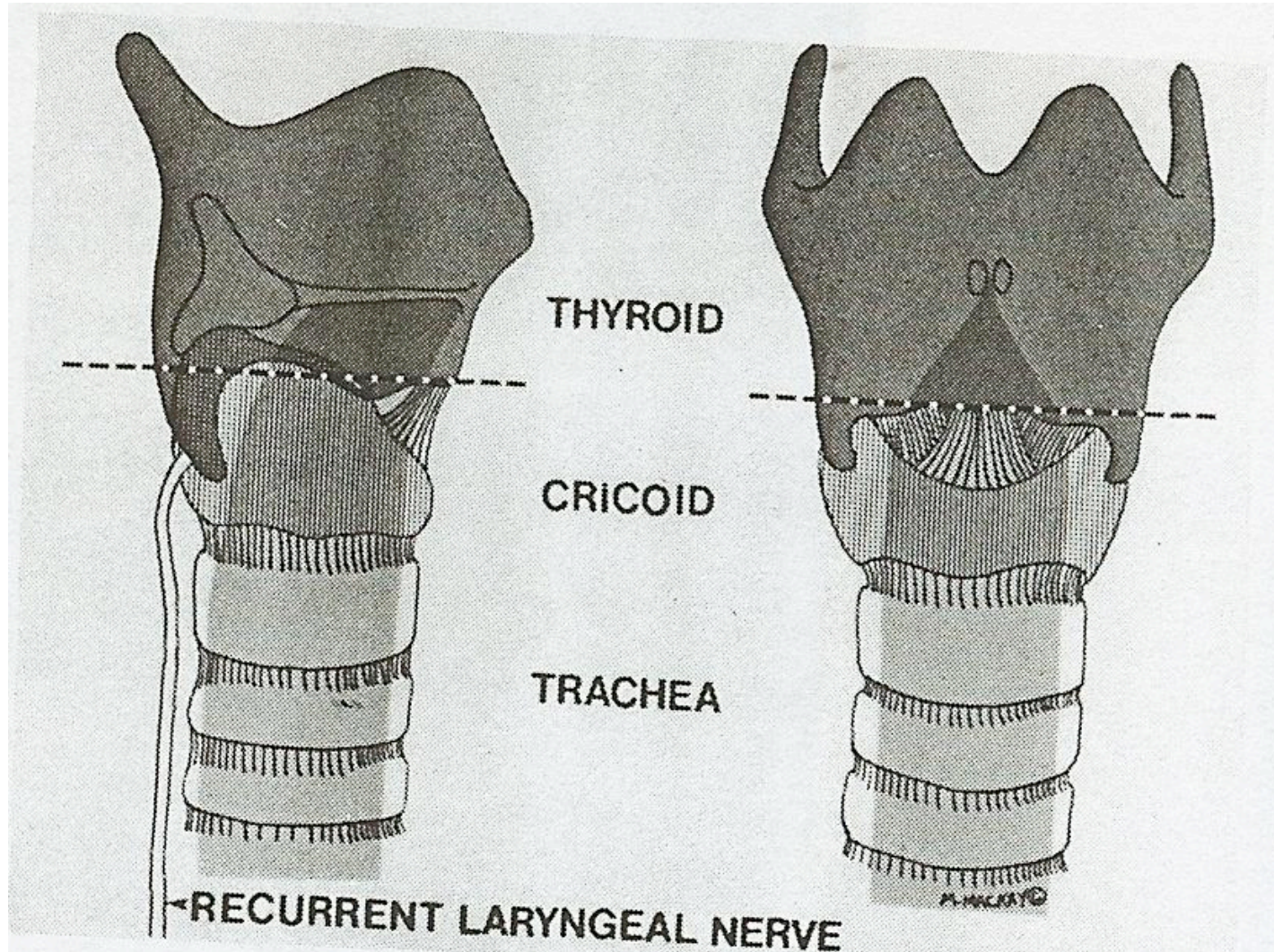
Tracheal resection



Subglottic stenosis

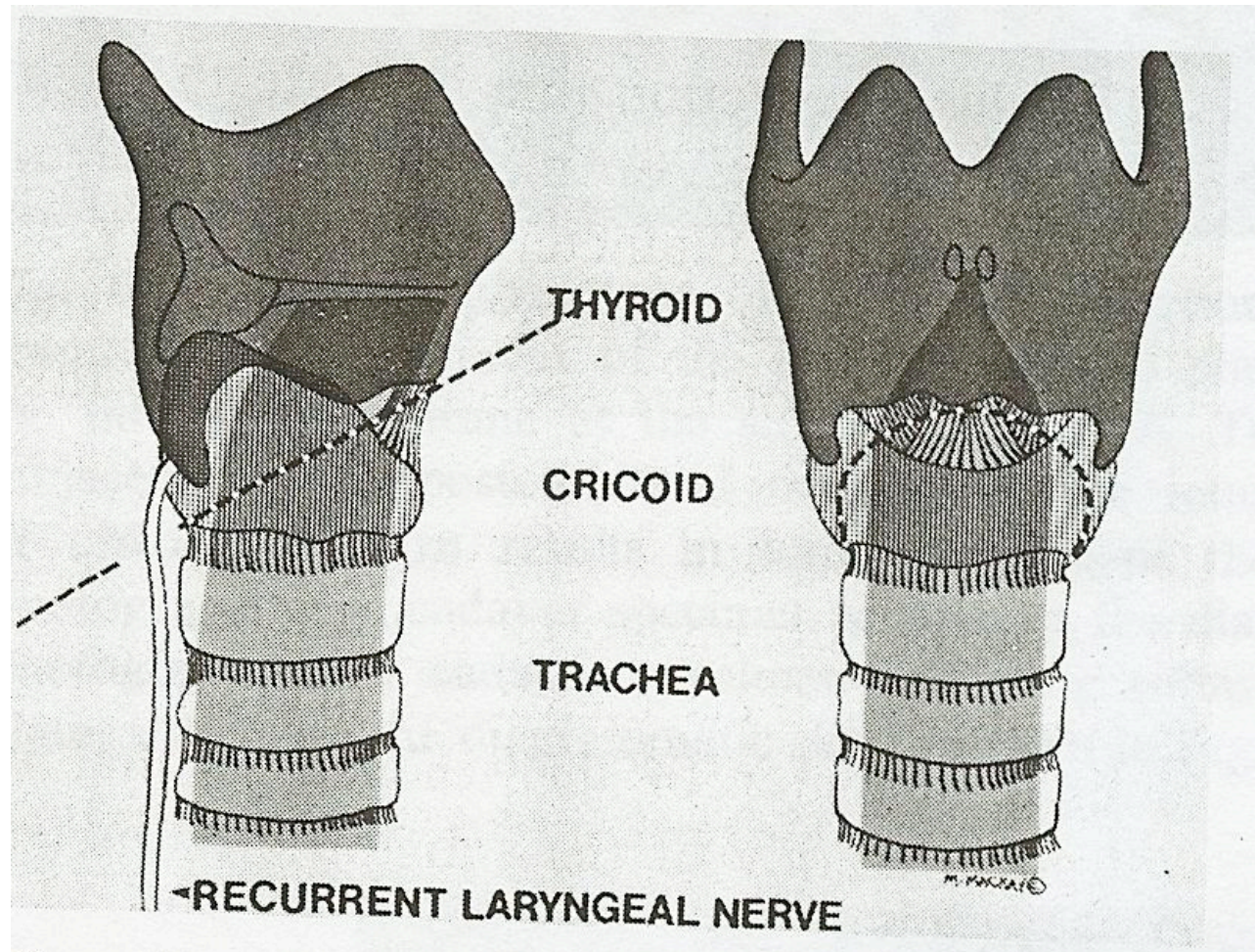


Cricotracheal resection

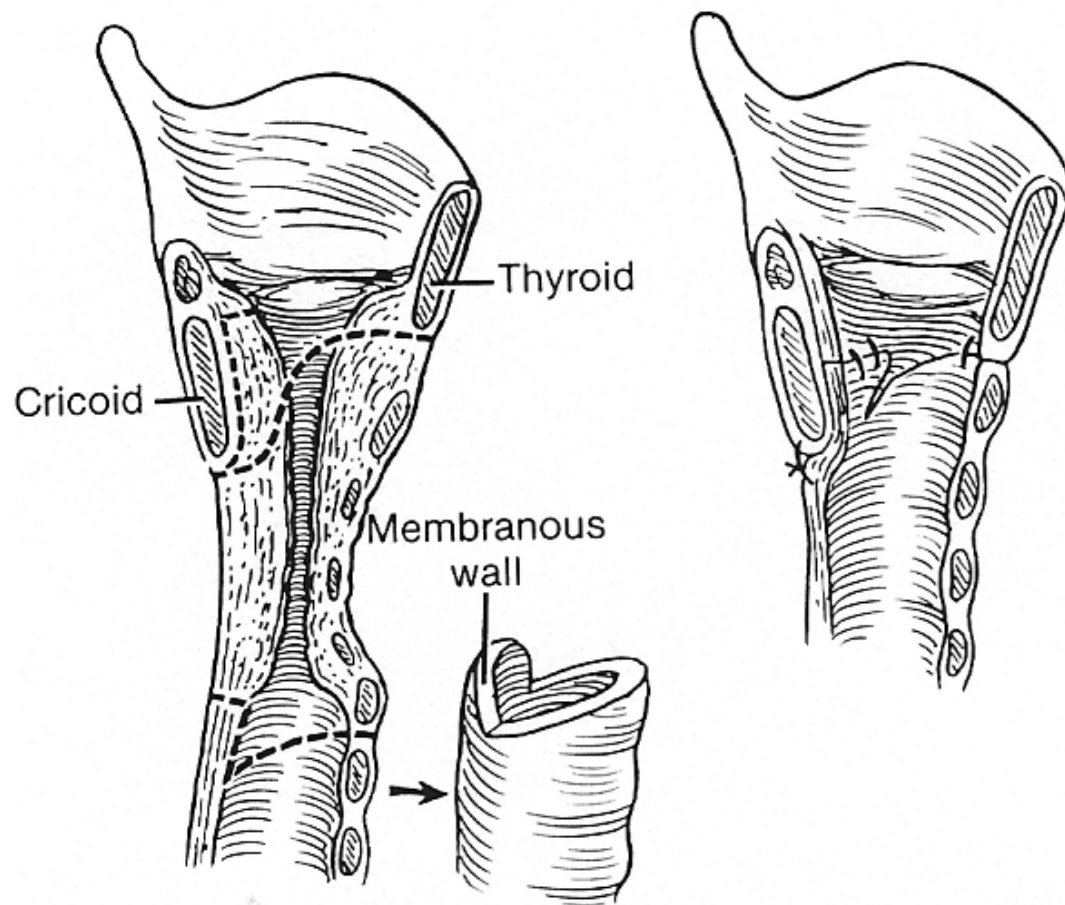


Cricotracheal resection

Pearson

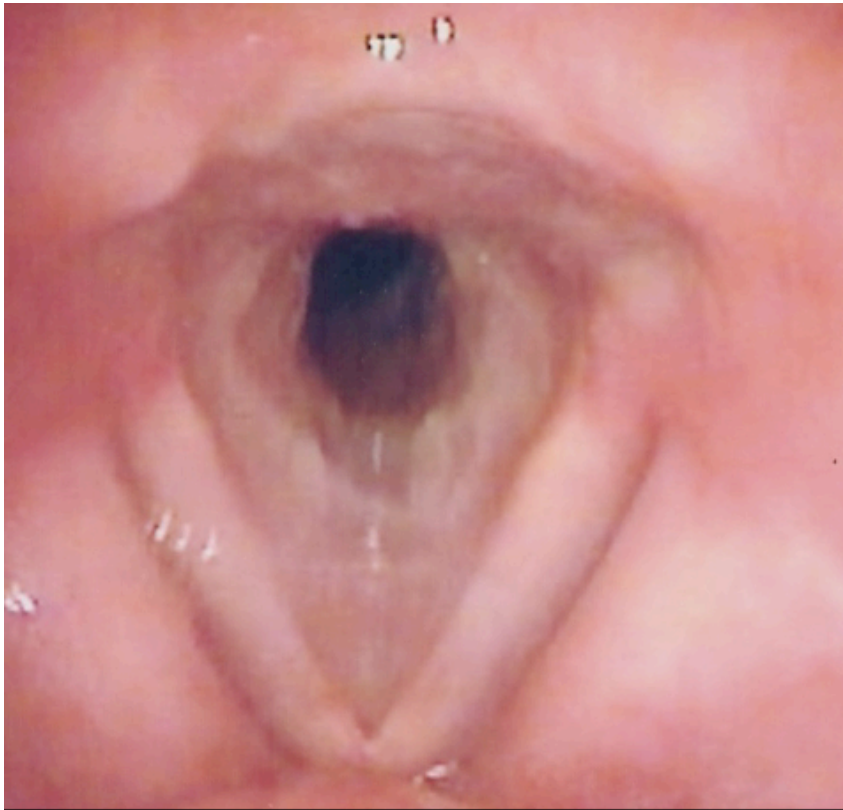


Cricotracheal resection

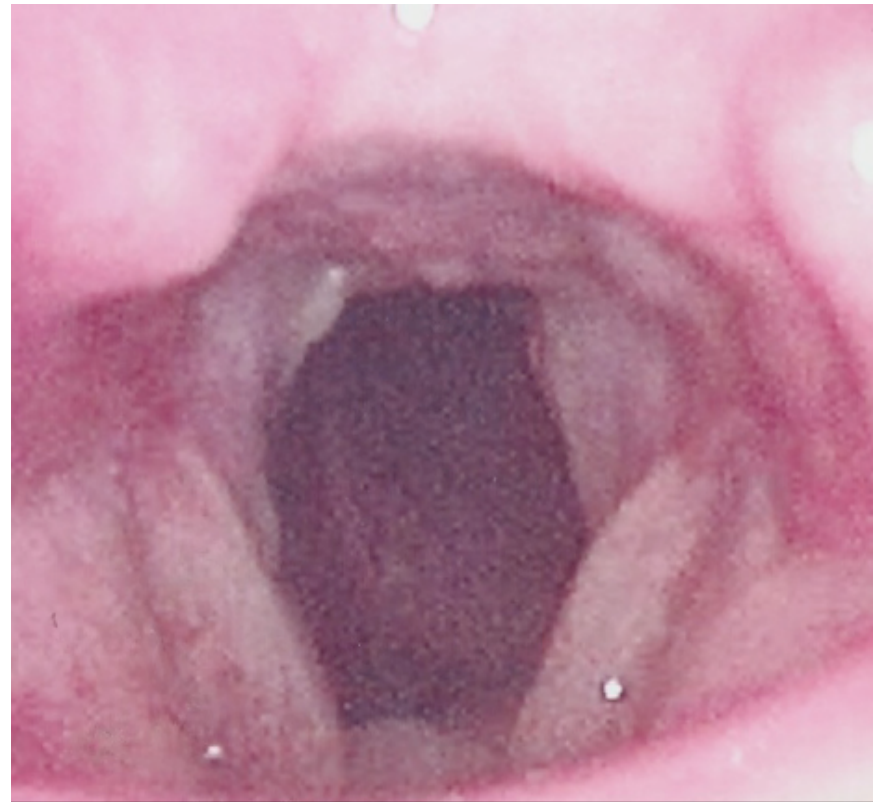


Cricotracheal Resection

PRE-CTR



POST-CTR



