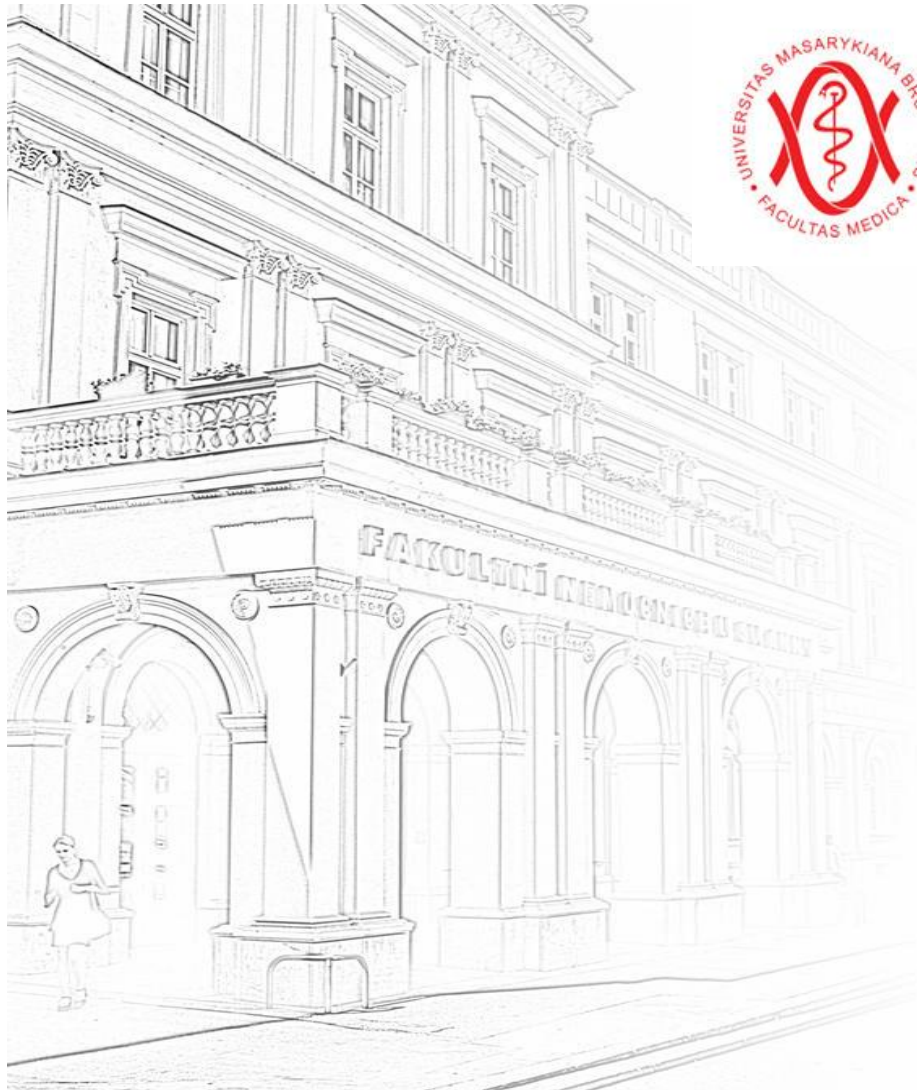


FAKULTNÍ
NEMOCNICE
U SV. ANNY
V BRNĚ



LARYNX and HYPOPHARYNX

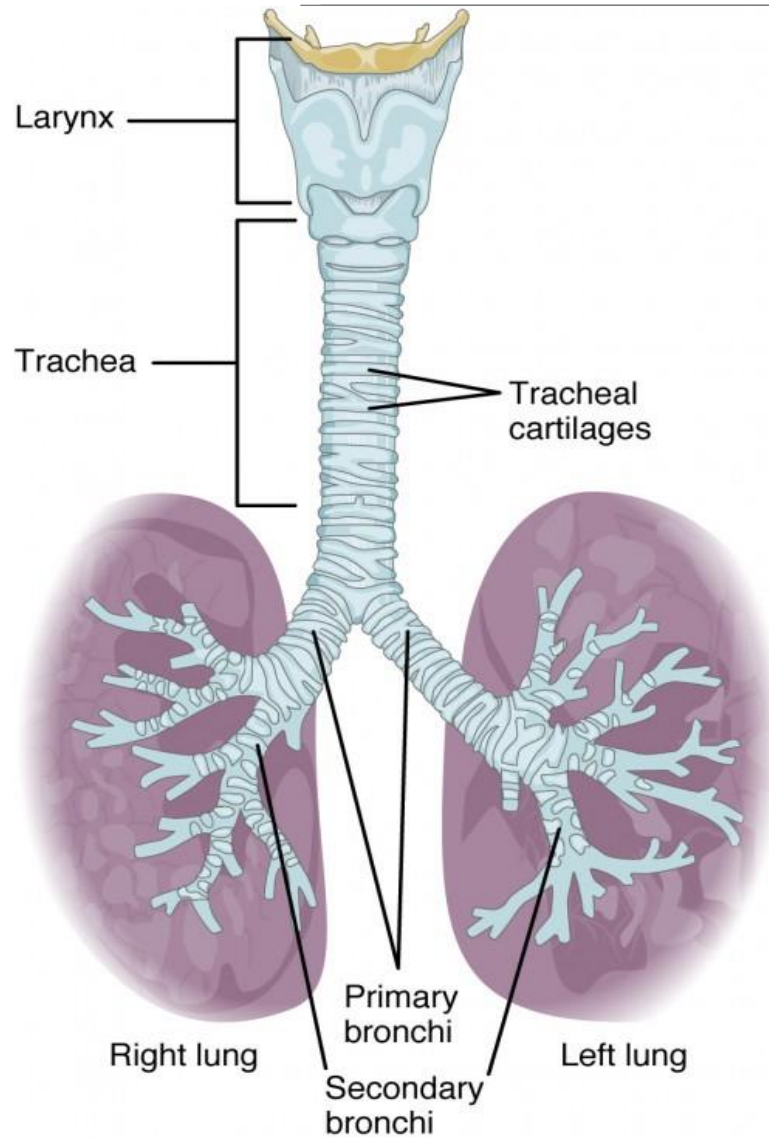
Ass.prof. P. Smilek, MD, Ph.D.

**ENT Clinic of Masaryk university, Brno
Faculty St. Ann Hospital**

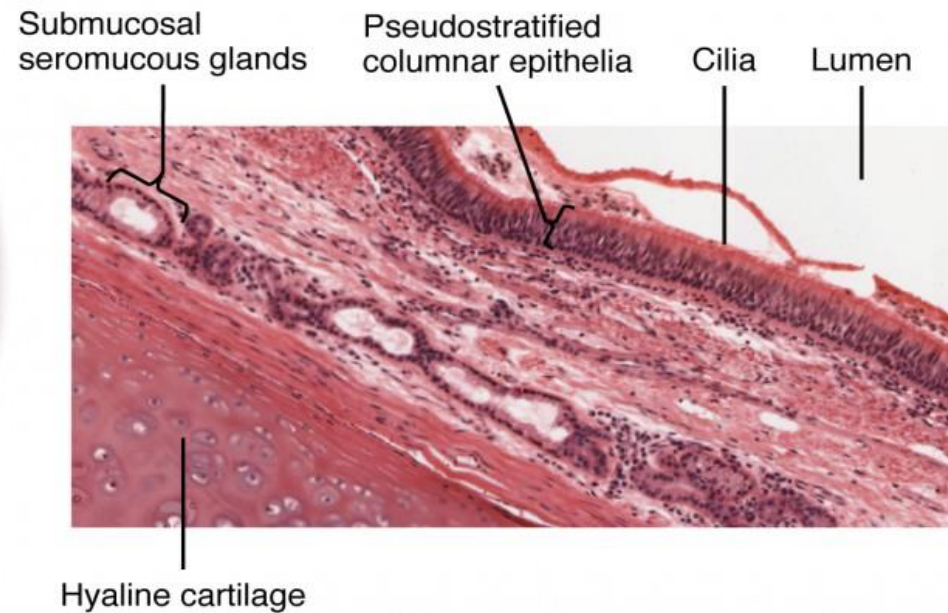
Head: Ass.prof. Gál Břetislav, MD, Ph.D.

Pekařská 53, Brno , 656 91

Air passages



(a)

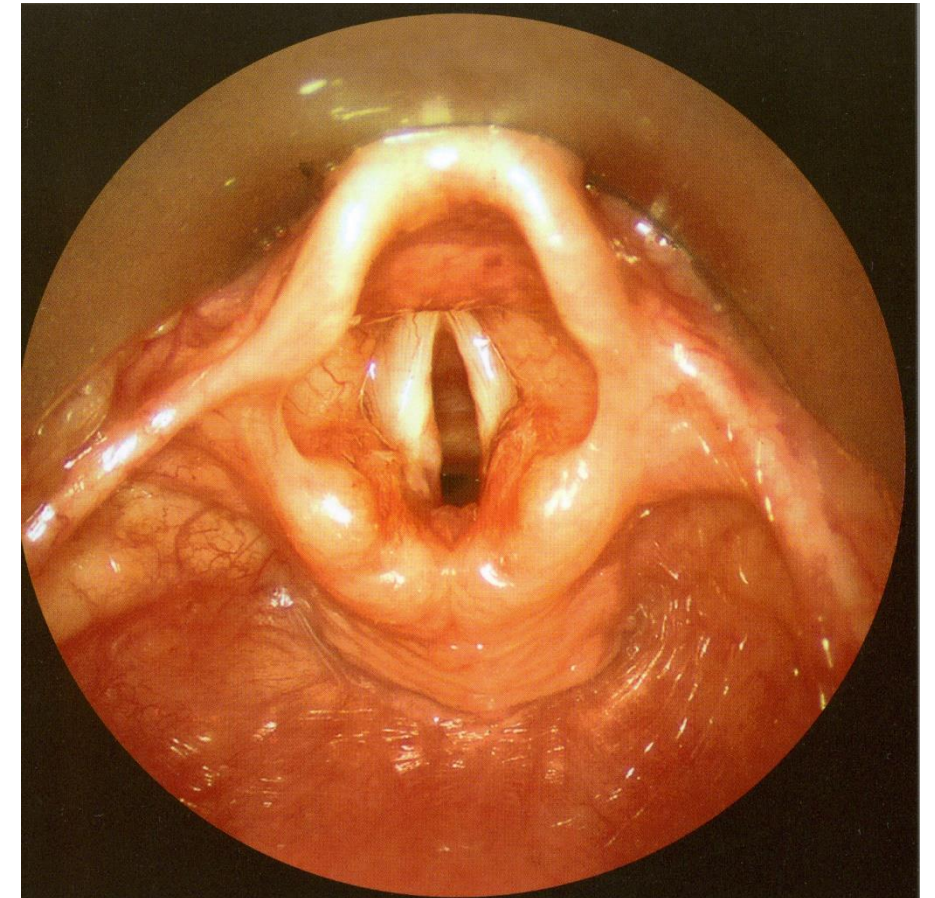
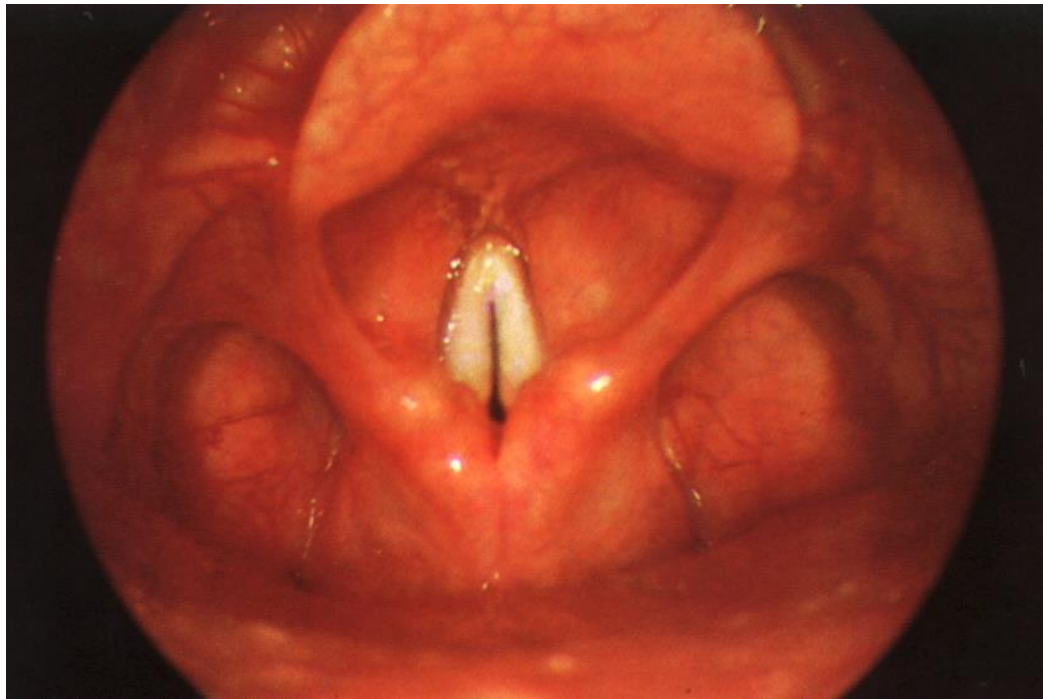


(b)

LARYNX - function

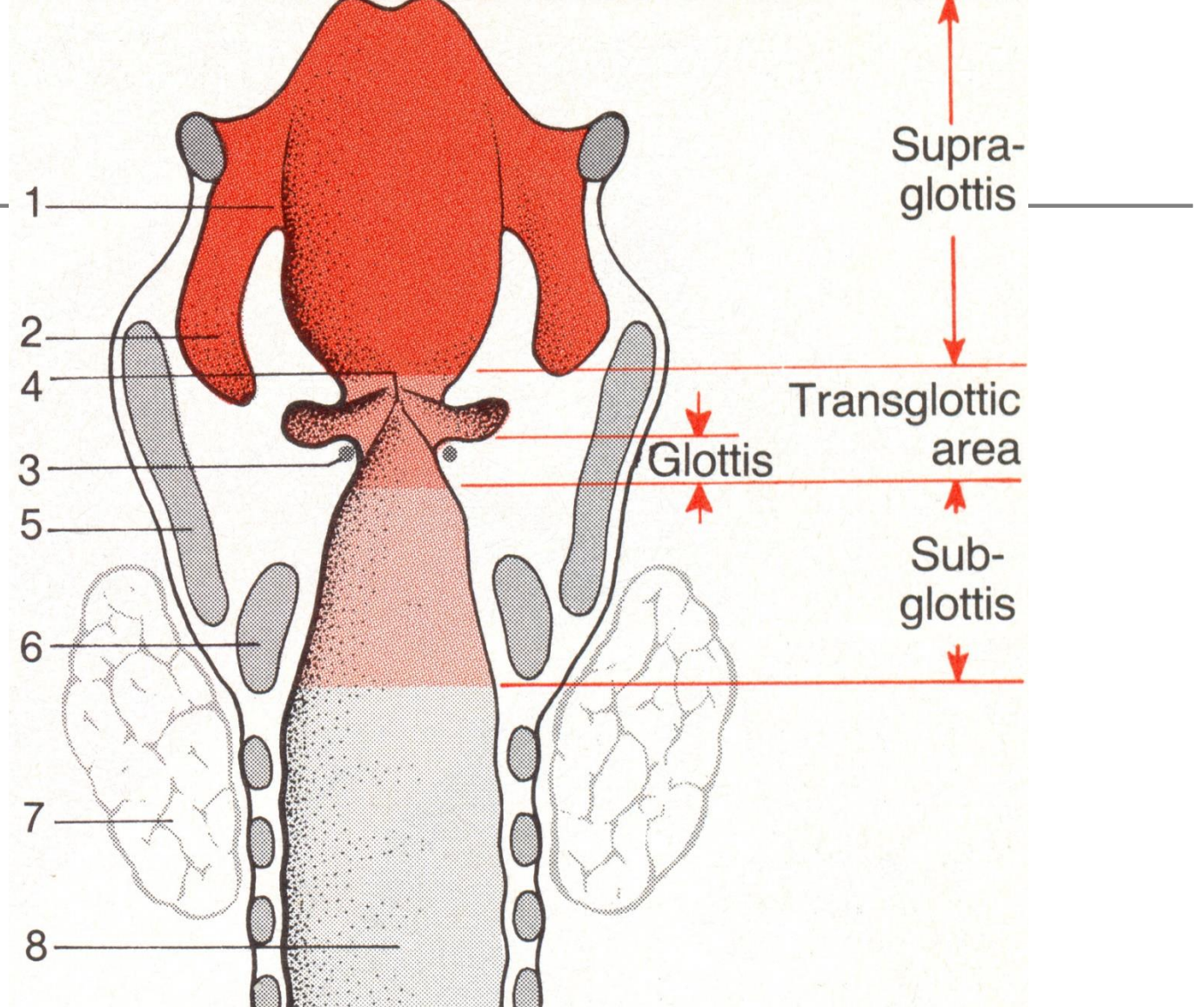
Function: vital (respiration), **social** (phonation), **protective of lower airways** (reflexes: closure of aditus, glottis, cough reflex etc.)