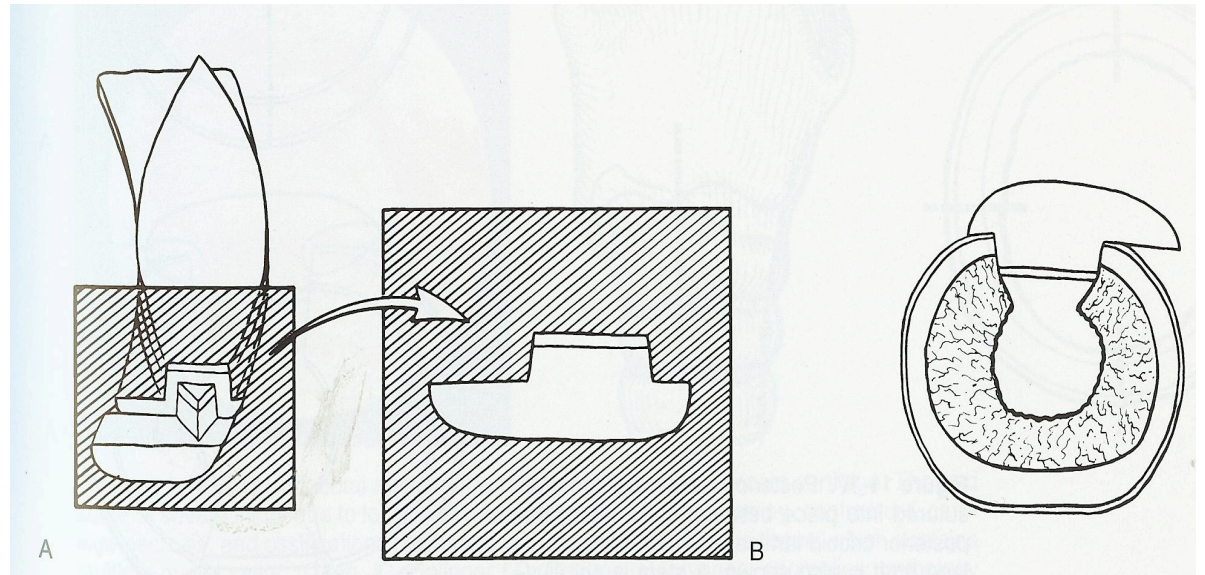
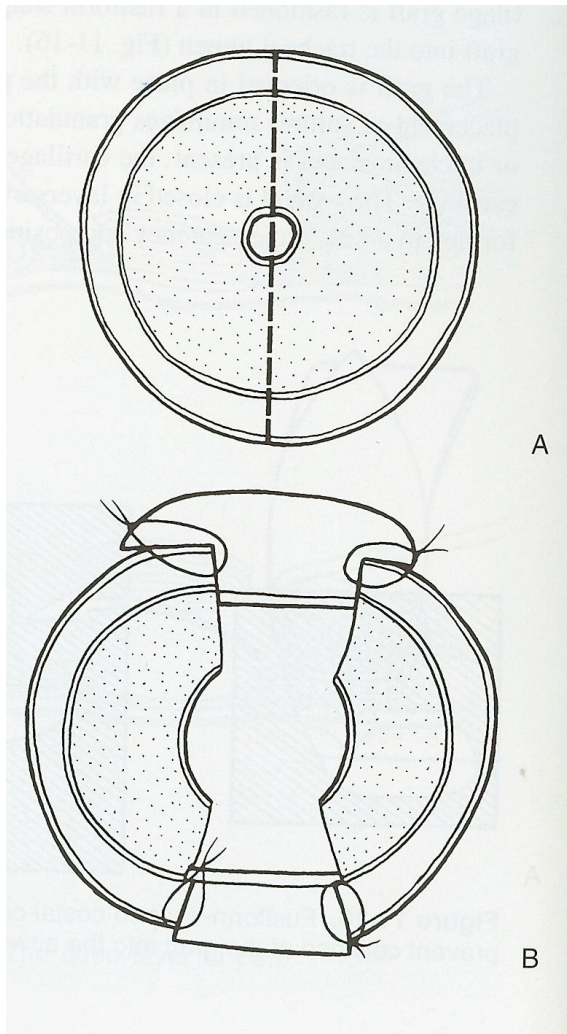
Long segment laryngotracheal stenosis

- Common scenarios
 - 2-level stenosis (glottic + subglottic, subglottic + tracheal, stenosis + tracheostomy tube)
 - Typically involvement of the stenosis is 3 cm or more
 - What are the options?
 - Reconstruct without removal of scar
 - Reconstruct with removal of scar

Treatment of Laryngotracheal Stenosis

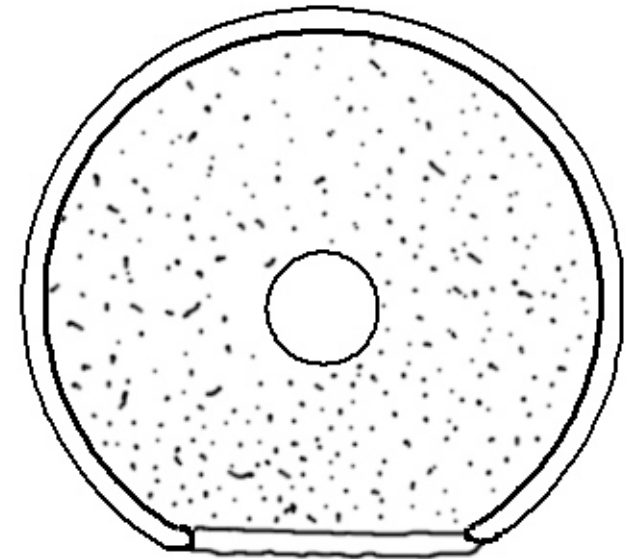
- Endoscopic
 - Laser
 - Dilation
 - ± Steroid injection, Mitomycin-C application
- Open Surgical
 - Primary resection and anastomosis
 - Laryngotracheoplasty (LTP)
 - Grafts (cartilage, mucosa)
 - Stenting
 - Single stage versus multistage

LTP: No scar removed

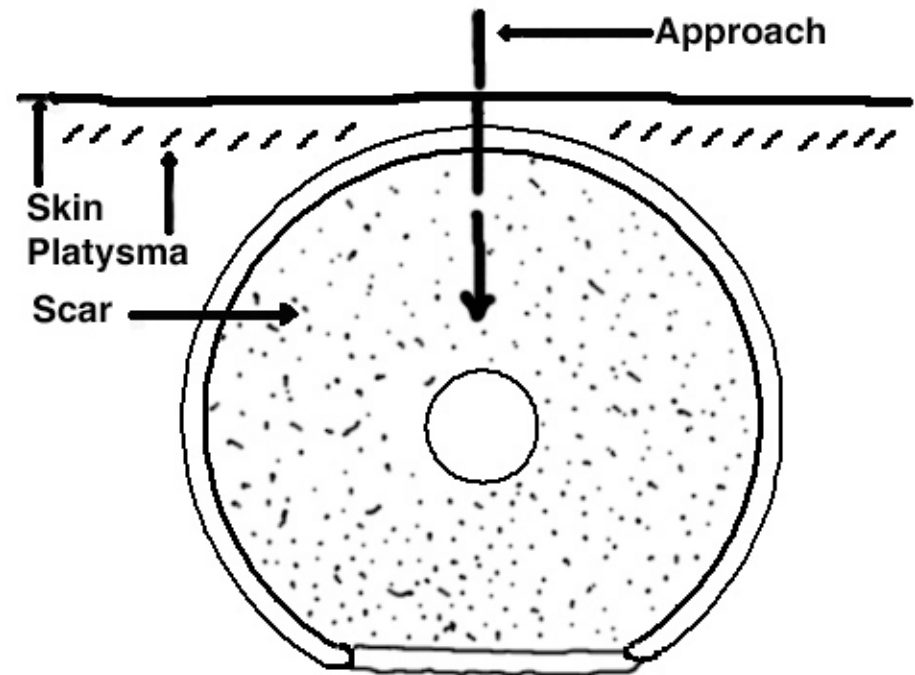
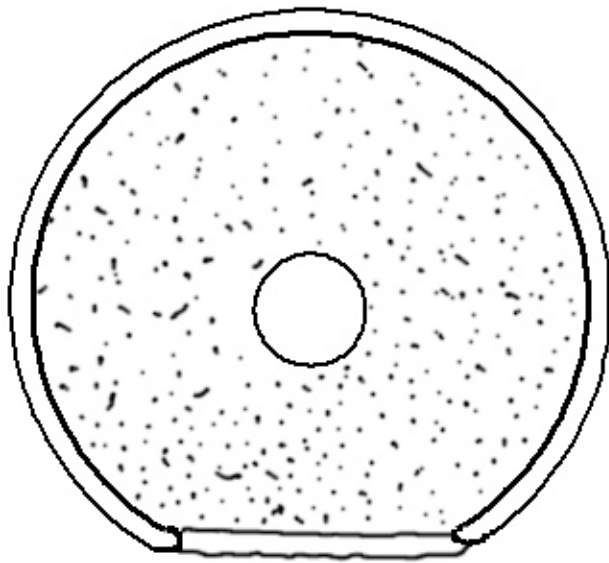