Pseudostratified columnar epithelium
X squamous cell epithelium

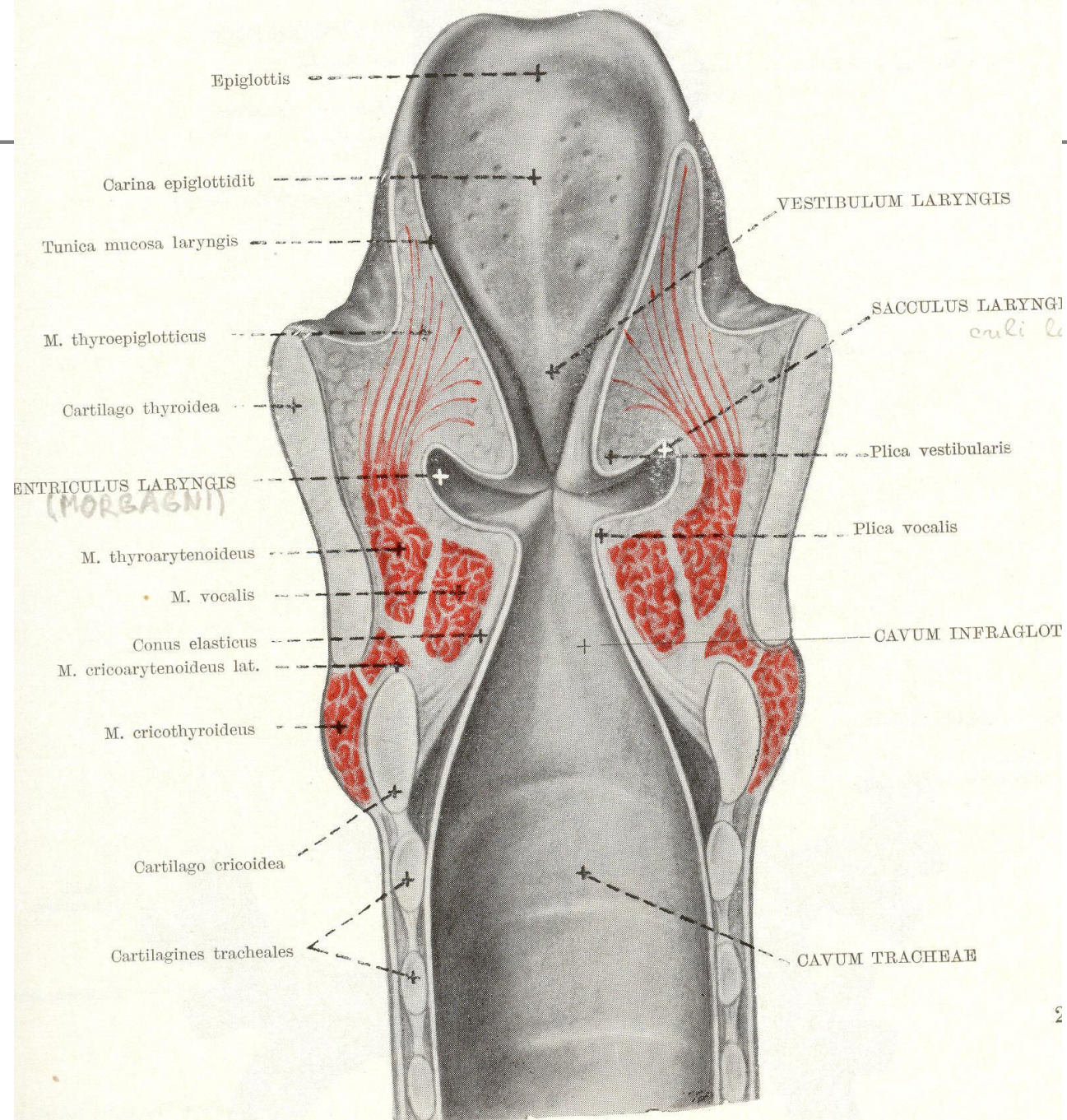


Frontal section through the larynx

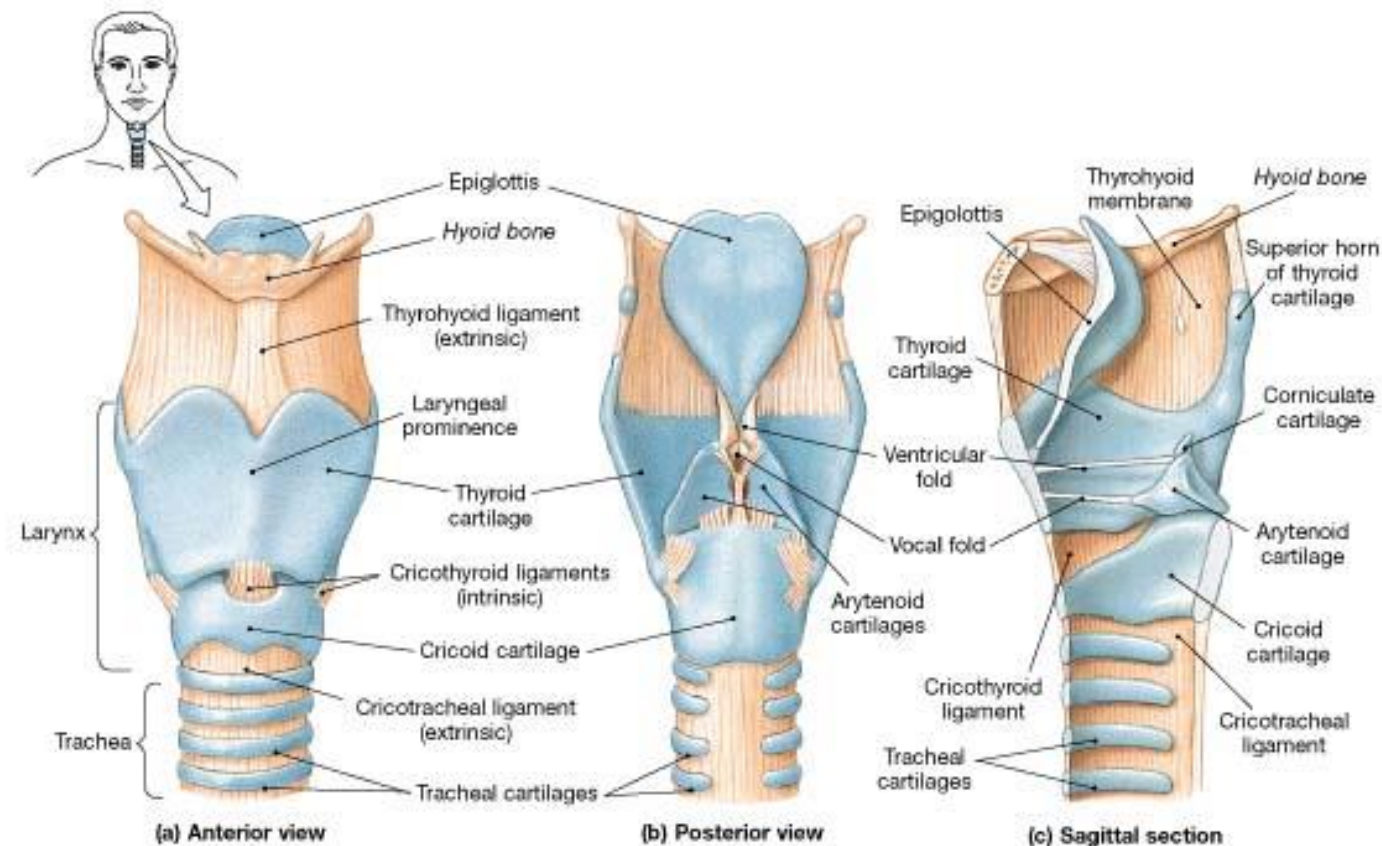
„sandclock, hourglass“ shape



1. Aryepiglottic fold, 2. recessus piriformis, 3. vocal cord, 4. anterior commissure, 5. thyroid cartilage, 6. cricoid cartilage, 7. thyroid gland, 8. trachea. (Taken from Becker, Neumann, Pfaltz. Ear, Nose and Throat Diseases 1989).



ANATOMY of the larynx

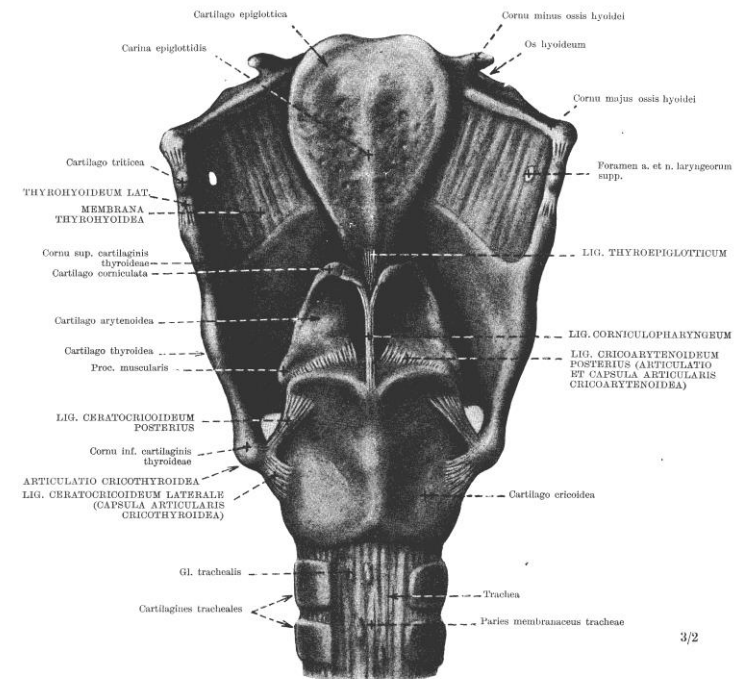
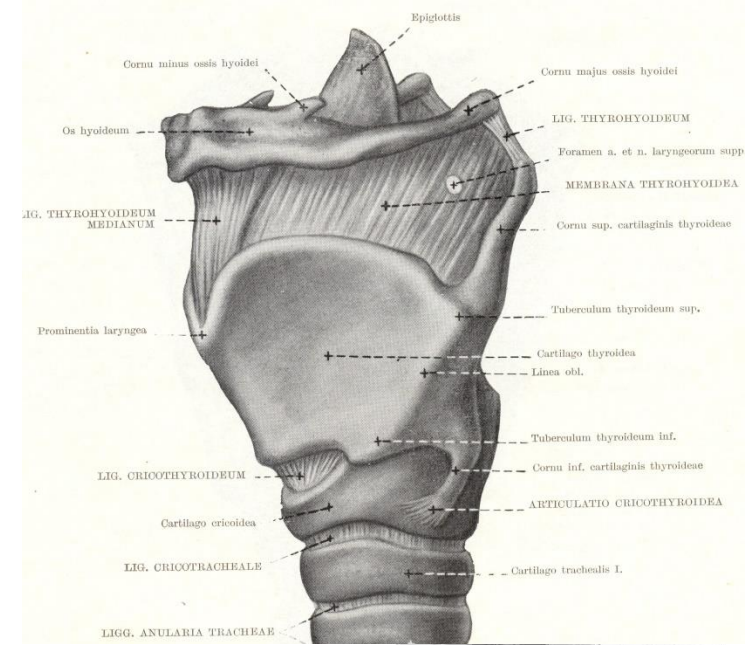


• **FIGURE 23-4** Anatomy of the Larynx. (a) Anterior view of the intact larynx. (b) Posterior view of the intact larynx. (c) Sagittal section through the larynx.

Larynx

3 non-pair cartilages (thyroid, cricoid and epiglottis)

3 pair cartilages – arytenoidea, corniculatae (Santorini), cuneiformes (Wrisbergi)





Laryngeal muscles

Muscle moving larynx externally:

infrahyoid (sternohyoideus, -thyreoideus, thyreohyoideus, omohyoideus), suprahyoid

Ones 'own laryngeal muscles:

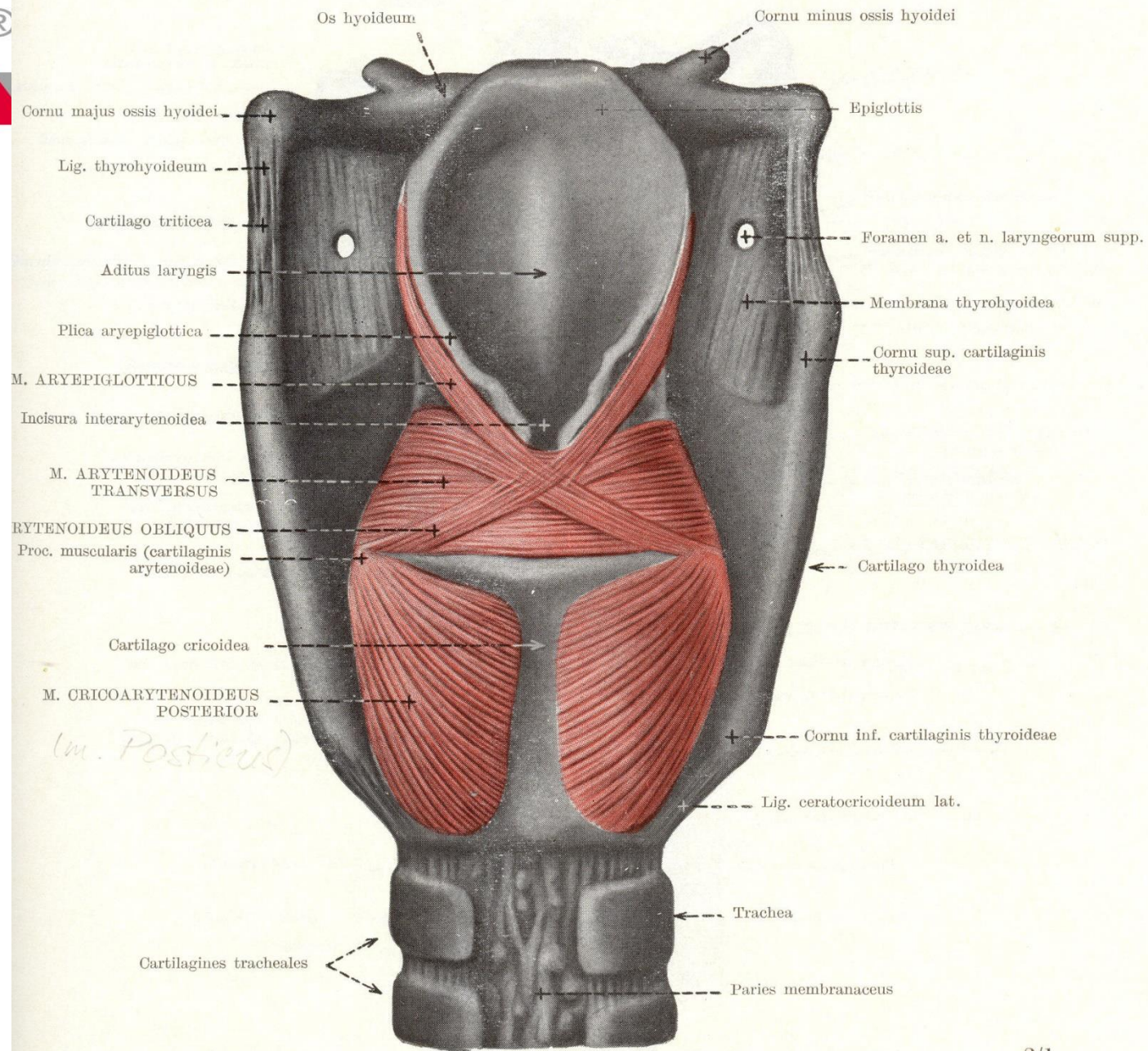
Abductores (open) – m. cricoarytenoideus post. (POSTICUS)

Adductores (close) – cricoarytenoideus lat., arytenoideus transversus

Tensores (stretch) – m. cricothyreoideus (r. ext. N. laryngici sup.), m. vocalis

Muscles moving aditus laryngis

m. aryepiglotticus, thyroepiglotticus



Schema of function of laryngeal muscles

A-cartilago arytenoidea

C-cartilago cricoidea

T-cartilago thyroidea

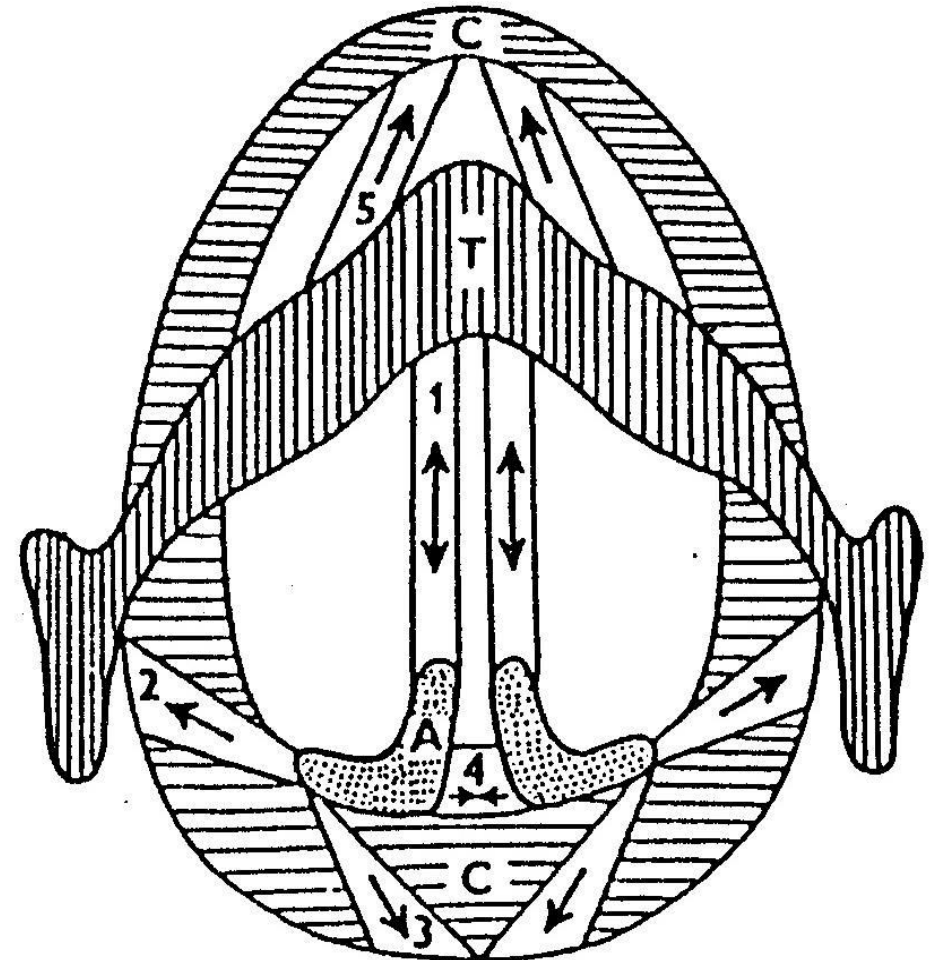
1.-m. thyroarytenoideus /vocalis/ "internus"

2.-m. cricoarytenoideus lateralis

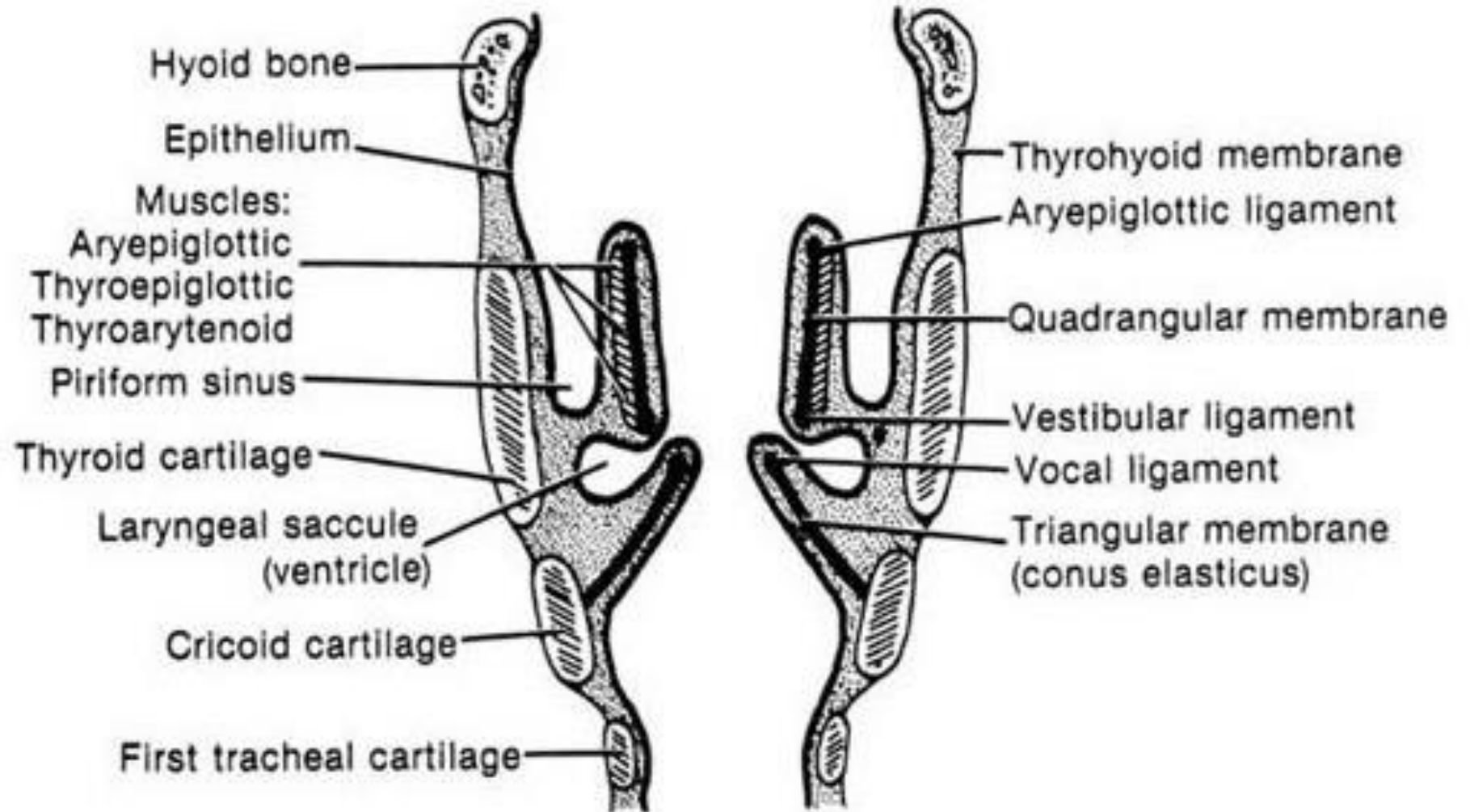
3.-m. cricoarytenoideus posterior "posticus"