LTP: With scar removal

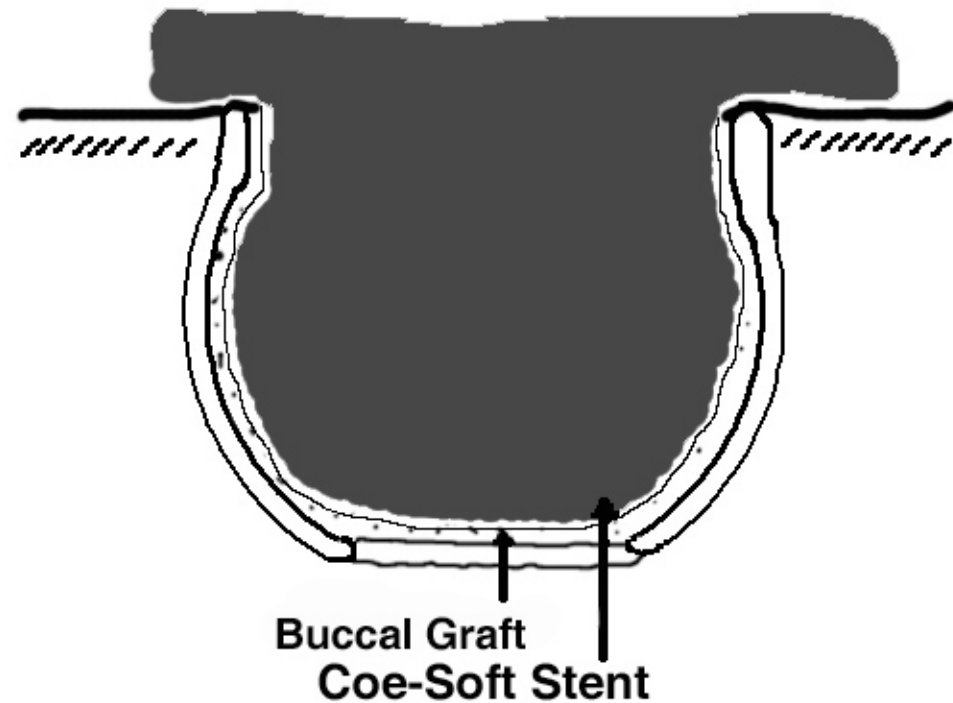
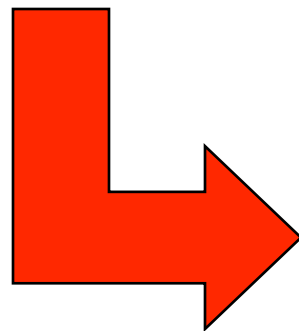
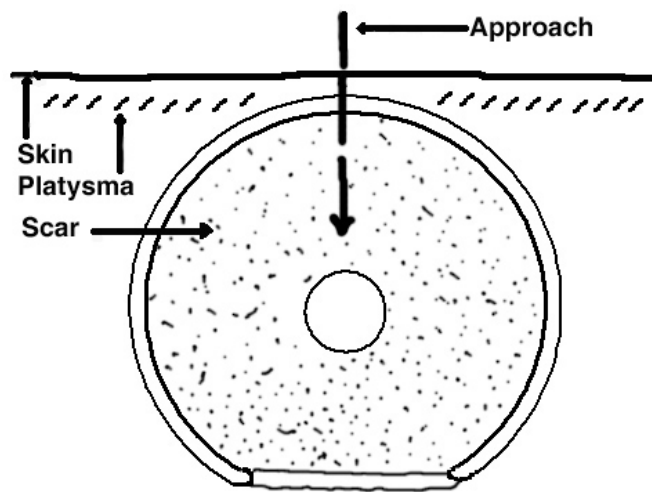
- Staged Laryngotracheoplasty
 - Resect scar and make an “open trough”
 - Line scar with mucosa (buccal)
 - Close trough in 2-3 weeks
 - Place T-tube stent



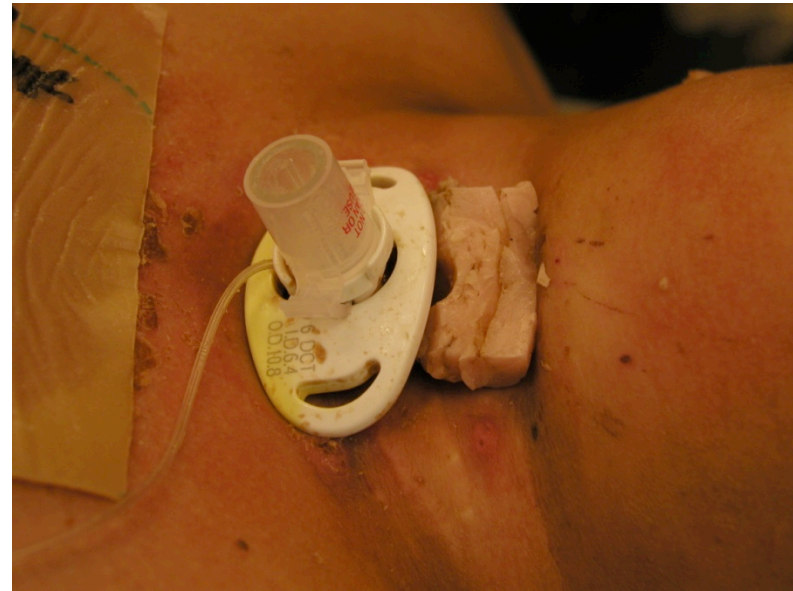
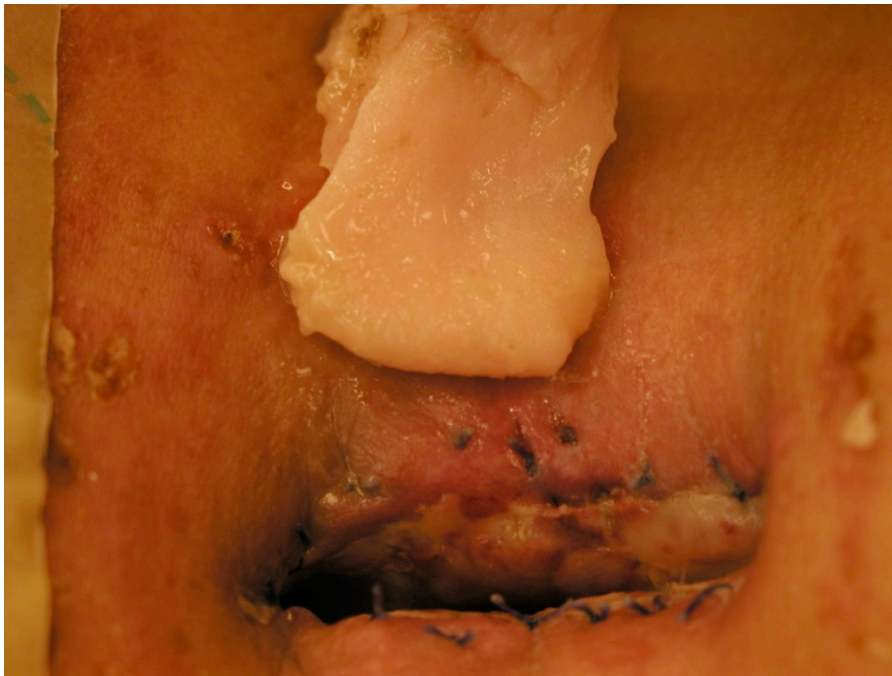
Laryngotracheoplasty – Stage 1