4.-m. arytenoideus transversus "transversus"

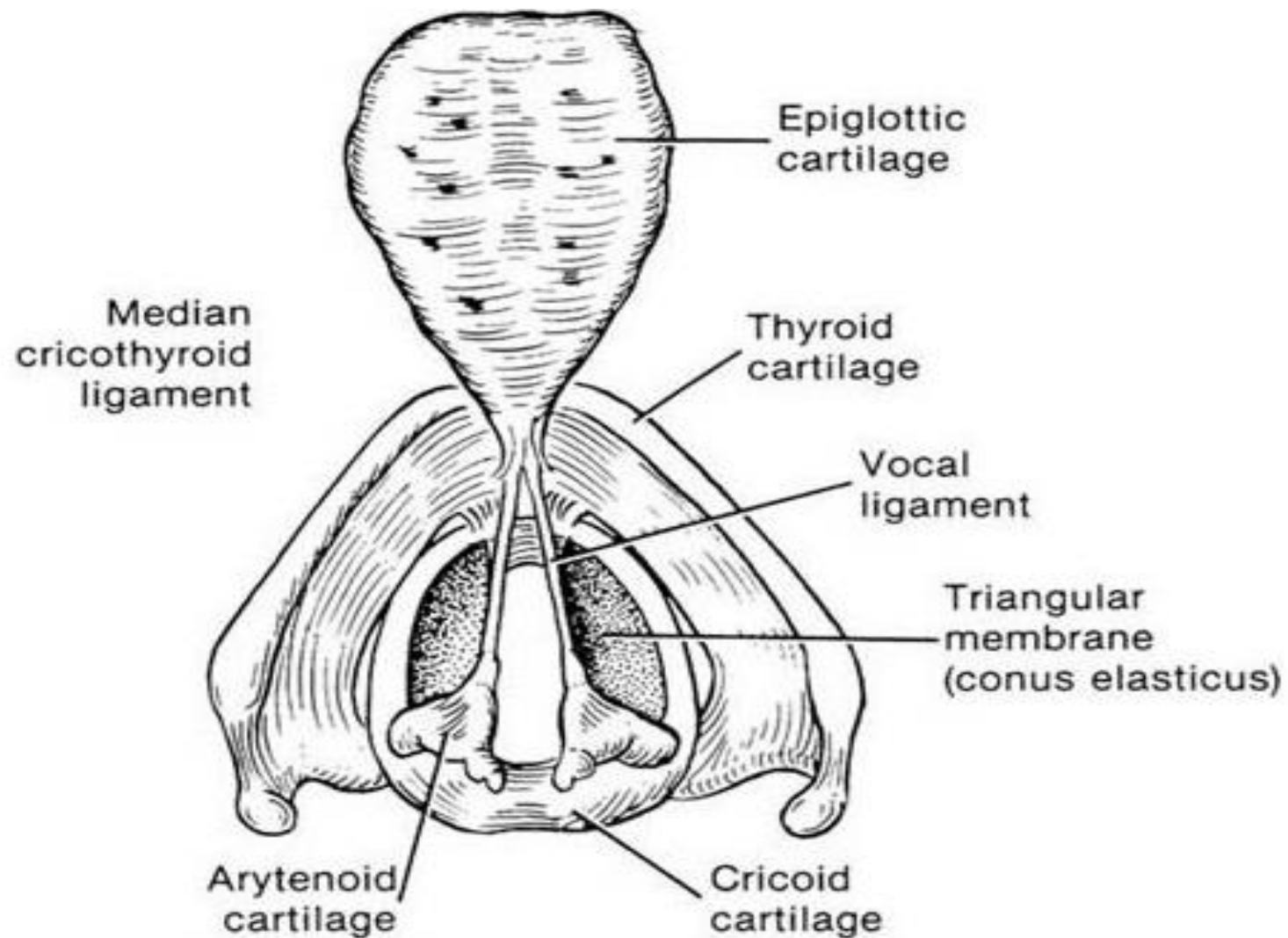
5.-m. cricothyroideus

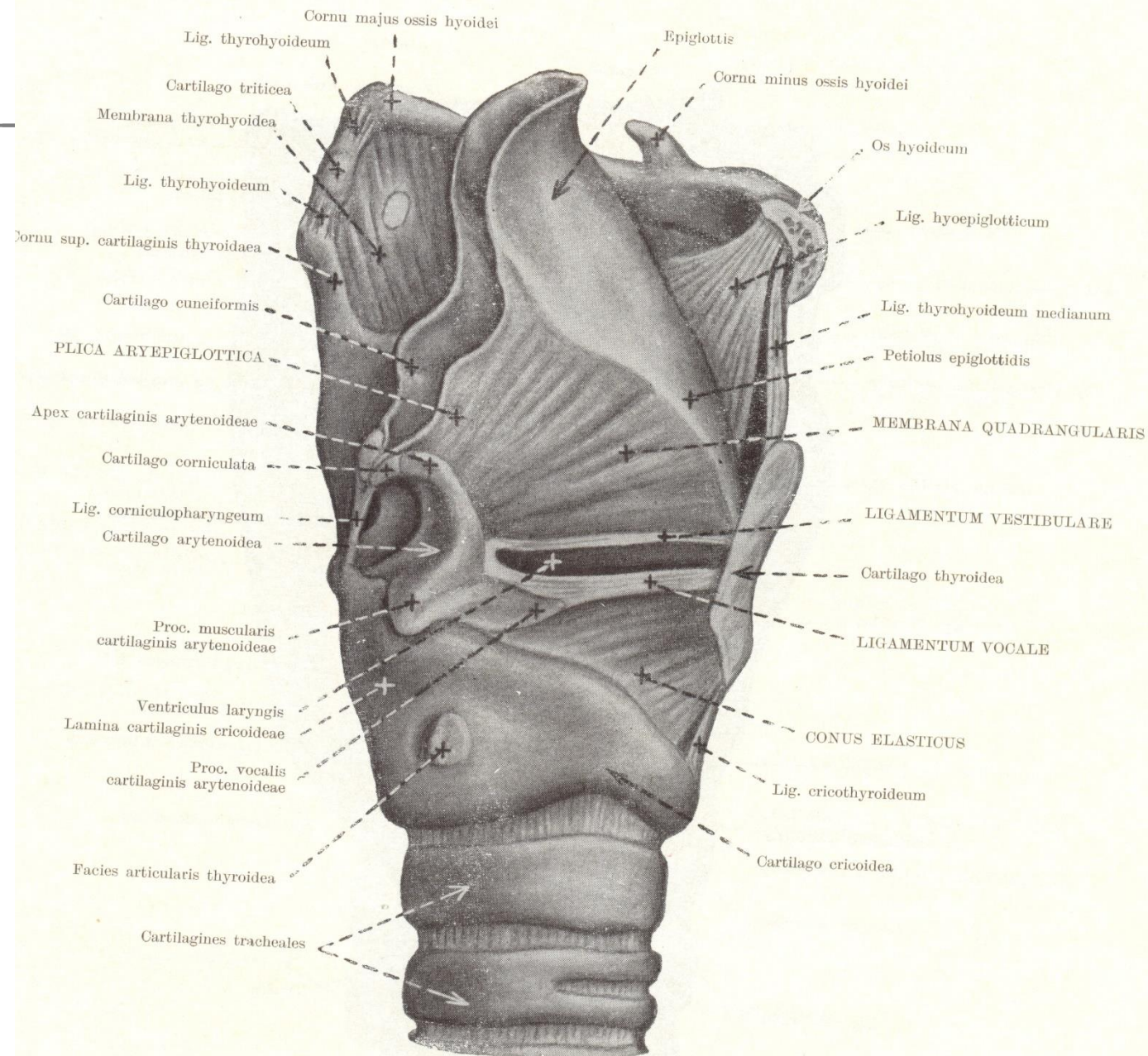


Internal ligaments and connective tissue membranes (membrana fibroelastica laryngis=quadrangularis + conus elasticus)

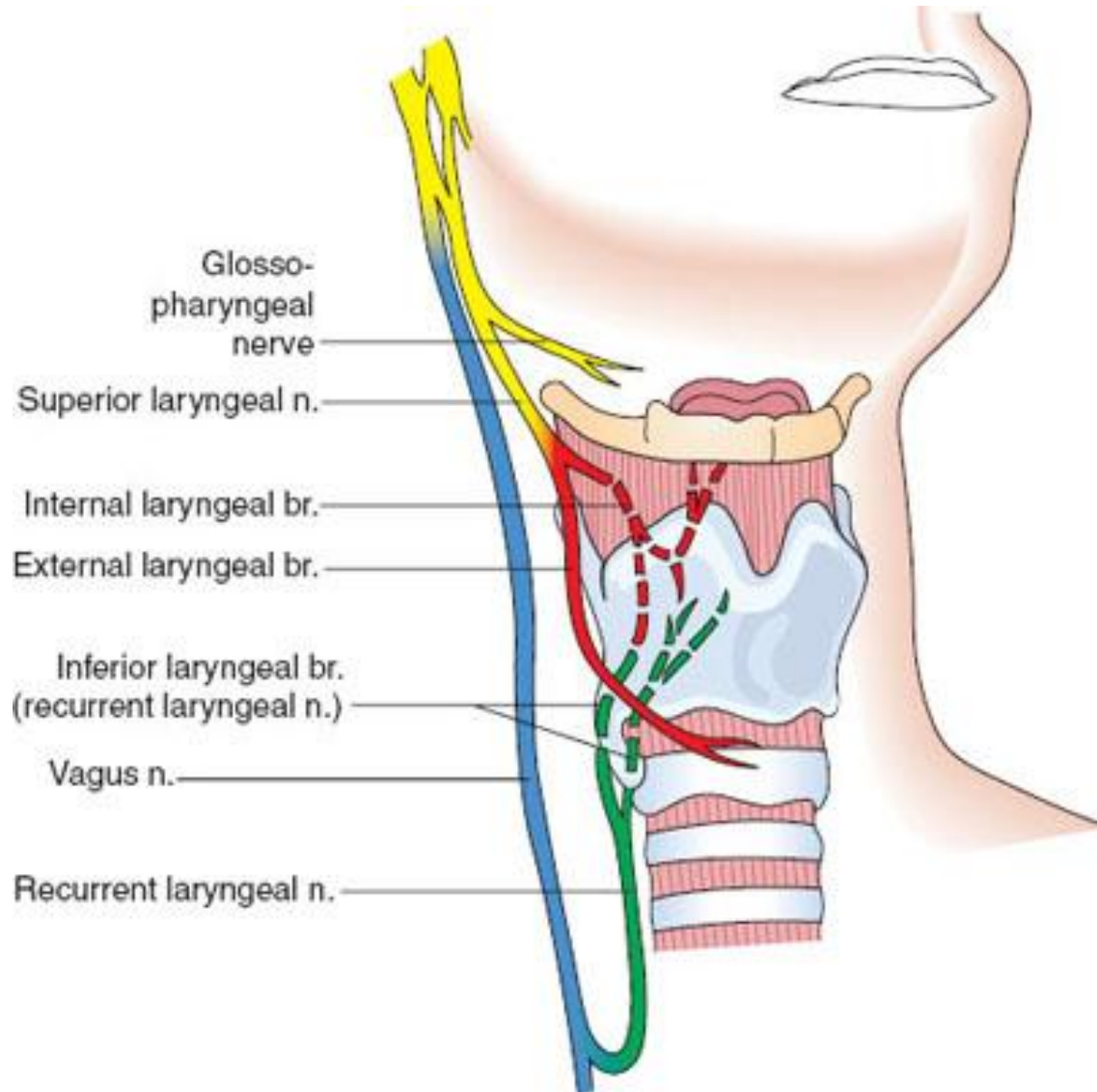


Conus elasticus





Laryngeal innervation



Remember: Laryn**X** is supplied
by the **X**th cranial nerve
Mnemonic: **SCAR**

S = Superior laryngeal nerve
C = Cricothyroid muscle

A = All other muscles
R = Recurrent laryngeal nerve

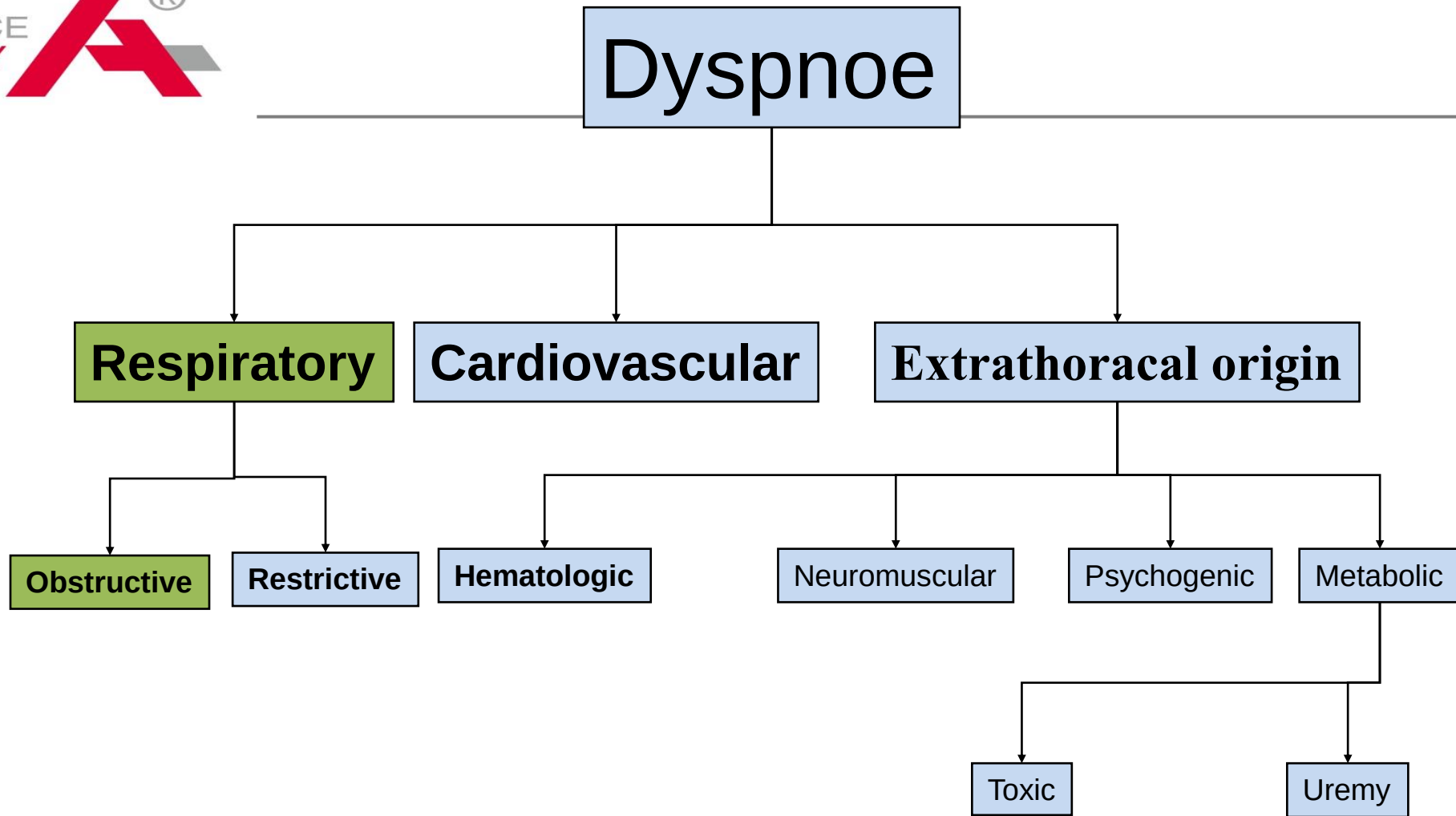
History of laryngeal disorder

Breathing disorder

inspiratory stridor - stenosis localized upwards from bifurcation. Symptoms of usage of auxiliary breathing muscles (retraction of jugulum). **There is longer inspirium (inhalation) as expirium (exhalation).** General symptoms - agitation with anxiety, loss of orientation, loss of conscience, tachycardy, usually bradypnoe. Auscultation the most noisy stridor above stenosis. Skin colour pale, then cyanotic. Growing exhaustion, alarm face.

Voice disorder

hoarseness – lasting longer then 14th days in male of risk group (smoker older 40 y) should by evaluated by otolaryngology.





Evaluation of dyspnoe

■ Subjective scales



■ (quasi) objective scales

- no dyspnoe (0)
- dyspnoe after greater physical labour than usually (1)
- dyspnoe after usual physical labour (2)
- dyspnoe at any physical action (3)
- dyspnoe in no action (4)



Pathophysiology of obstructive respiratory insufficiency

- **inspiratory dyspnea**
- stridor - 400-800 Hz, the most proximal stenosis, the lower frequency is
- Involvement of auxiliary breathing muscles
- dysphony
- cough, sometimes odynophagia.

Stage of compensation — prolongation of regular inspiration, good blood supply, possible causal therapy

Stage of decompensation — mild tachypnoea, motoric agitation, hypercapnia, anoxemia, respiratory acidosis, larynx in anteflex position, anxiety, exhaustion. Hypercapnia leads gradually to inhibition of breathing center

Stage of suffocation — air flow with turbulence, decreased breath volume, reanimation is necessary



Obstructive respiratory insufficiency

1. Larynx and superior part of trachea - „laryngeal“ dyspnea

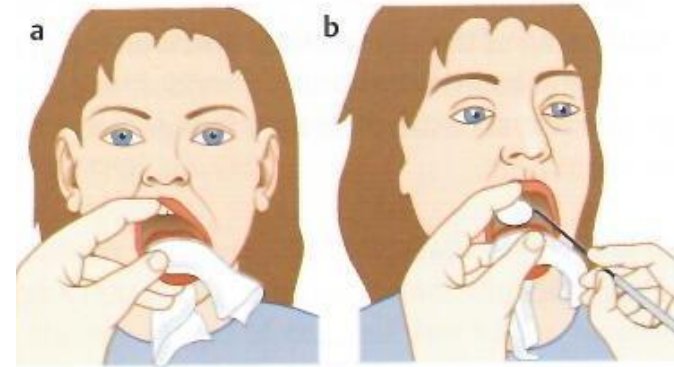
inspiratory stridor - stenosis localized upwards from bifurcation. Symptoms of usage of auxiliary breathing muscles (retraction of jugulum). There is longer inspiration as expiration. General symptoms - agitation with anxiety, loss of orientation, loss of conscience, tachycardia, usually bradypnea. Auscultation the most noisy stridor above stenosis. Skin color pale, then cyanotic. Growing exhaustion, alarm face.

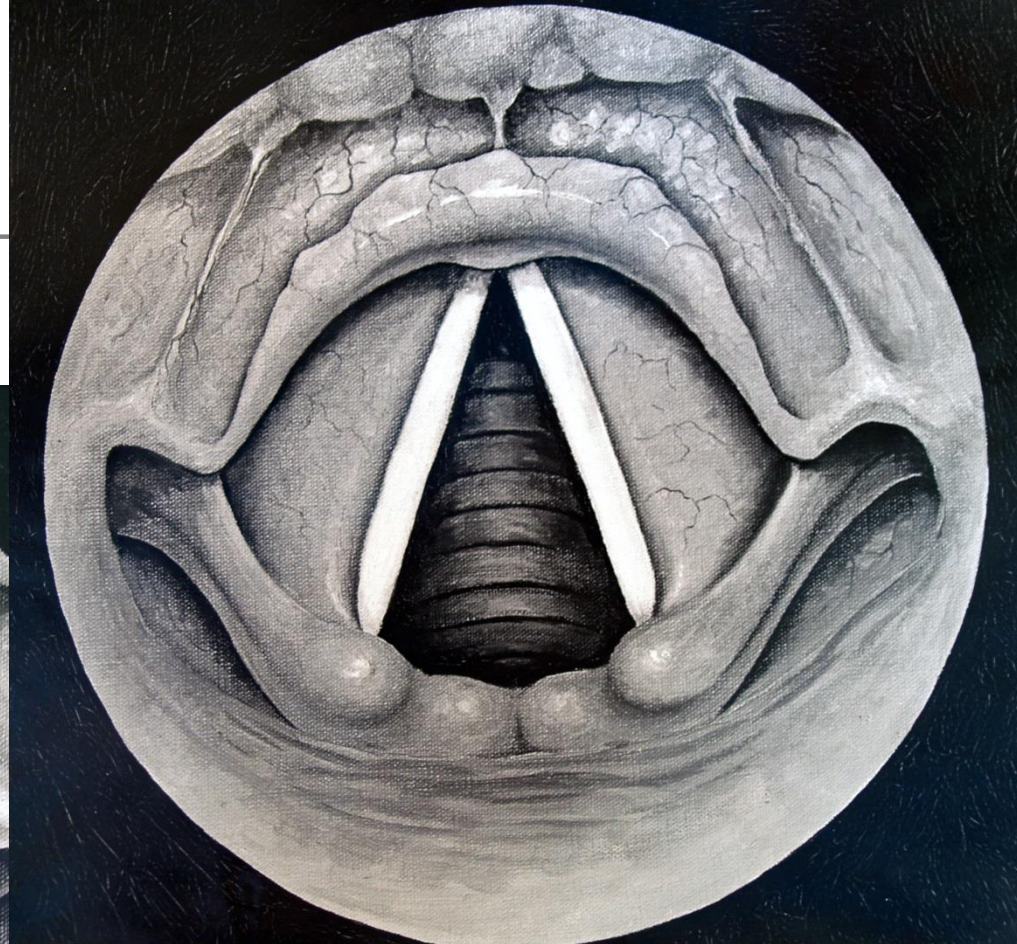
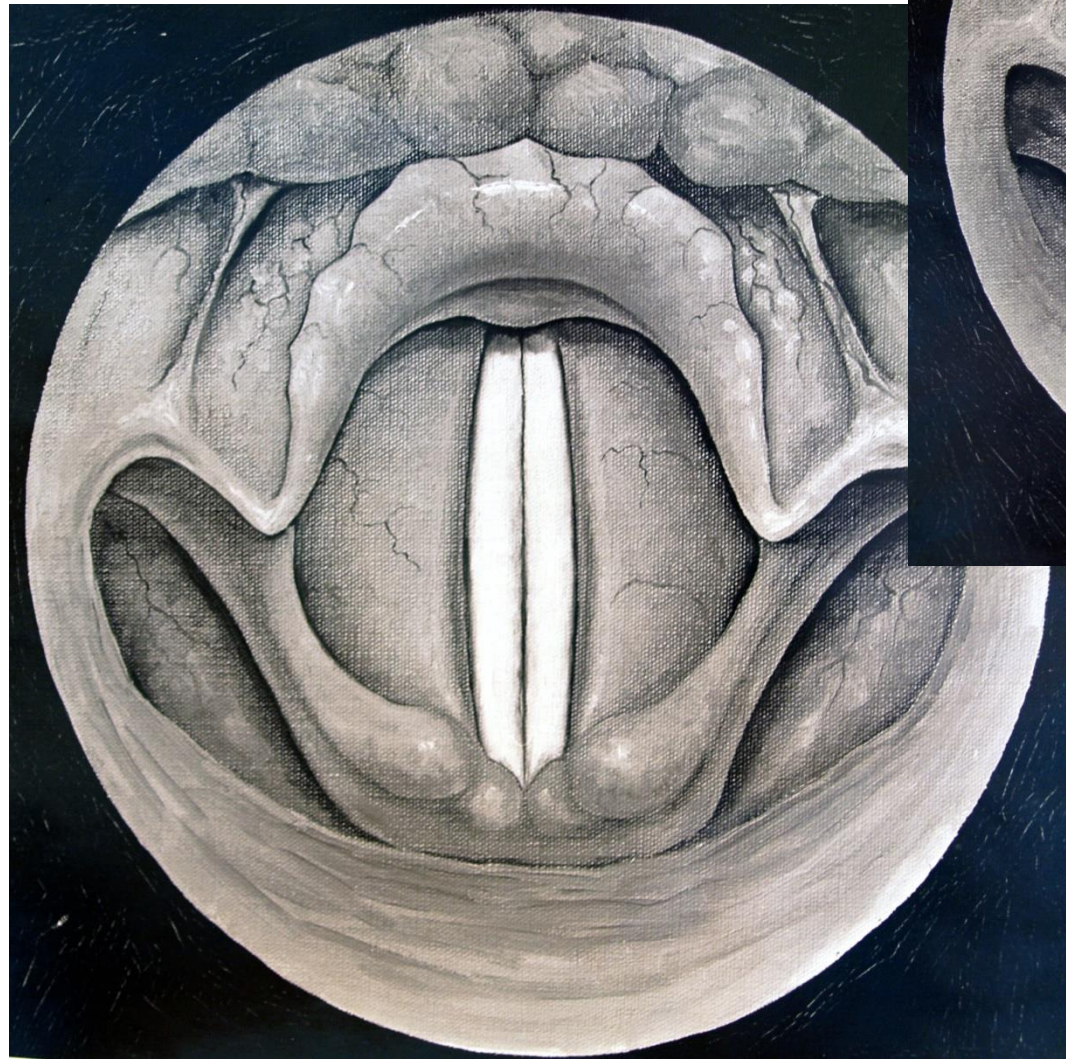
2. Distal part of airways.

Expiratory stridor - longer expiration

Methods of investigation of larynx

- Inspection
- Palpation (crepitation, emphysema)
- Indirect laryngoscopy
- Direct laryngoscopy
 - Flexible
 - Rigid
 - Microlaryngoscopy sec Kleinsasser
- Stroboscope (high frequency movies, allowing scientific analysis of the laryngeal function, especially of the vocal cords)
- Tomography
- CT





Laryngoscopy

direct - flexible endoscopy (laryngoscopy)

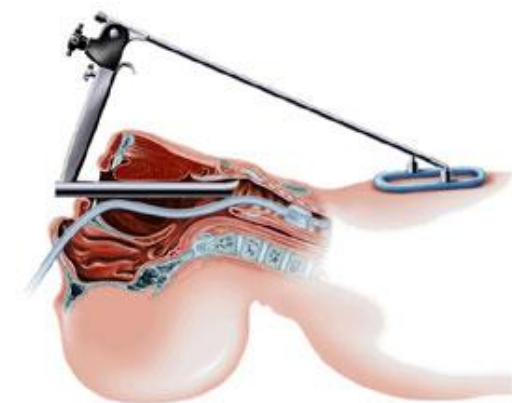


Rigid laryngoscopy

according to Stuckrad

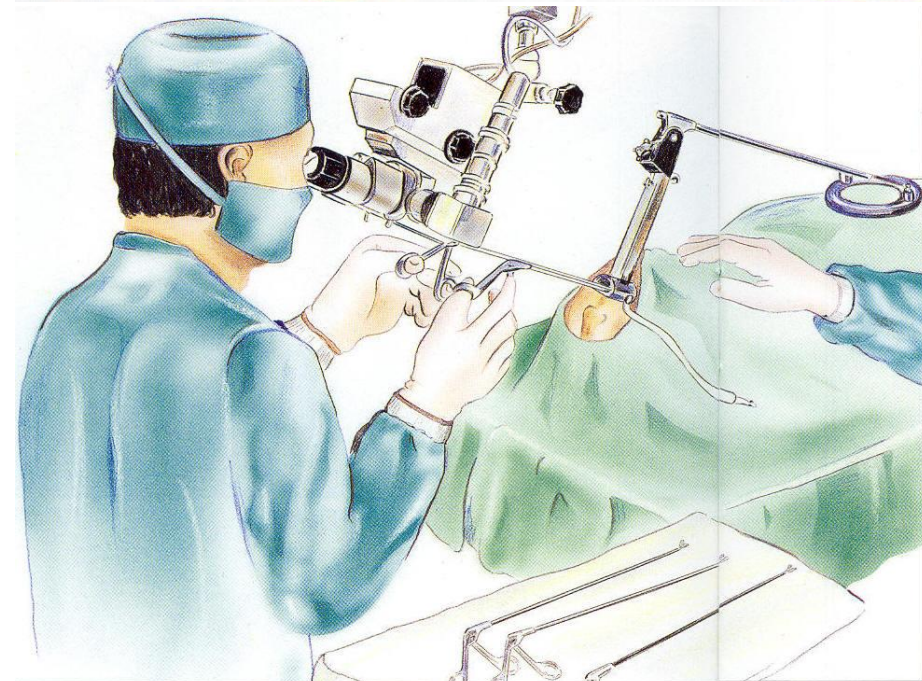
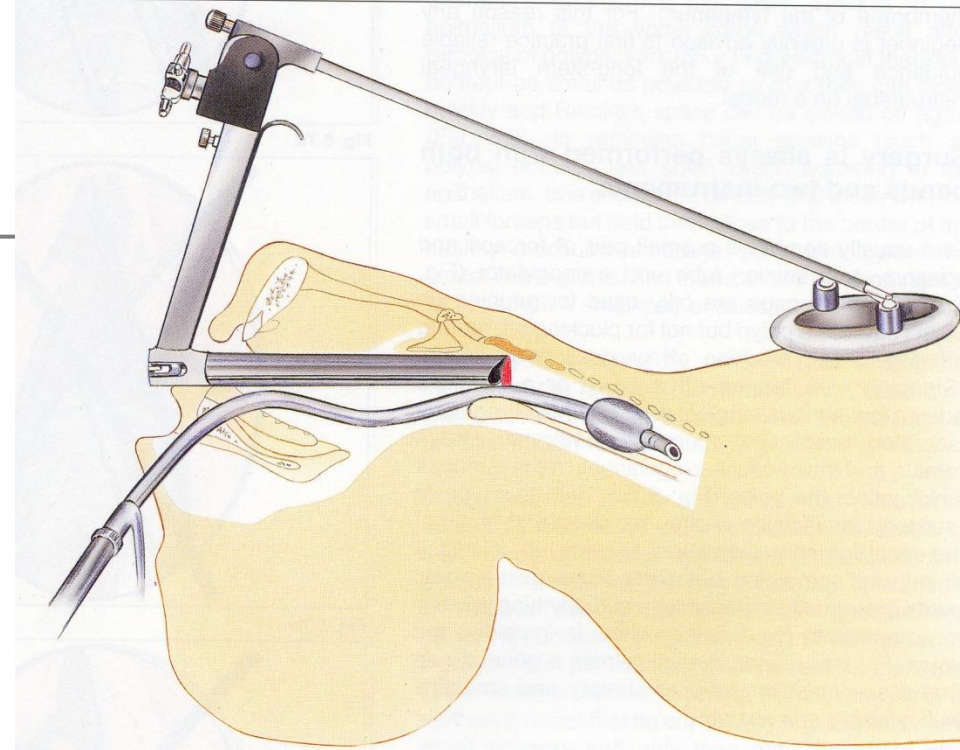


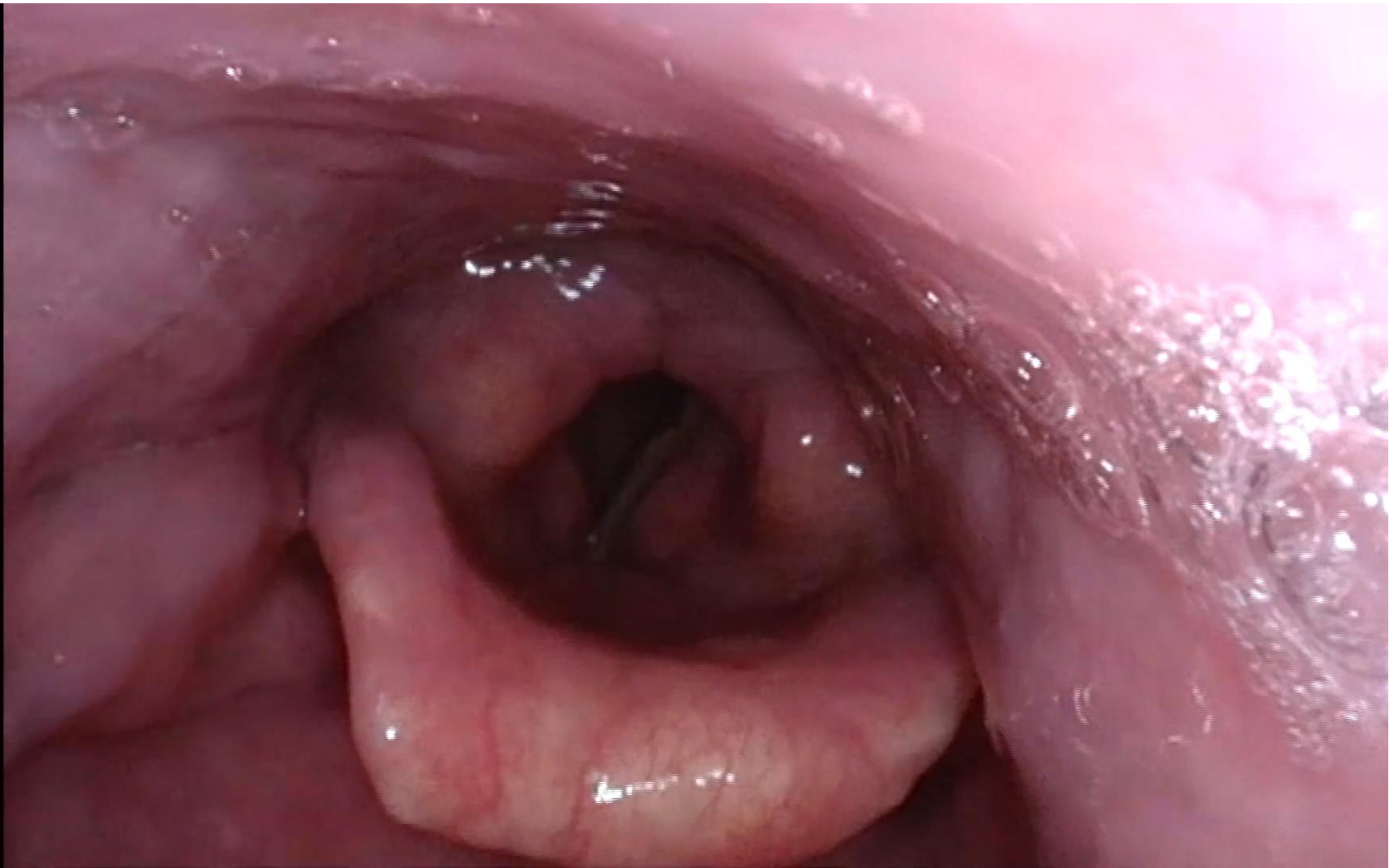
according to Kleinsasser



Microlaryngoscopy sec. Kleinsasser

- general anesthesia
- chest holder
- microscope



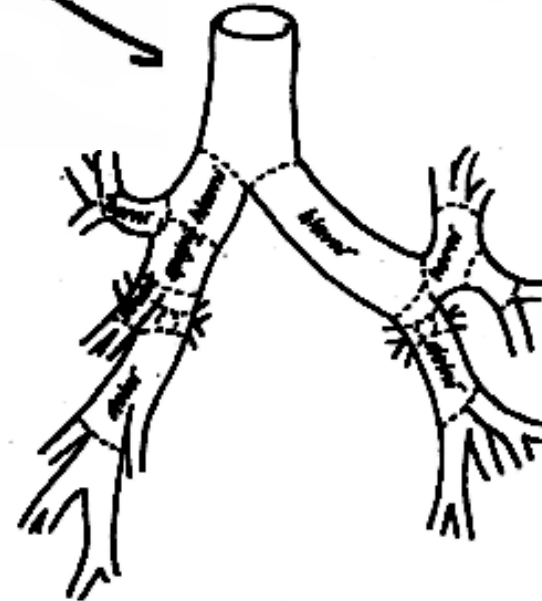
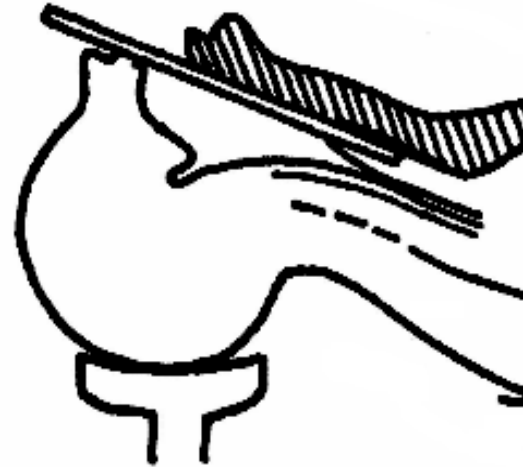