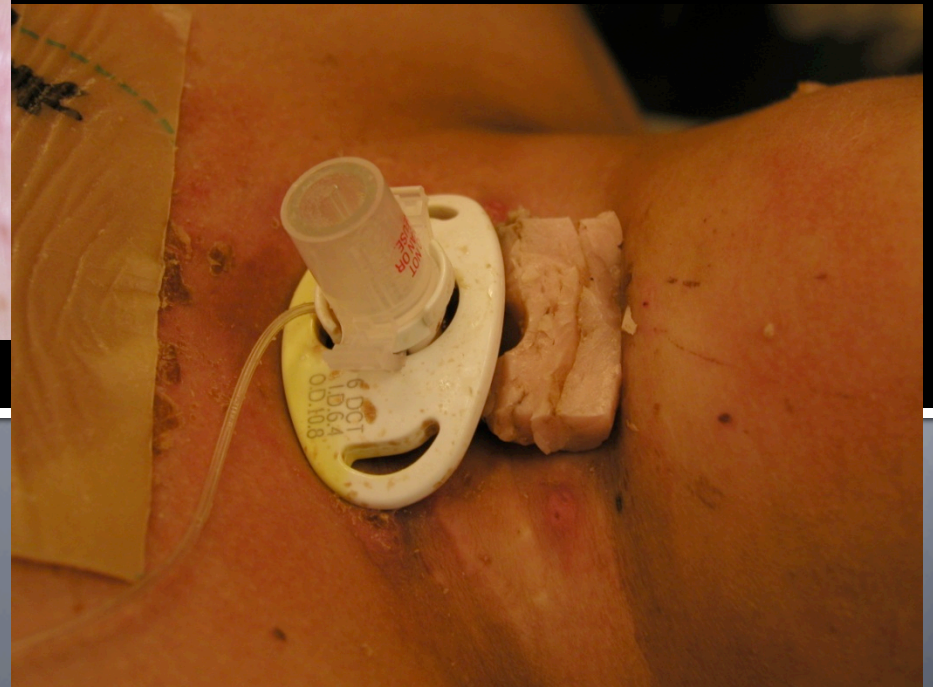


Laryngotracheoplasty – Stage 1

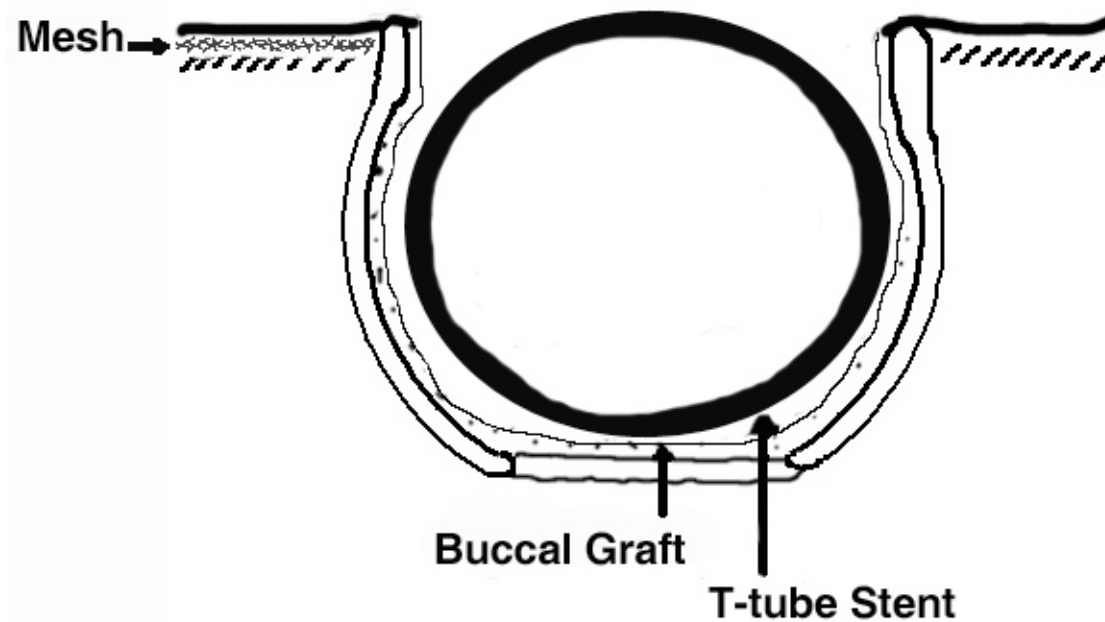


Stage I LTP





Laryngotracheoplasty – Stage 2



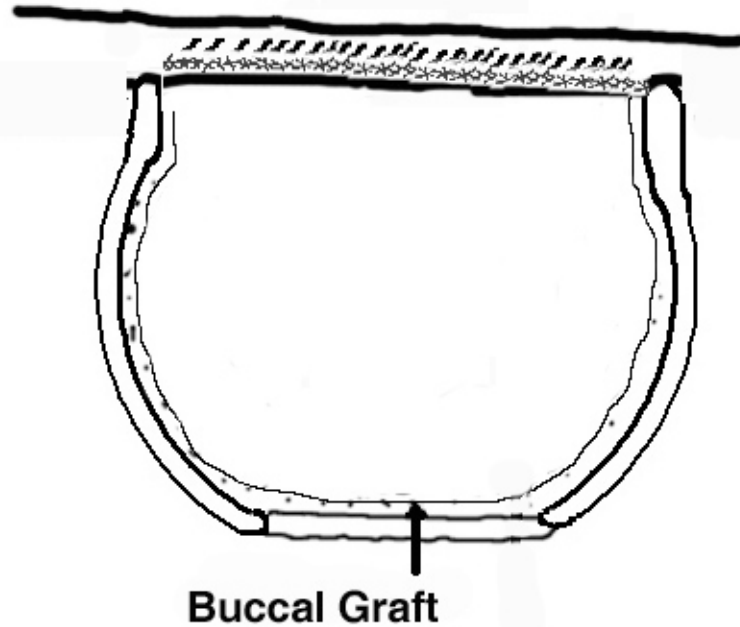
Laryngotracheoplasty – Stage 2



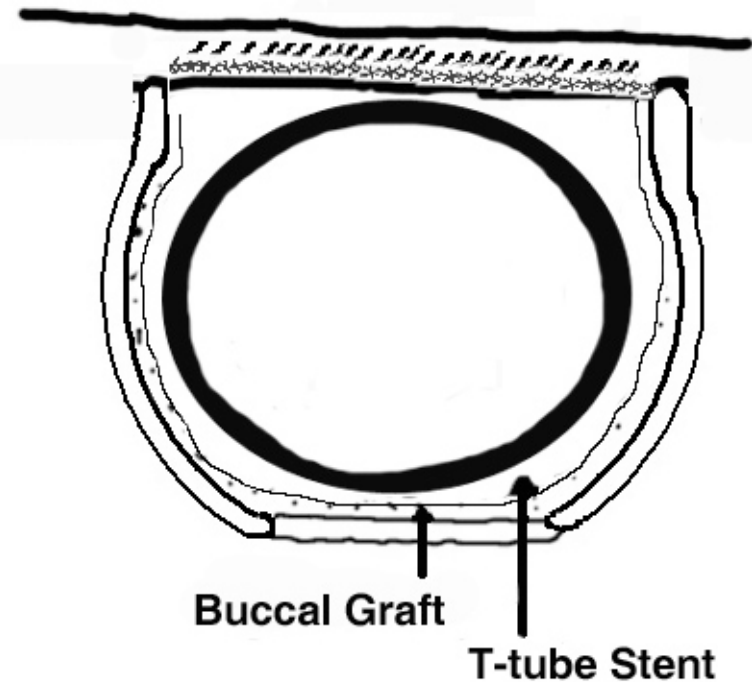
Stage II LTP



Laryngotracheoplasty – Stage 3



LTP Stage 3 – Without T-Tube



LTP Stage 3 – With T-tube

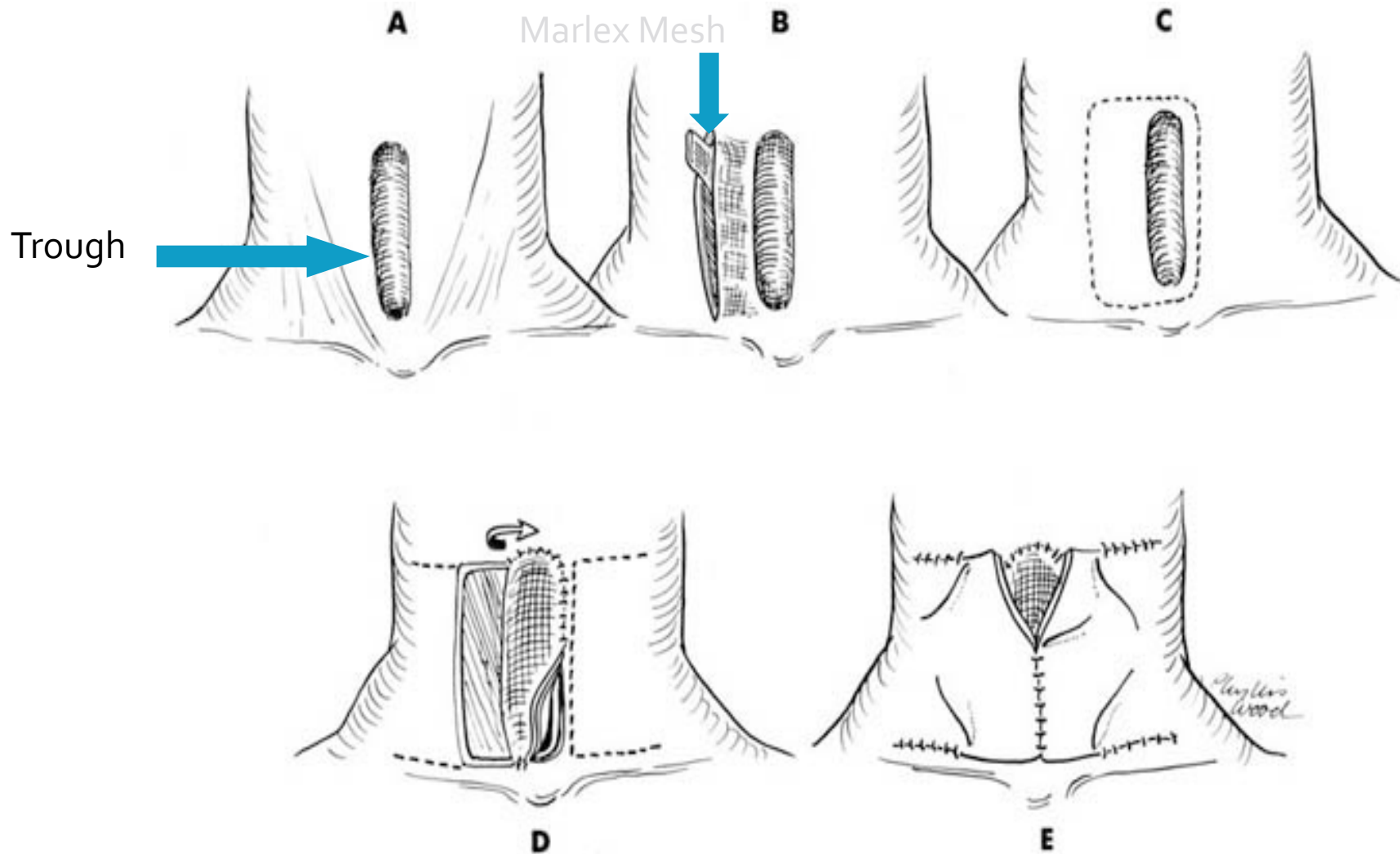
Staged LTP

- Remove stent in 6- months
- Replace with trach tube
- If no recurrence of stenosis then decannulate 2-3 weeks later