Stroboscopy



James P. Thomas, MD
voicedoctor.net

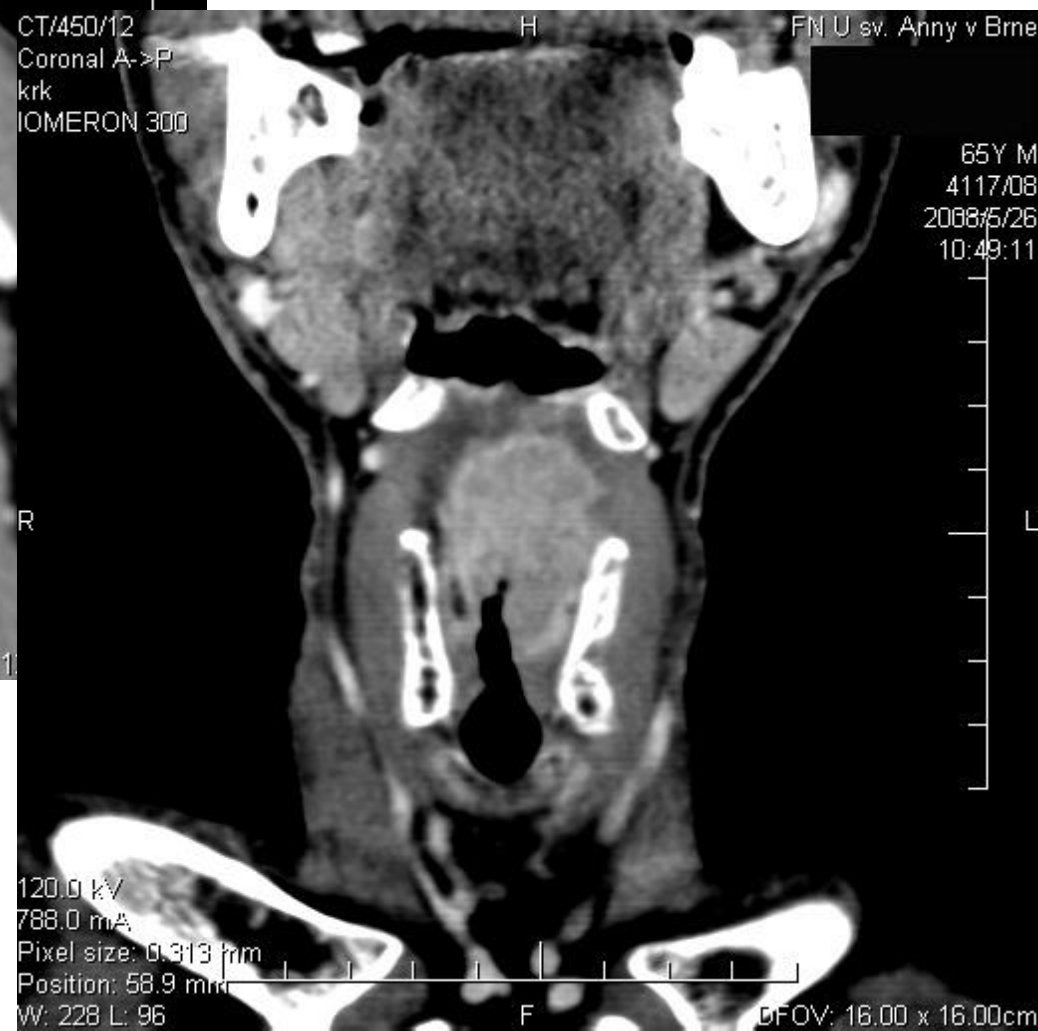
Tracheo-bronchoscopy rigid vs. flexible



Zjednodušené schéma
bronchiálního stromu

Transglottic cancer spreading
into preepiglottic space,
subglottic spread

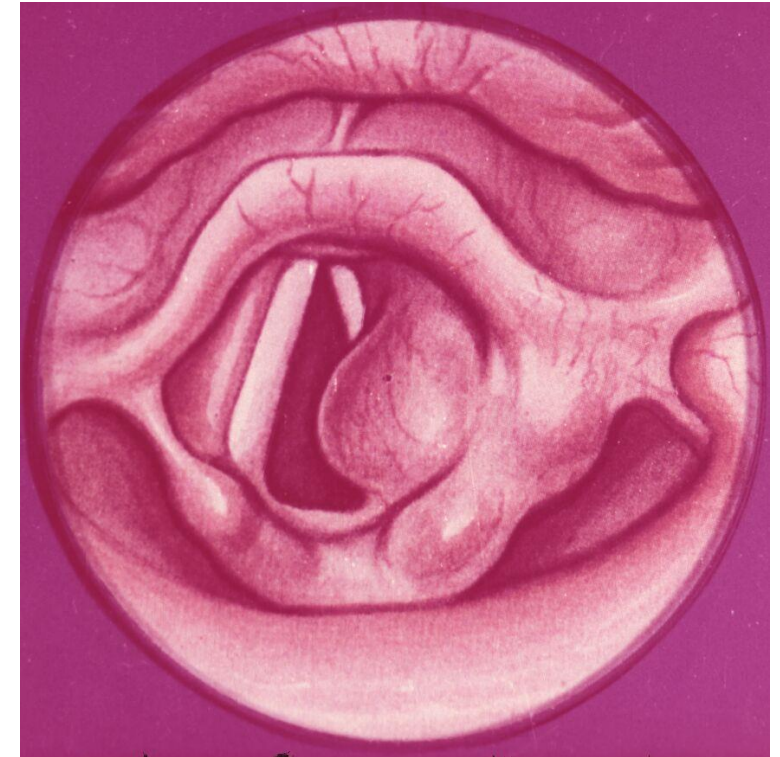




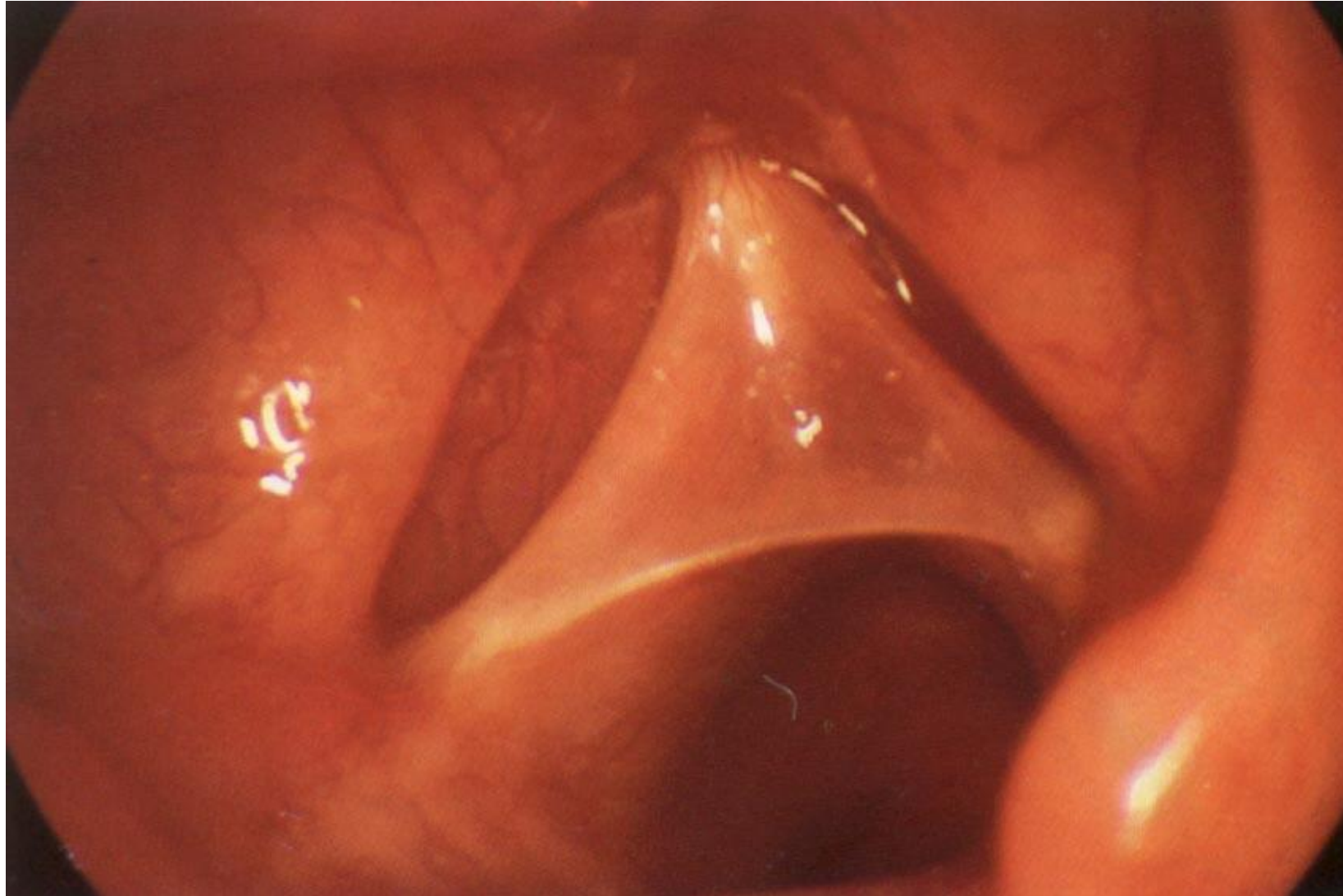
Congenital laryngeal anomalies

Laryngomalacia – dyspnea, dysphonia, dysphagia. Unusual weakness of the supraglottic laryngeal skeleton

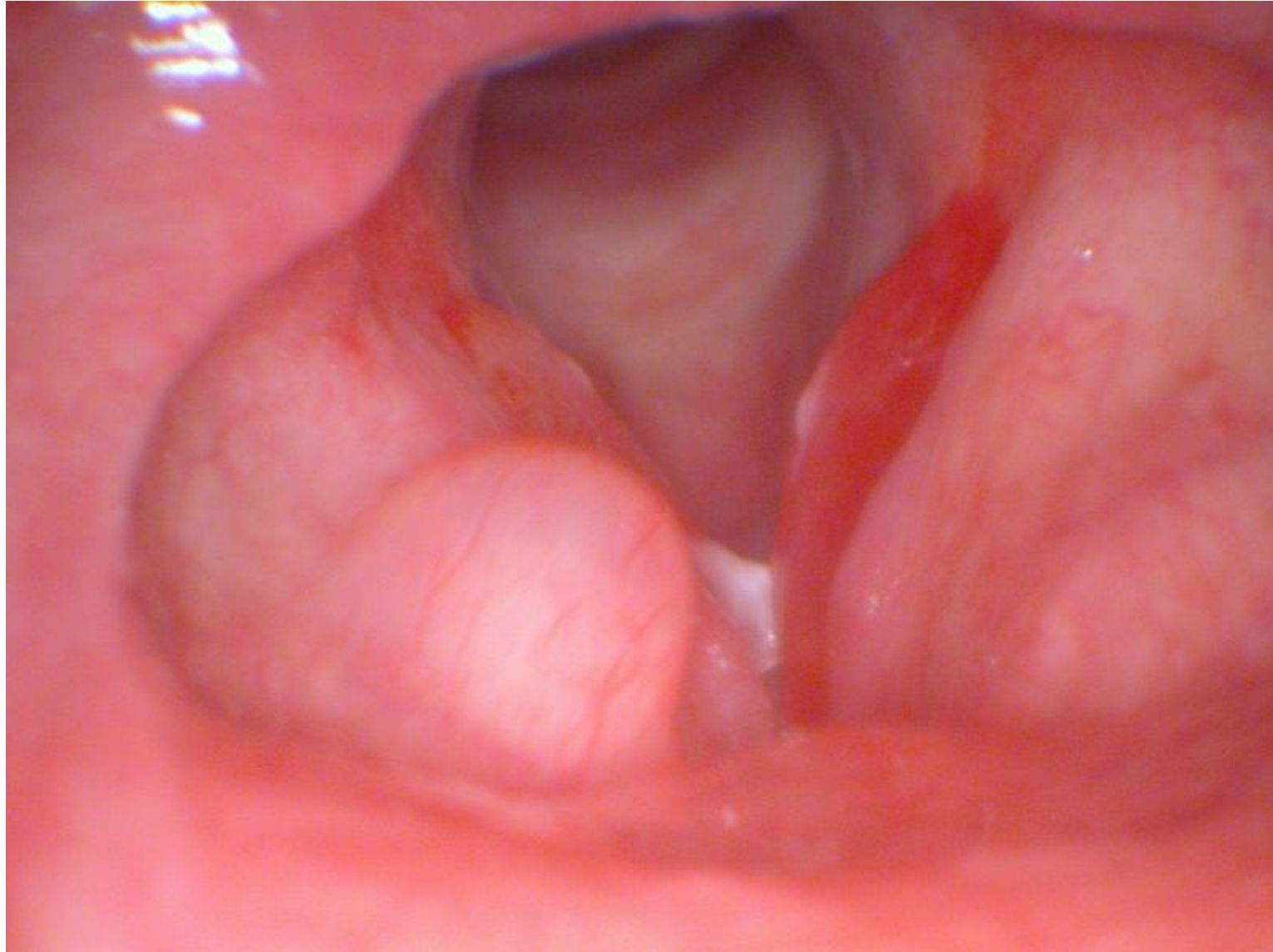
Laryngoceles – lie within the larynx in the vestibular fold – dyspnoea, dysphonia



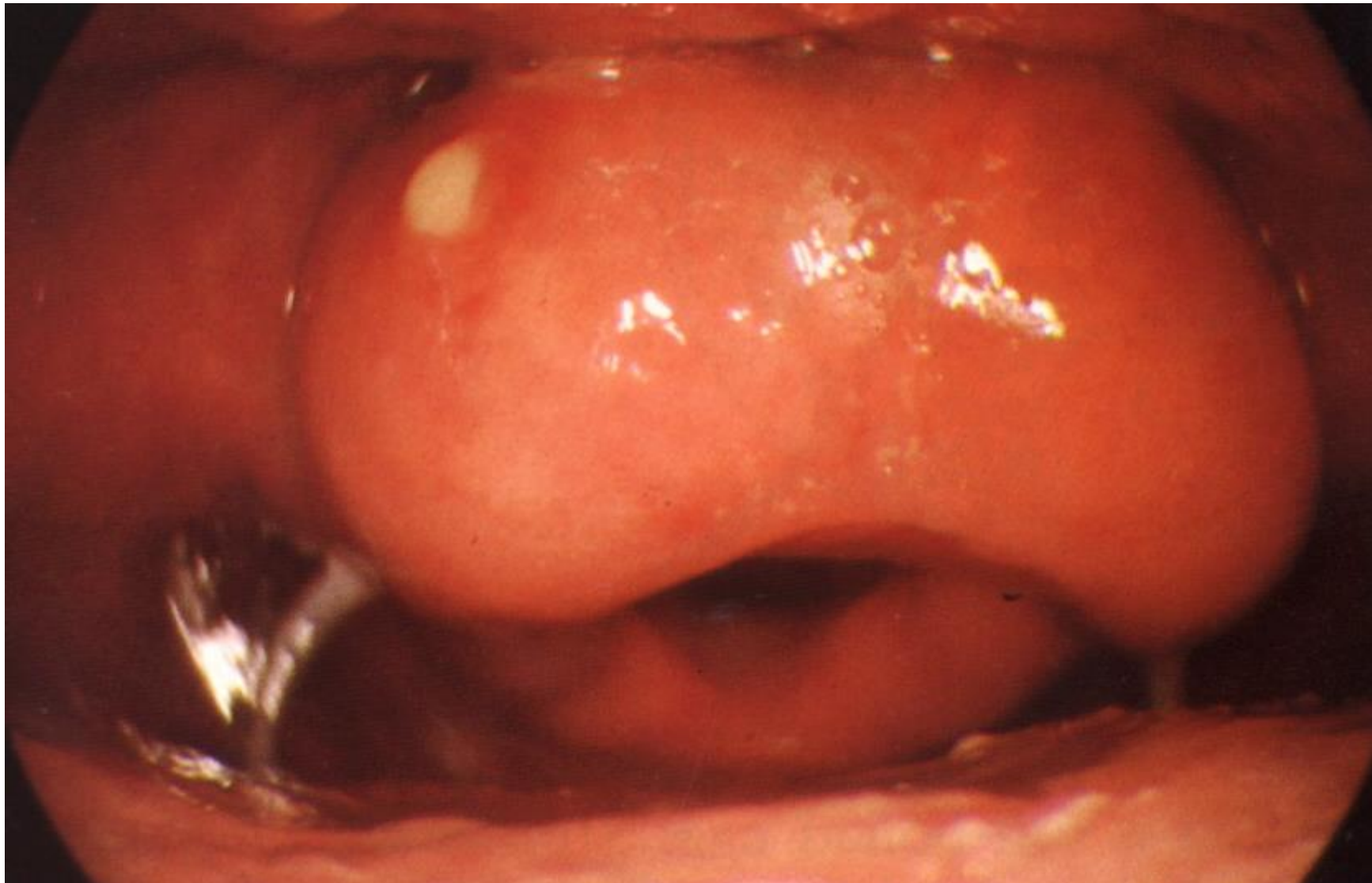
Atresia and membranes



Laryngitis acuta (restricted x diffused)



Abscesus epiglottidis

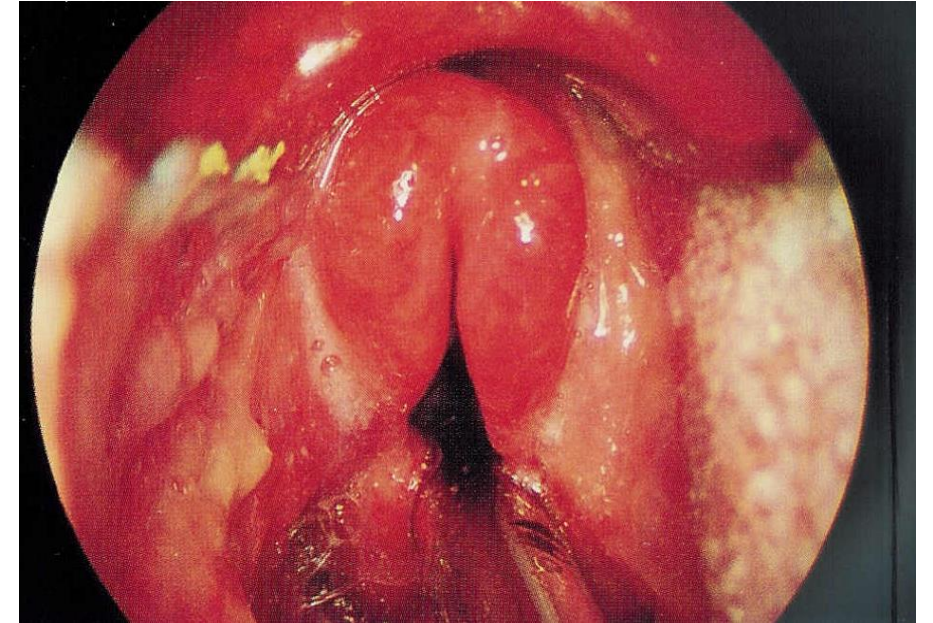


Acute supraglottic laryngitis - epiglottitis

- Hemophilus influenzae
- inspiratory stridor
- dysphagia

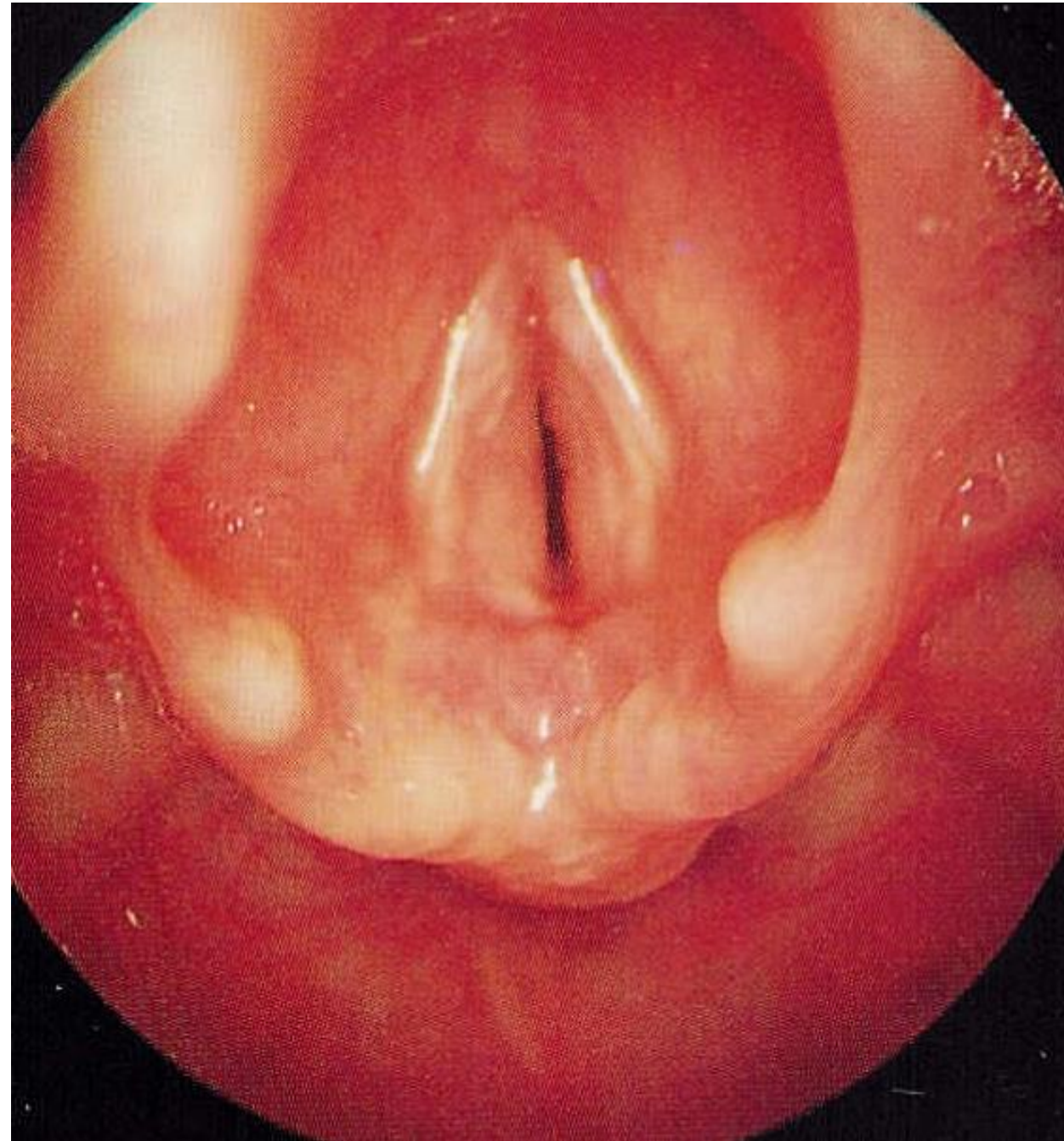
Treatment strategy according to the rate of progression. Main aim – to ensure airway patency

- antibiotic treatment
- steroids
- tracheal intubation
- tracheostomy

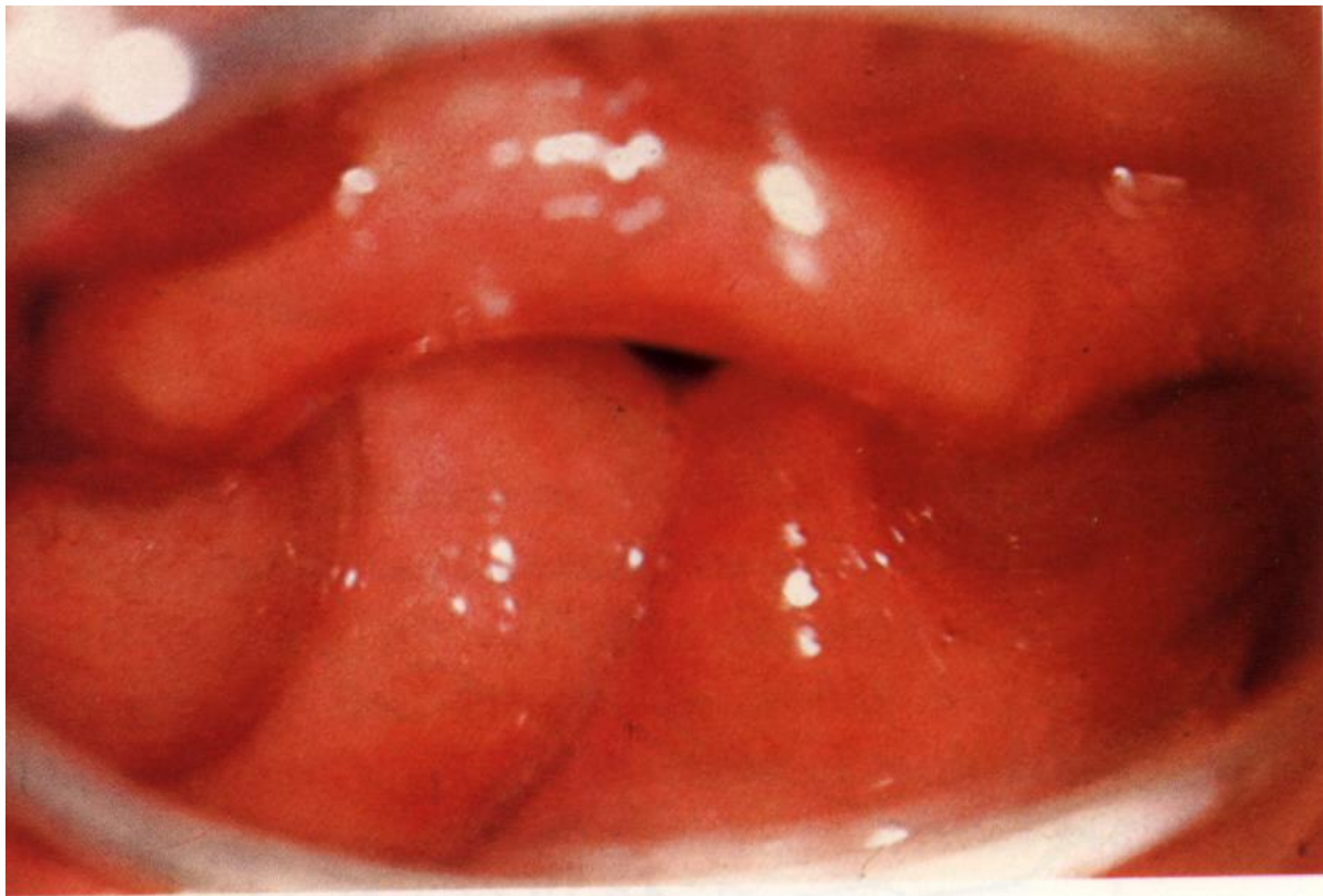


Acute subglottic laryngitis

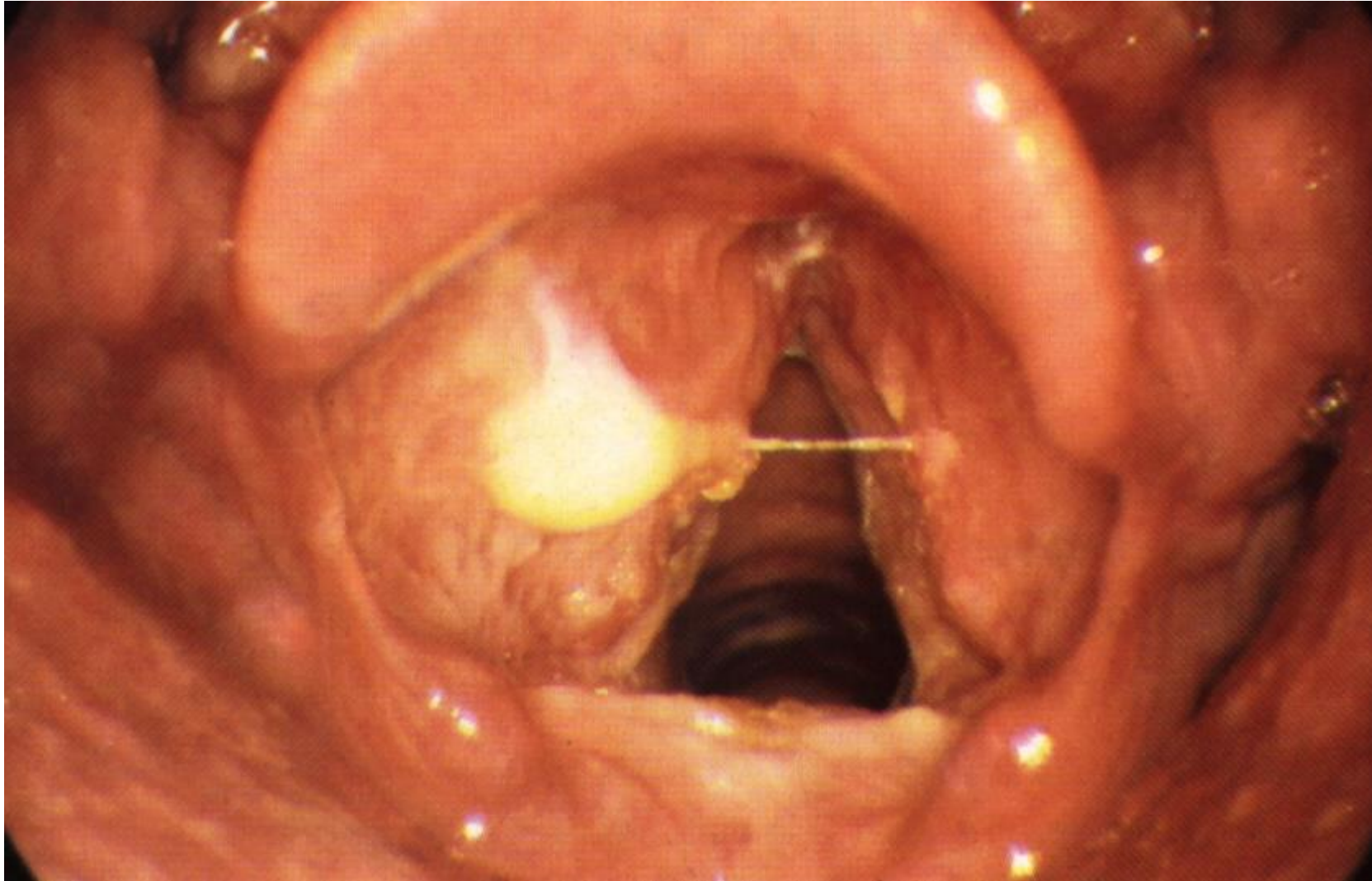
- viral infection
- rapid growth at night
- cough
- inspiratory stridor, inspiratory dyspnea
- steroids, sedation, ATB,
- Microclimate (steam inhalation)