Staged LTP

- Staged Expansion Laryngotracheoplasty
 - Stage I (laryngotracheofissure, resection of stricture endoluminally, application of buccal mucosal graft, placement of prosthetic endoluminal bolster, open upper airway trough)
 - Stage II (placement of lateral marlex mesh)
 - Stage III (closure of anterior neotracheal wall incorporating mesh, advancement skin flaps)

Staged LTP

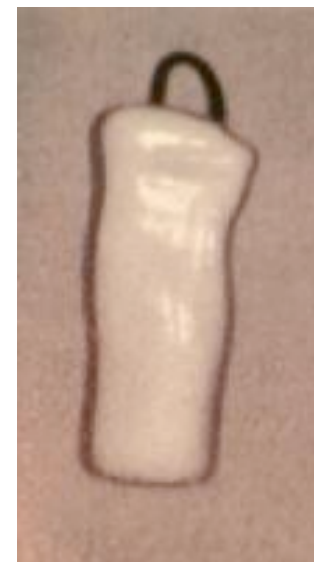
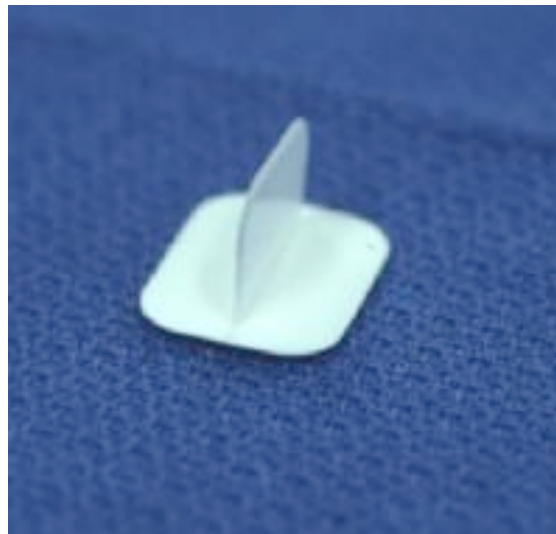
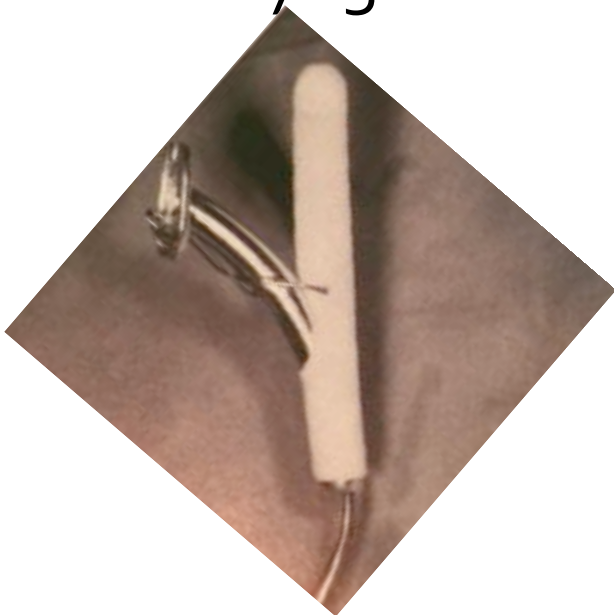


Laryngotracheal Stents

- Purpose of stents
 - Stabilize the larynx or trachea after surgery to prevent collapse of the lumen
 - Counteract or prevent recurrent scar formation
- Stent Trivia
 - The word stent is derived from Charles B. Stent, a British dentist who practiced in the late 19th century

Types of Stents

- Laryngeal
 - Aboulker stents, silicone stents, Montgomery laryngeal stents, endotracheal tubes, and laryngeal keels



Types of Stents - Tracheal

SILICONE TRACHEAL STENT

- Long-term tolerability
- Easily removable.
- Poor mucociliary clearance
- Can migrate

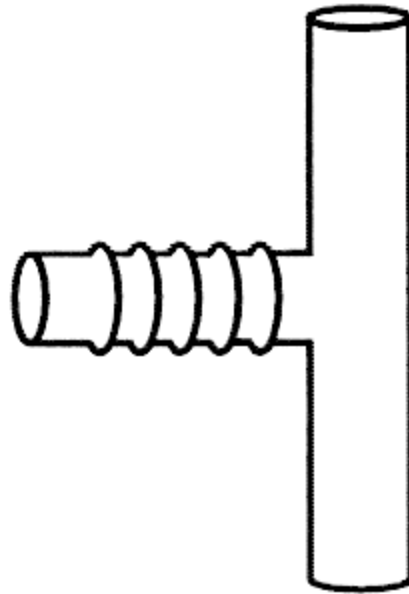
METALLIC TRACHEAL STENT

- Incorporates into mucosa
- Difficult to remove
- Better mucociliary clearance
- More reaction and granulation tissue