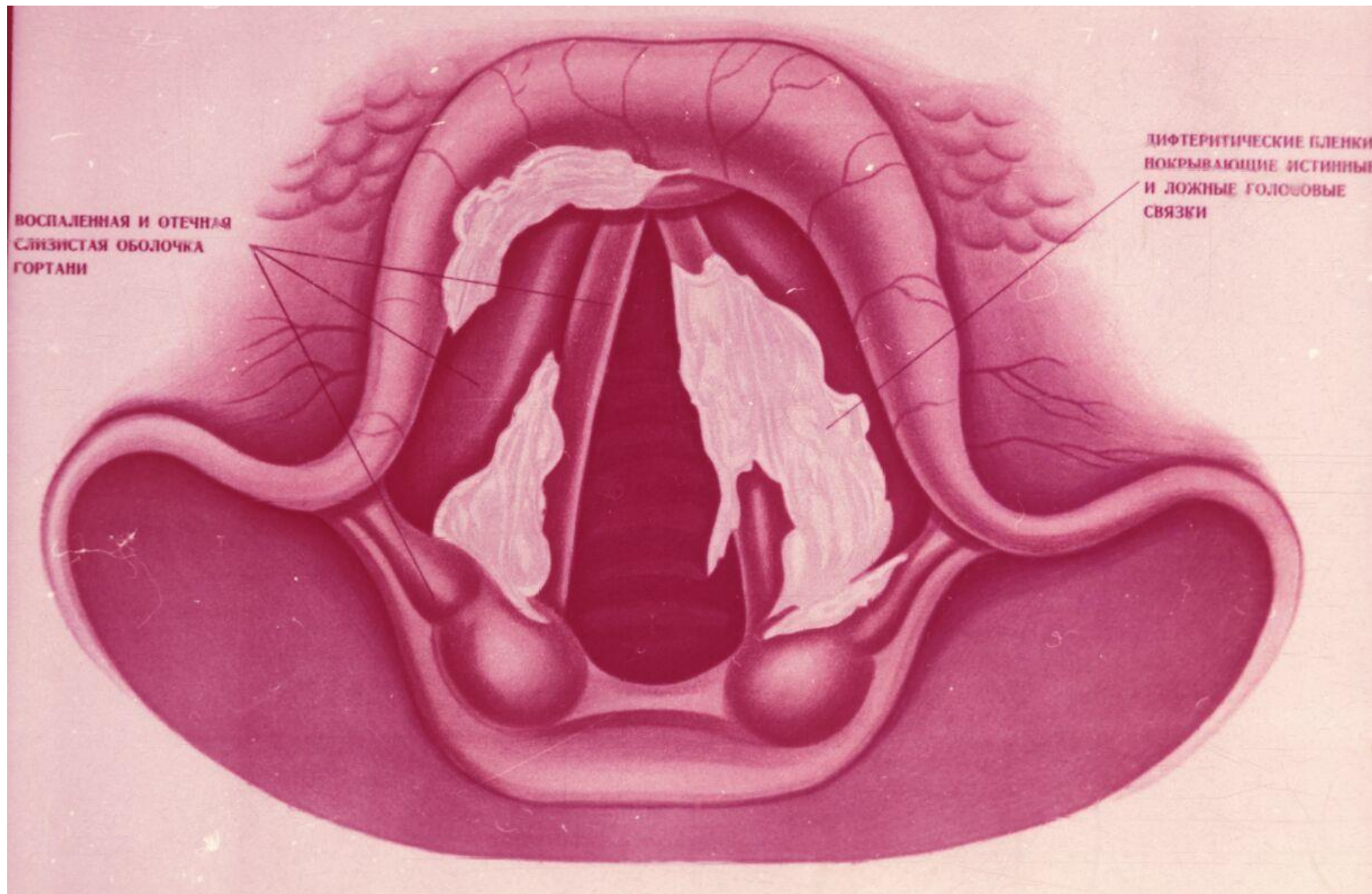
Angioneurotic swelling of larynx



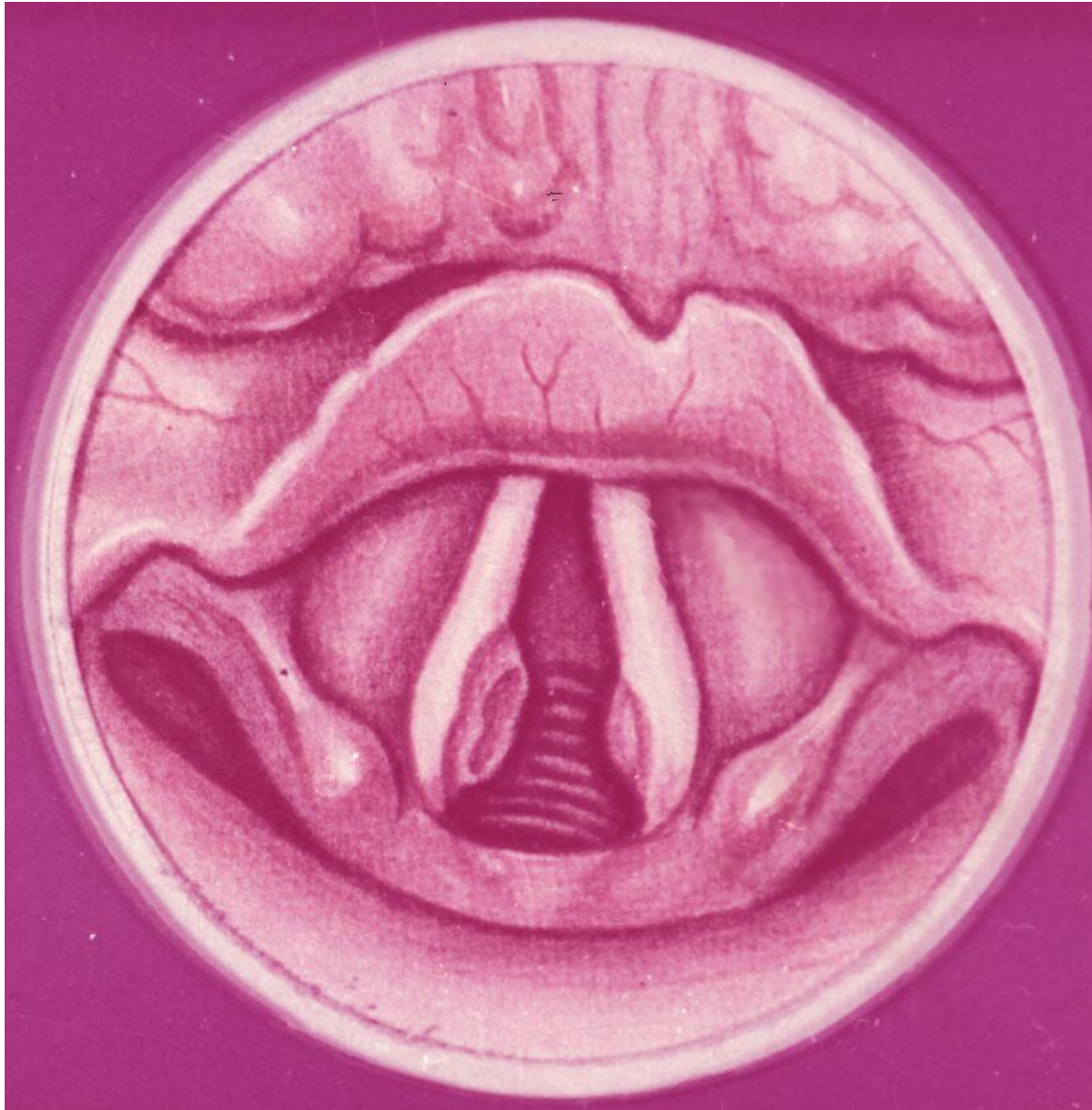
Laryngitis chronica



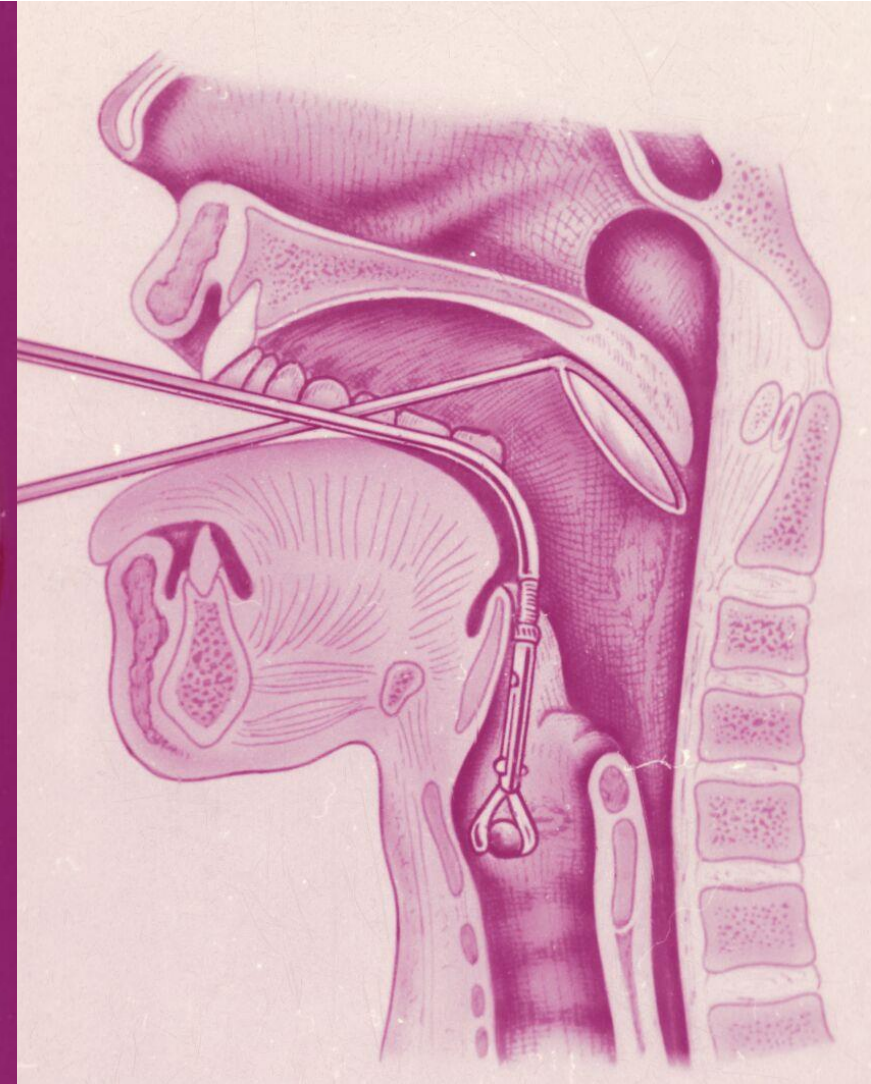
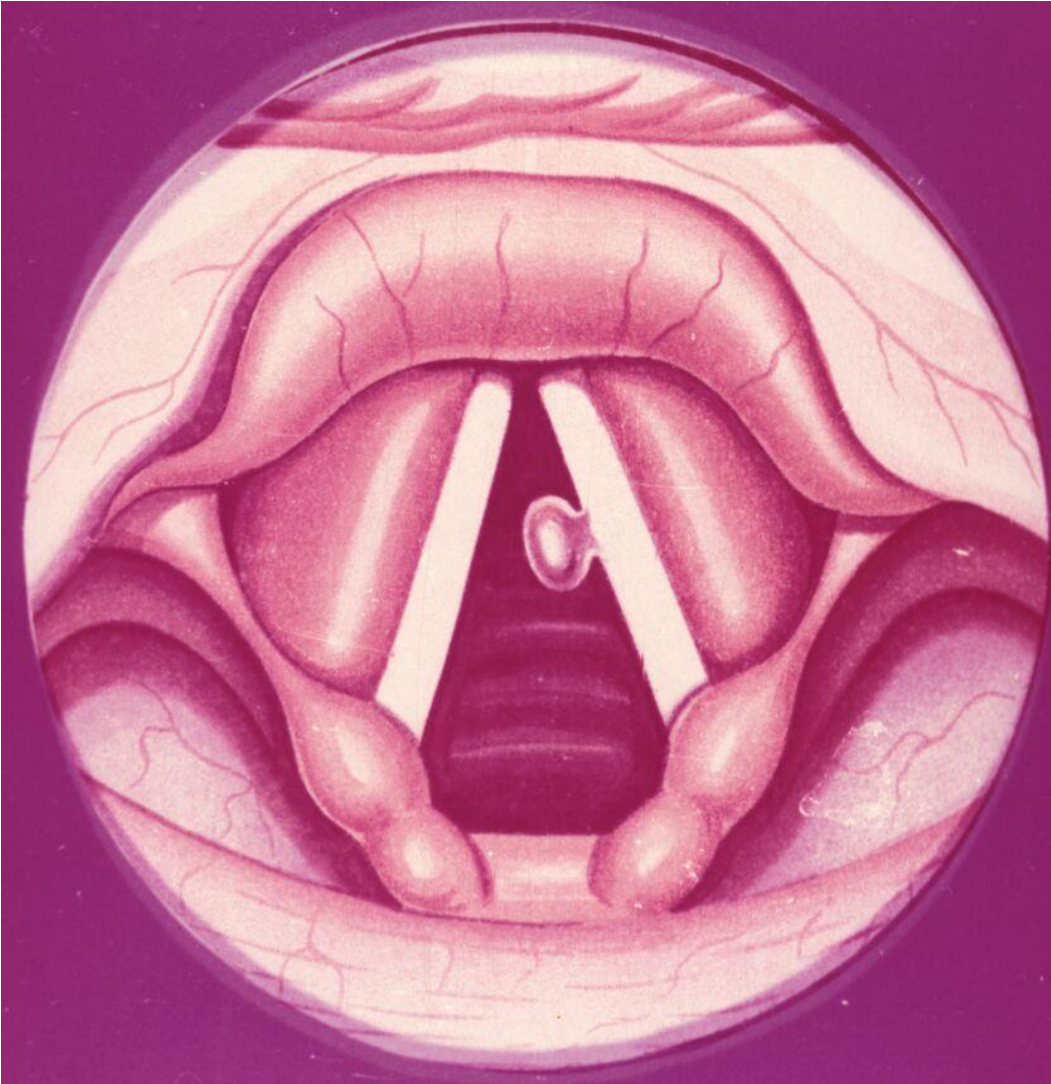
Diphtheria



Laryngitis chronica hyperplastica



Laryngeal polypus



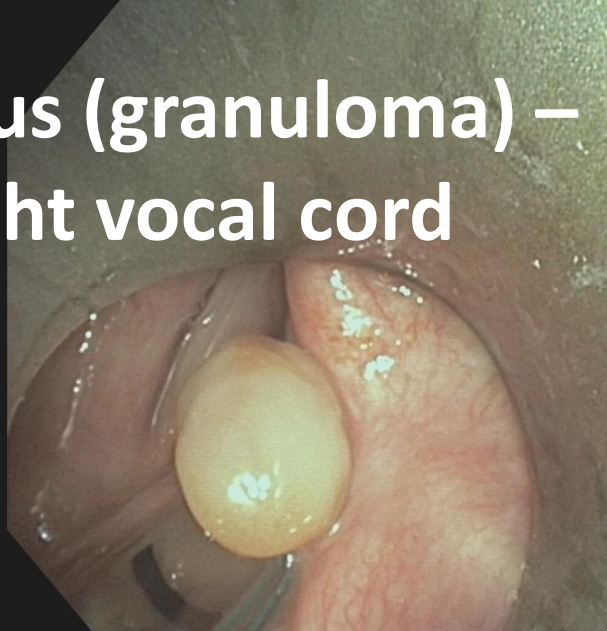
ID:
Name:

Sex: Age:
D.O.B.:
30/11/2016
11:56:46

■■■/---(0/1)
Eh:A3 Cm:1

Comment:

Polypus (granuloma) – right vocal cord

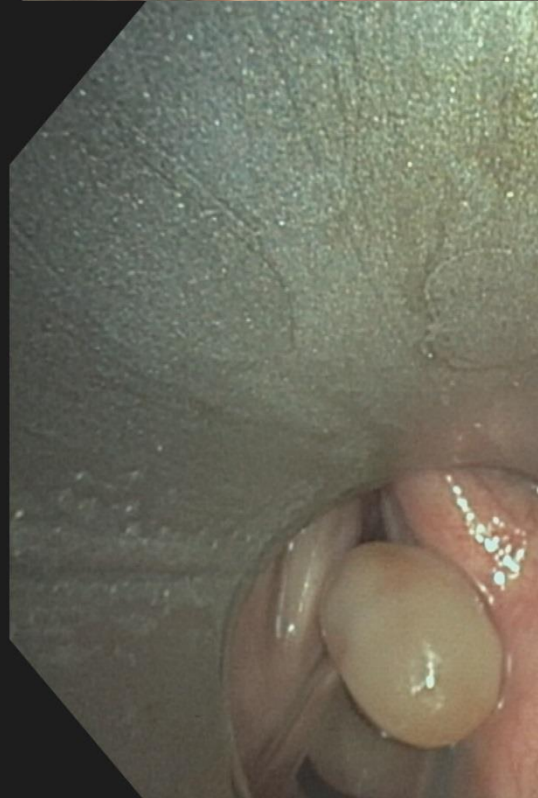


ID:
Name:

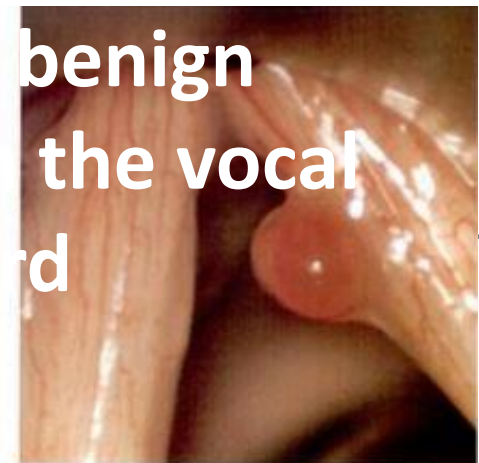
Sex: Age:
D.O.B.:
30/11/2016
11:57:21

■■■/---(0/1)
Eh:A3 Cm:1

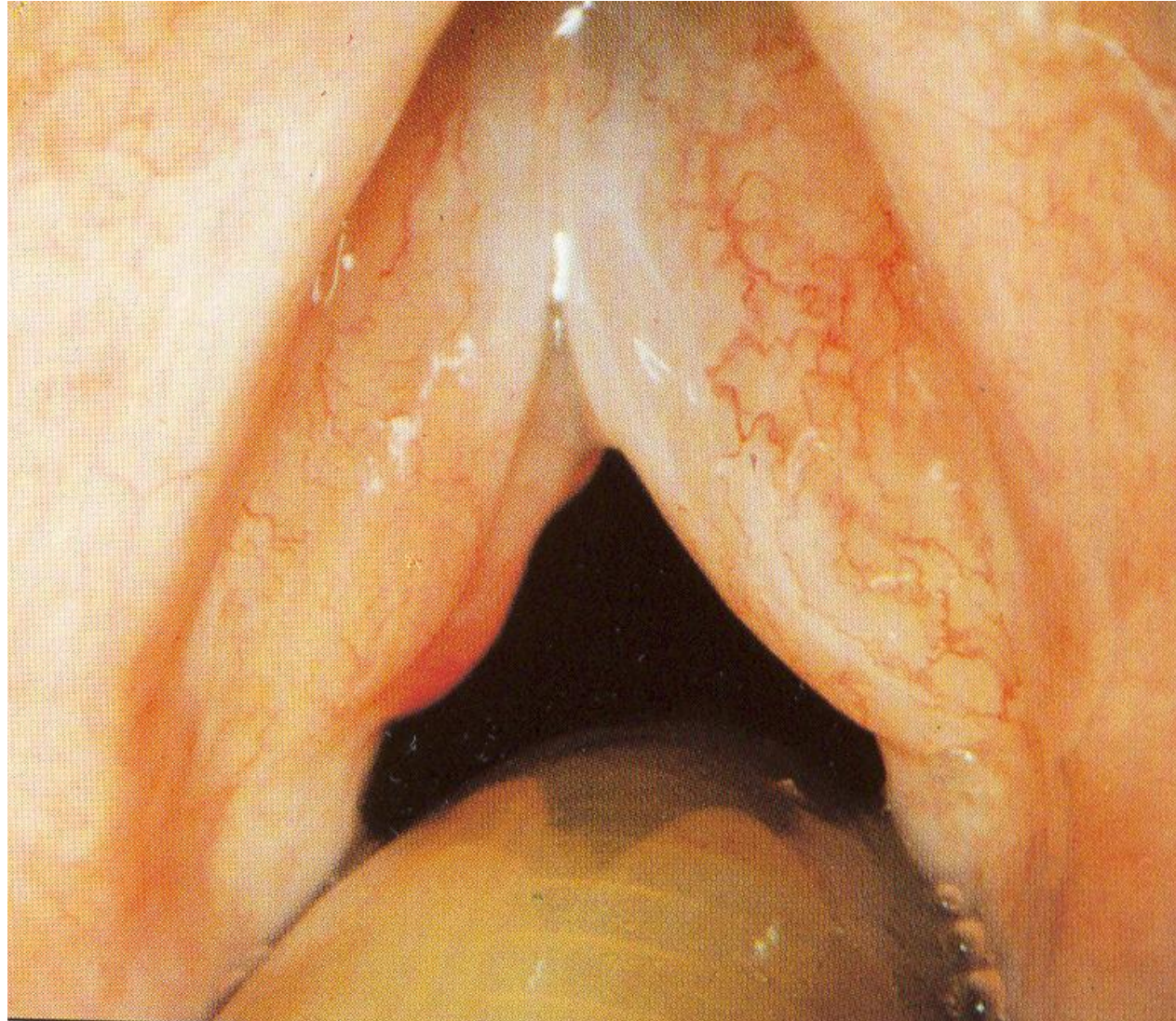
Comment:



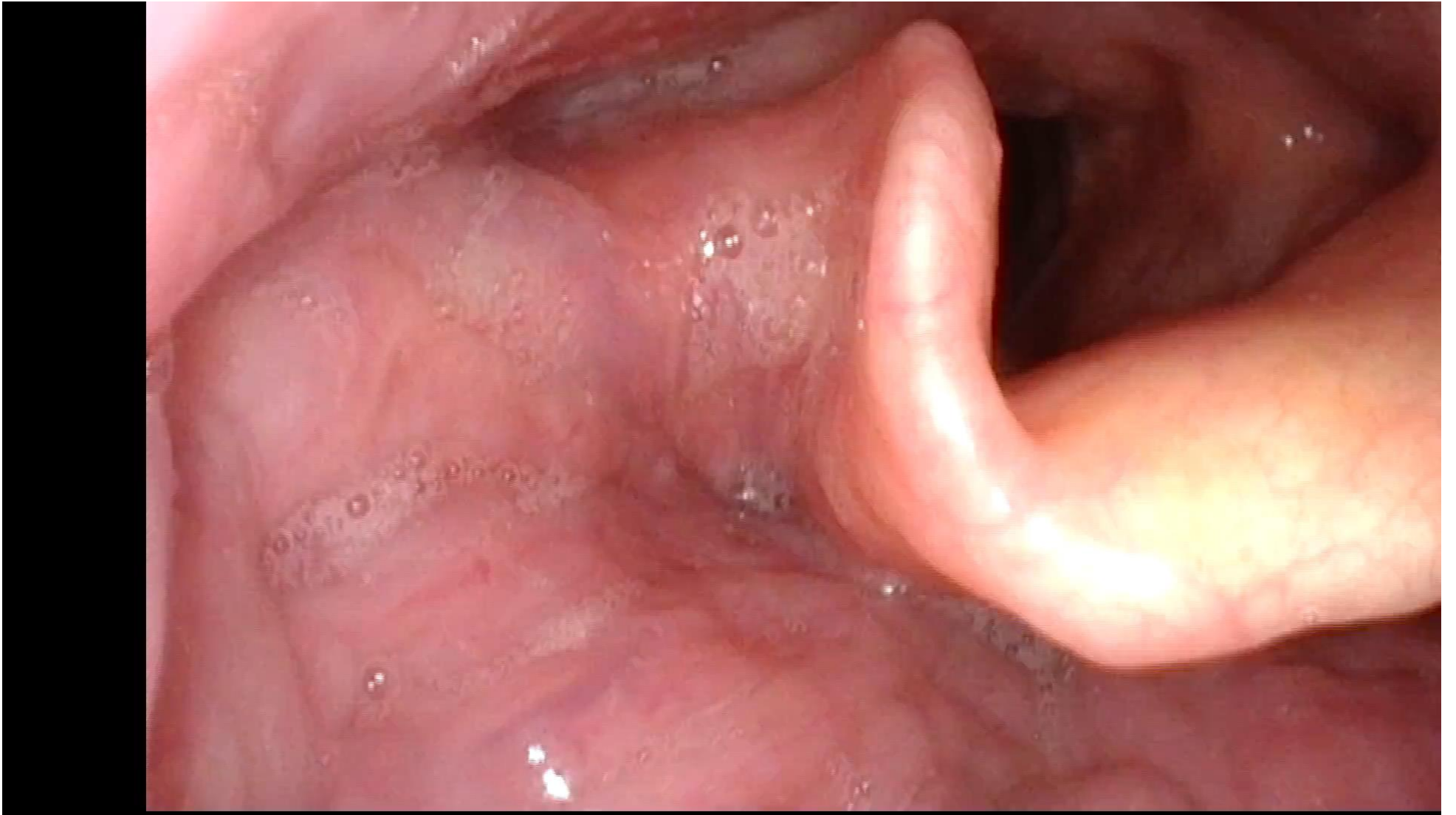
Various benign findings on the vocal cord