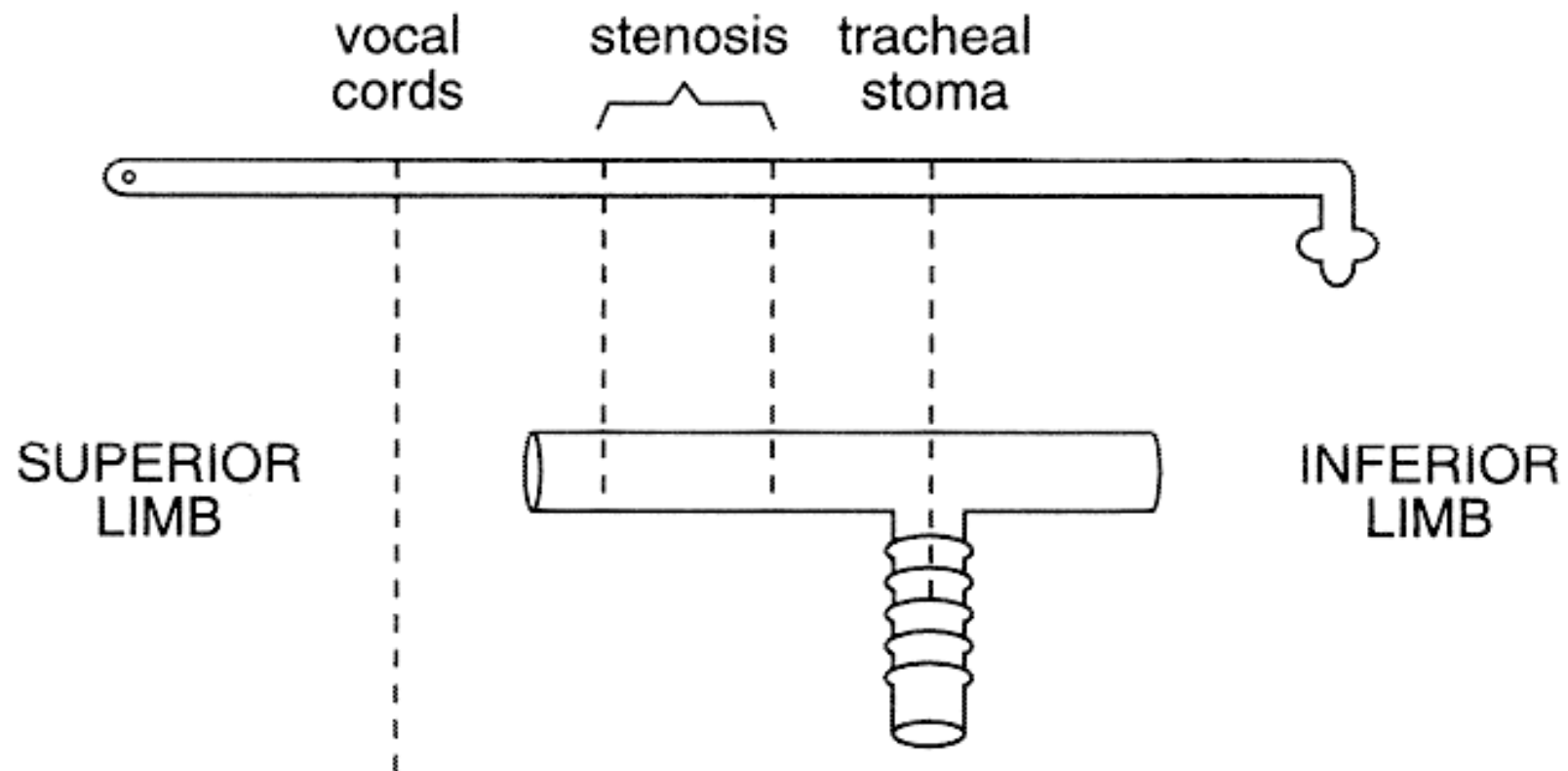
T-Tube



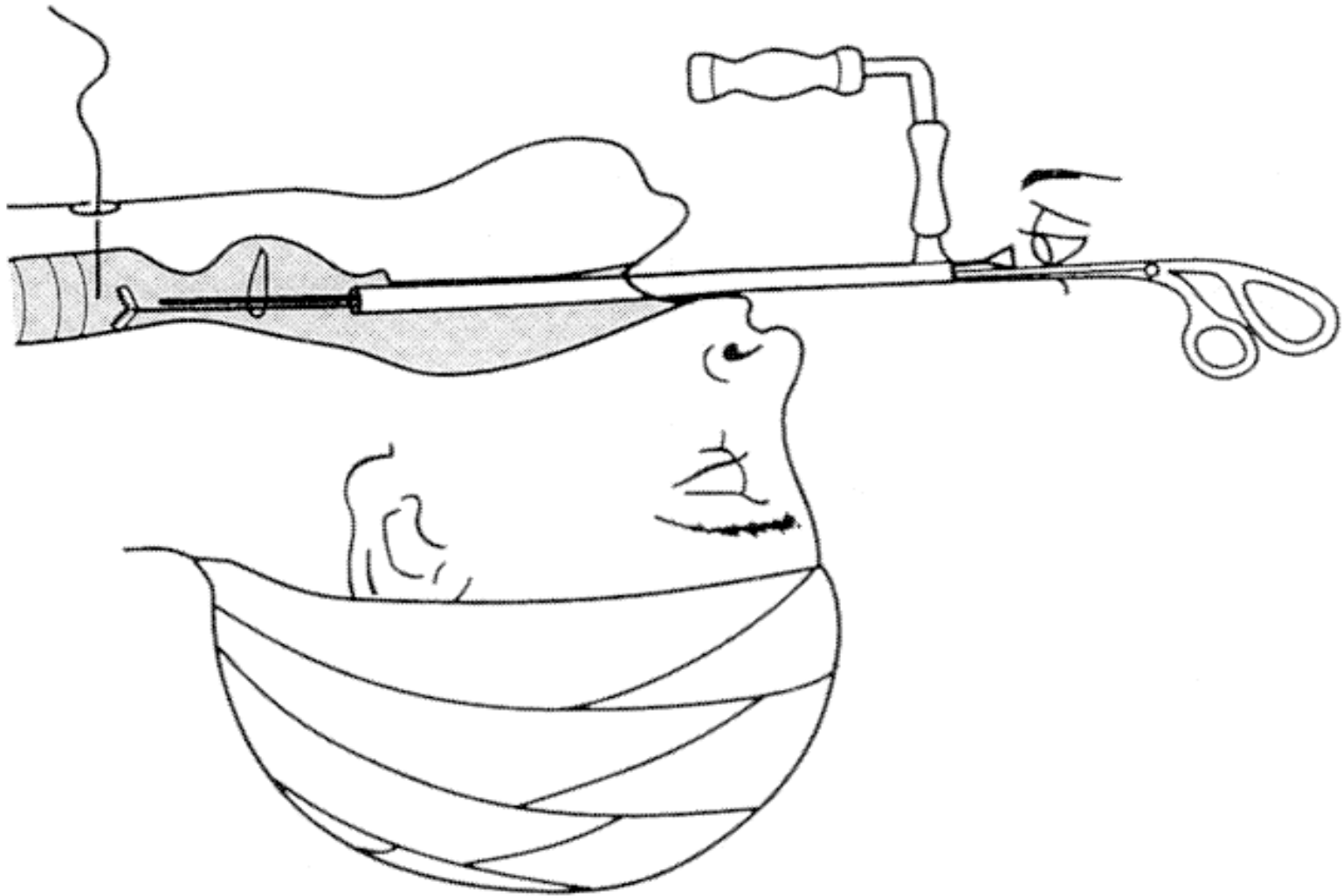
Insertion of a T-tube



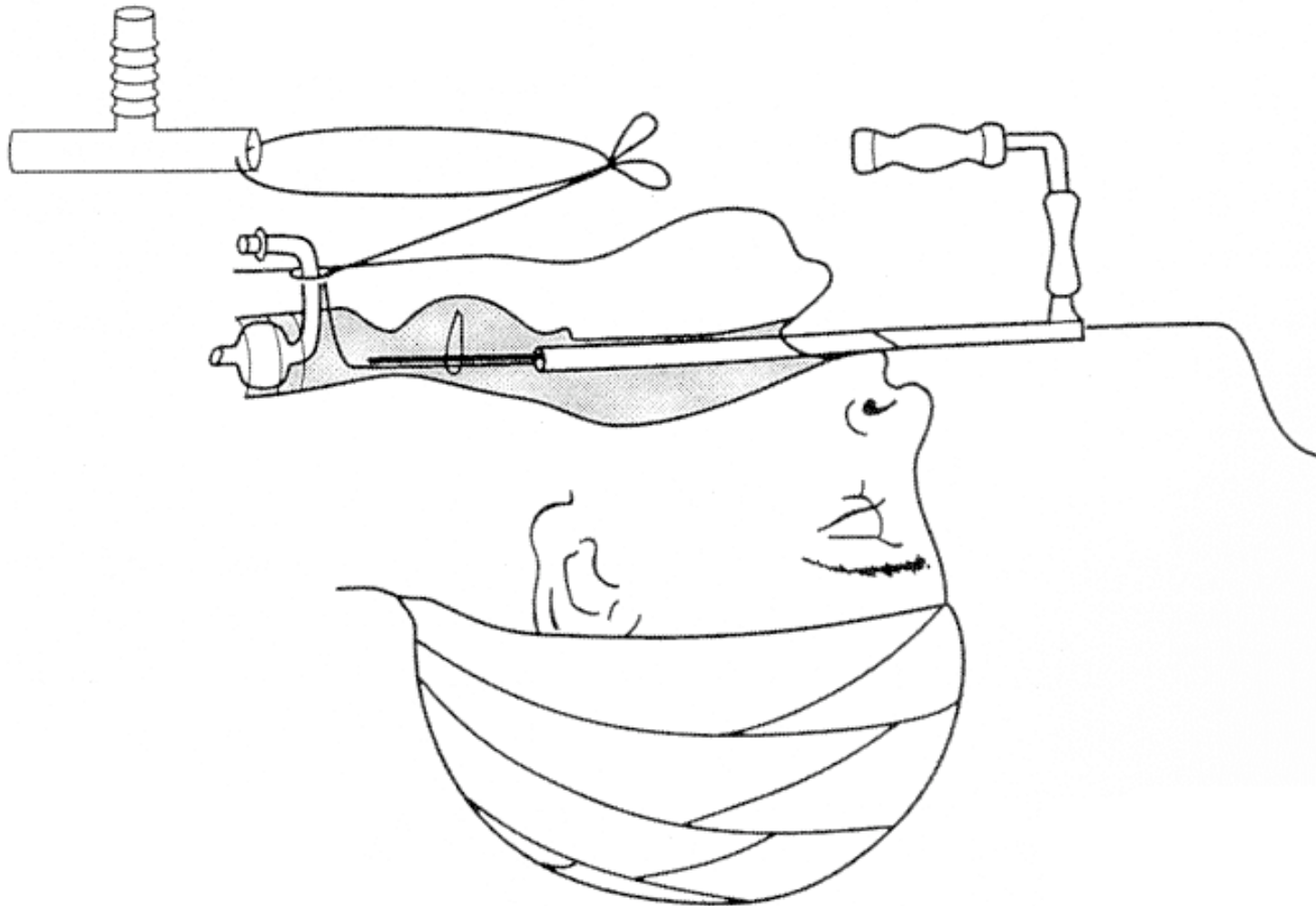
Insertion of a T-tube



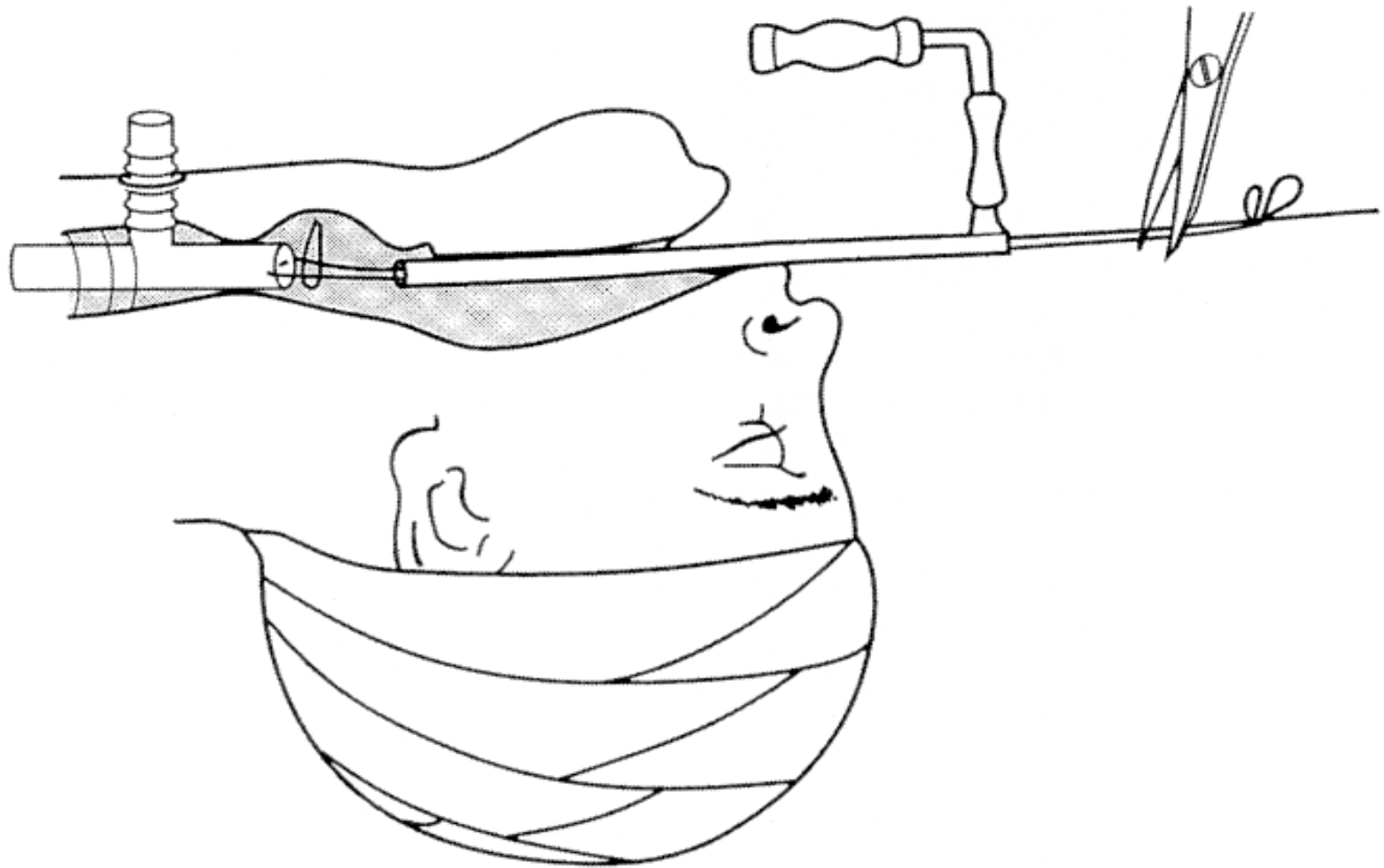
Insertion of a T-tube



Insertion of a T-tube

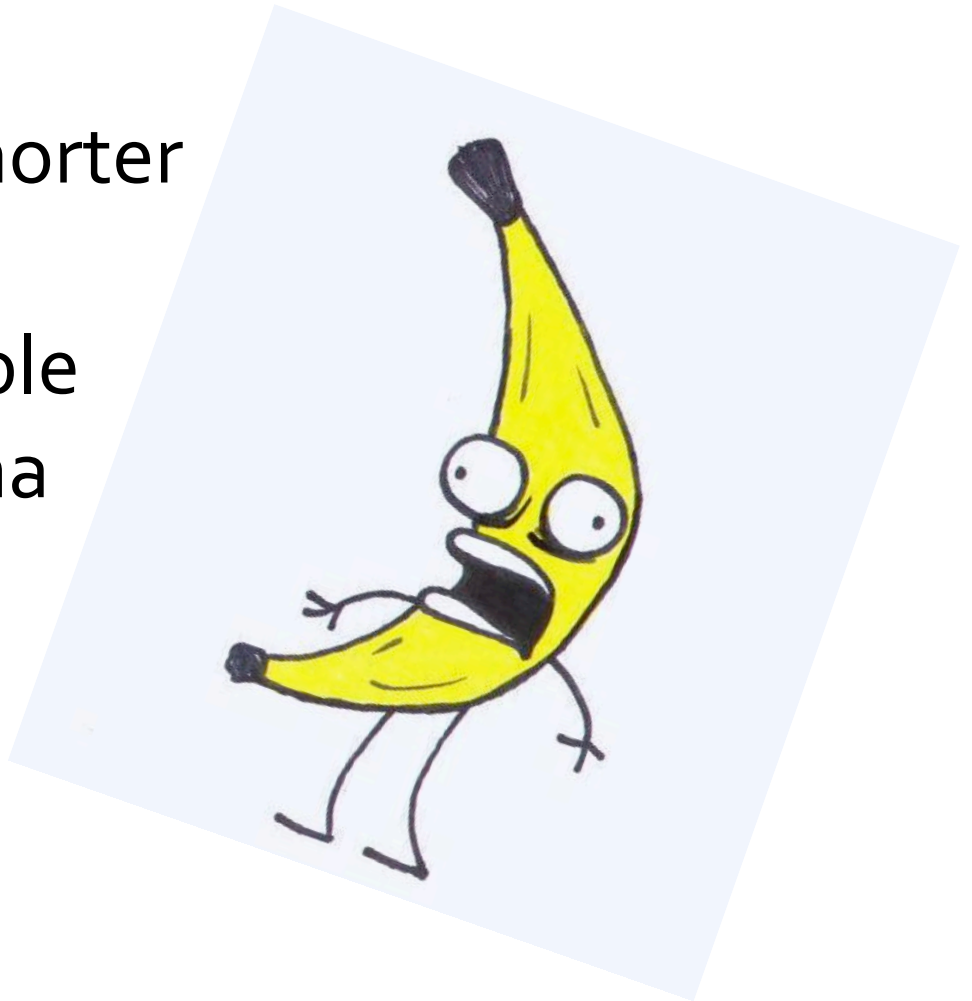


Insertion of a T-tube



Removal of a T-tube

- Curved hemostats
- Know which limb is shorter
 - Take this side out first
- Grasp as low as possible
- Pull it out like a banana



Case Presentations #1

- Principles
 - **Subglottic/tracheal stenosis –**
 - No trach, not-intubatable
 - LMA
 - Endoscopic Balloon Dilation with CRE catheter system
 - CTR vs. staged LTP if serial dilations not sufficient or desired
 - Or CTR vs LTP, trach through stenosis under visualization

Case Presentations #2

- Principles
 - **Subglottic lesion, tracheostomy present**
 - Assess location of tracheotomy and distance from stenosis
 - Then perform CTR versus staged LTP
 - Need repeated procedures

Case Presentations #3

- Principles
 - **Tracheal Stenosis – soft web**
 - Do LMA (allows one to visualize stenosis endoscopically), balloon dilation
 - If severe, Do LMA, then trach, then assess lesion
 - **If severe tracheal lesion then do trach through stenosis**
 - Primary resection with anastomosis
 - Tracheoplasty (staged)
 - For **severe stenosis** best to perform awake trach, then as above