LARYNGITIS CHRONICA-OEDEMA REINCKE



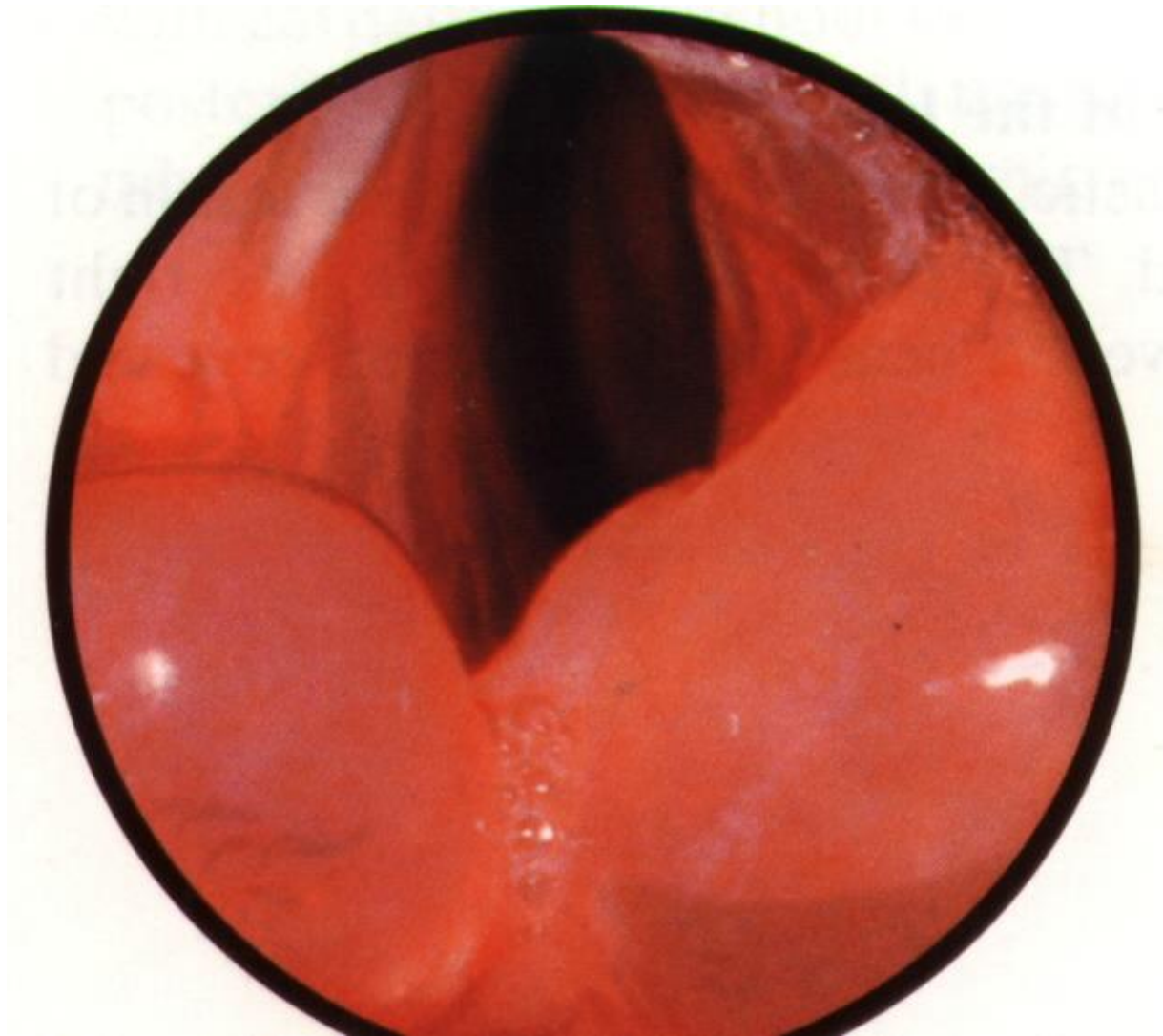
Vocal polyp without malignancy



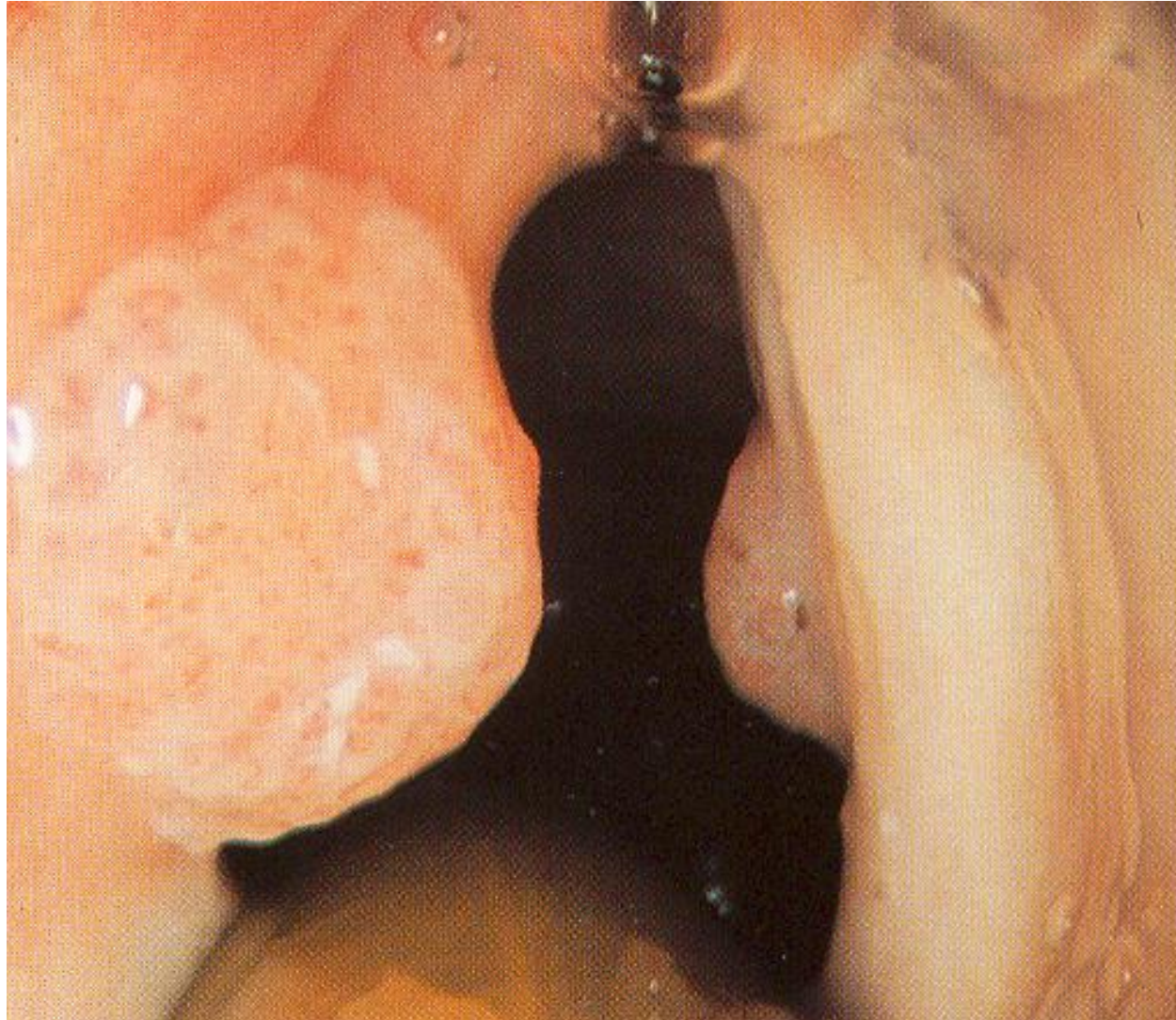
Reincke's oedema



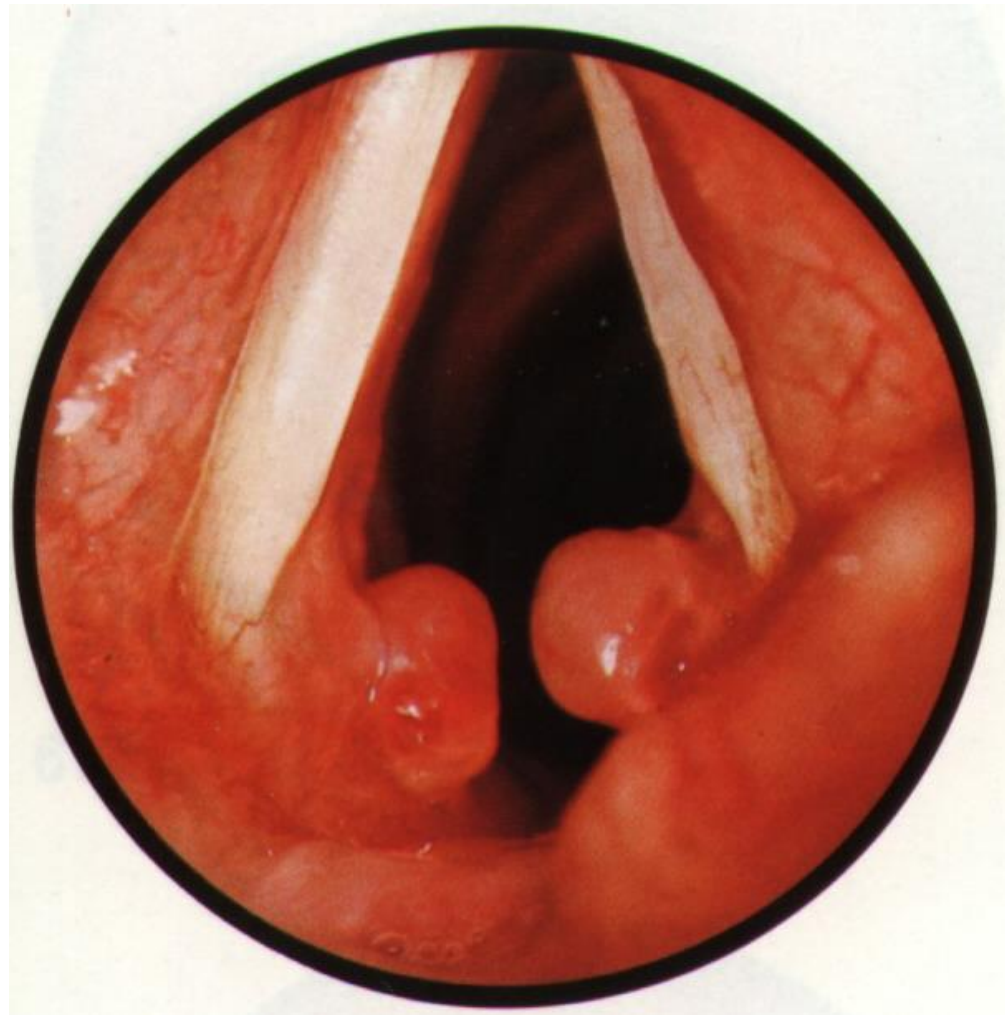
Oedema laryngis



Papilomatosis laryngis, HPV virosis

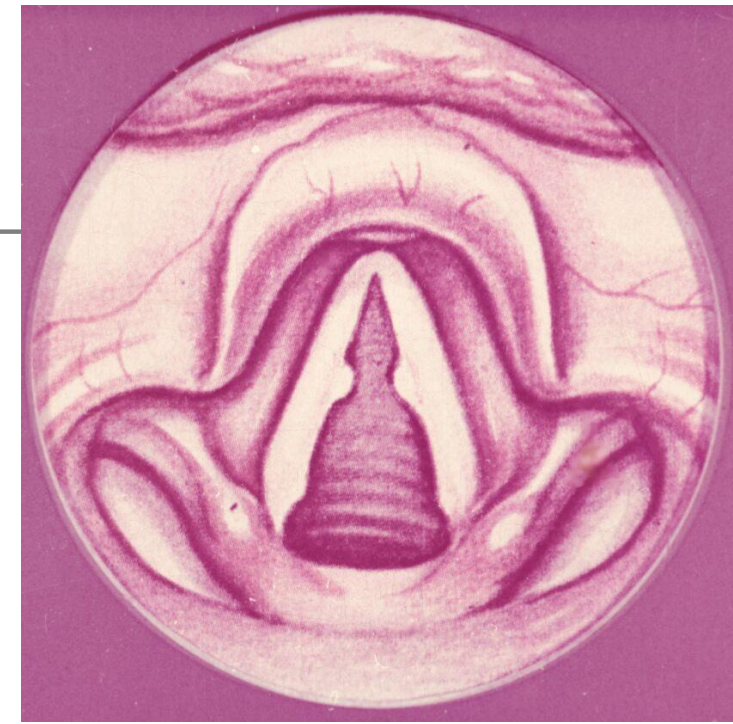
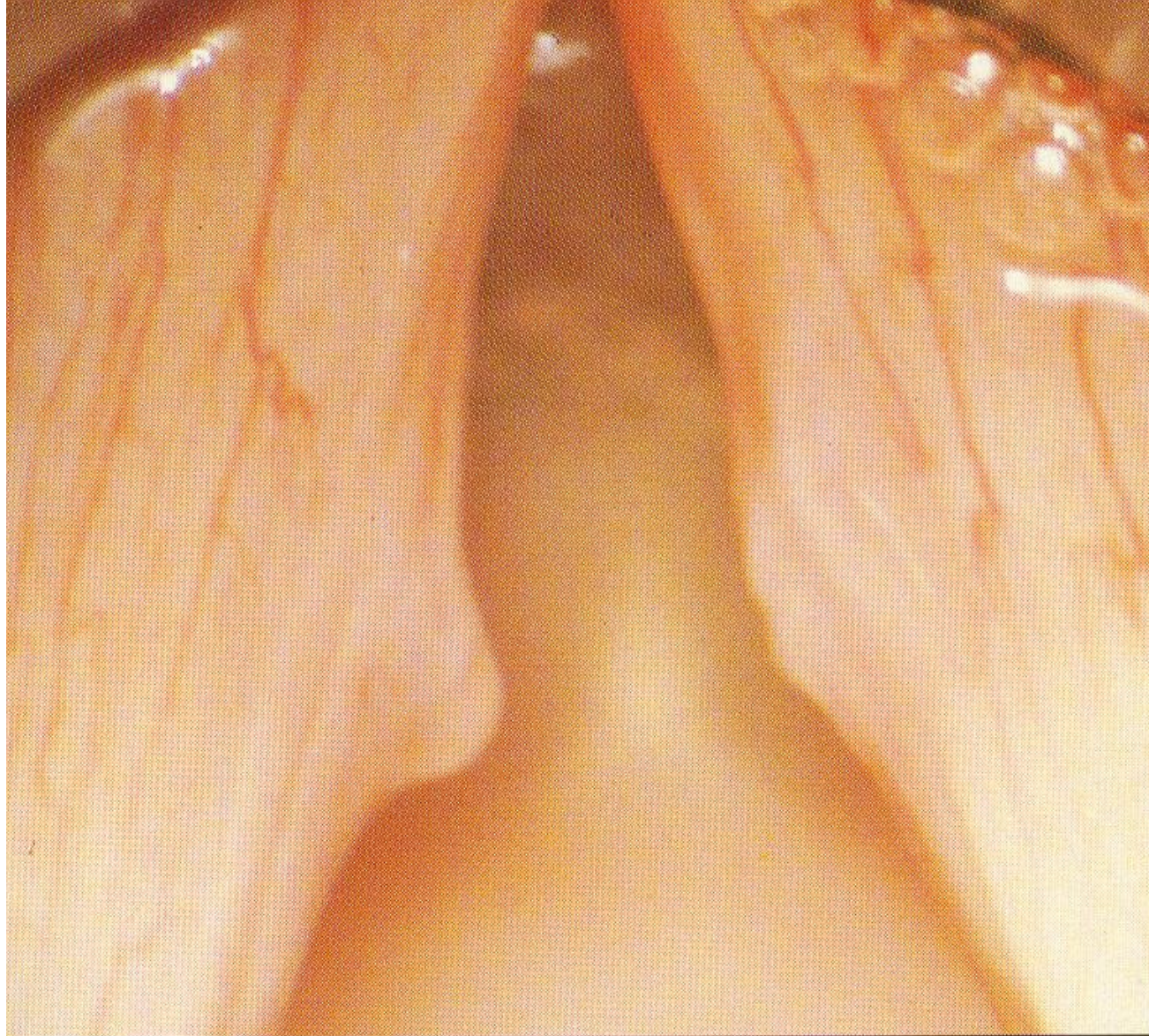


Intubation injury, granulomas



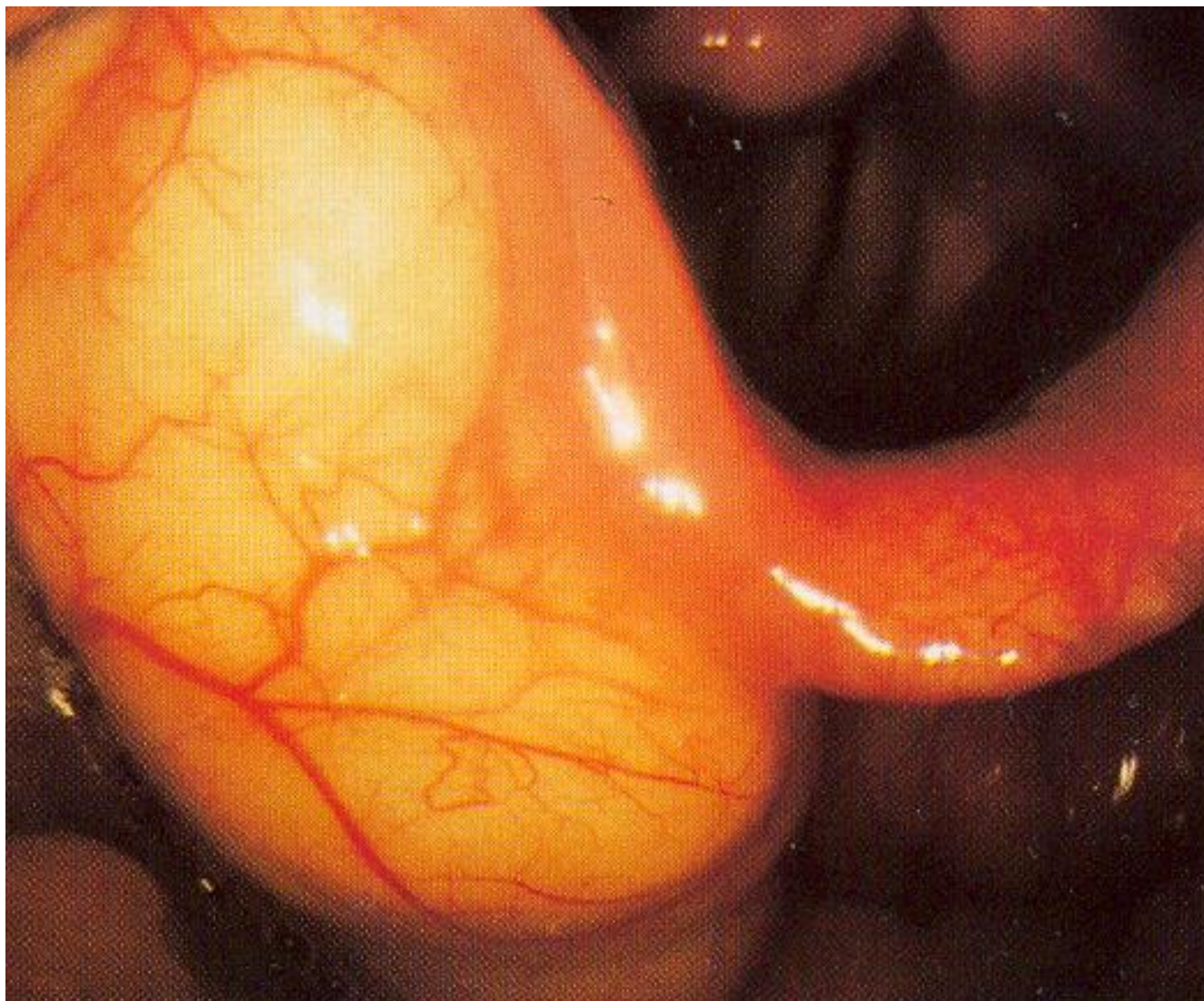
Noduli cantatorii

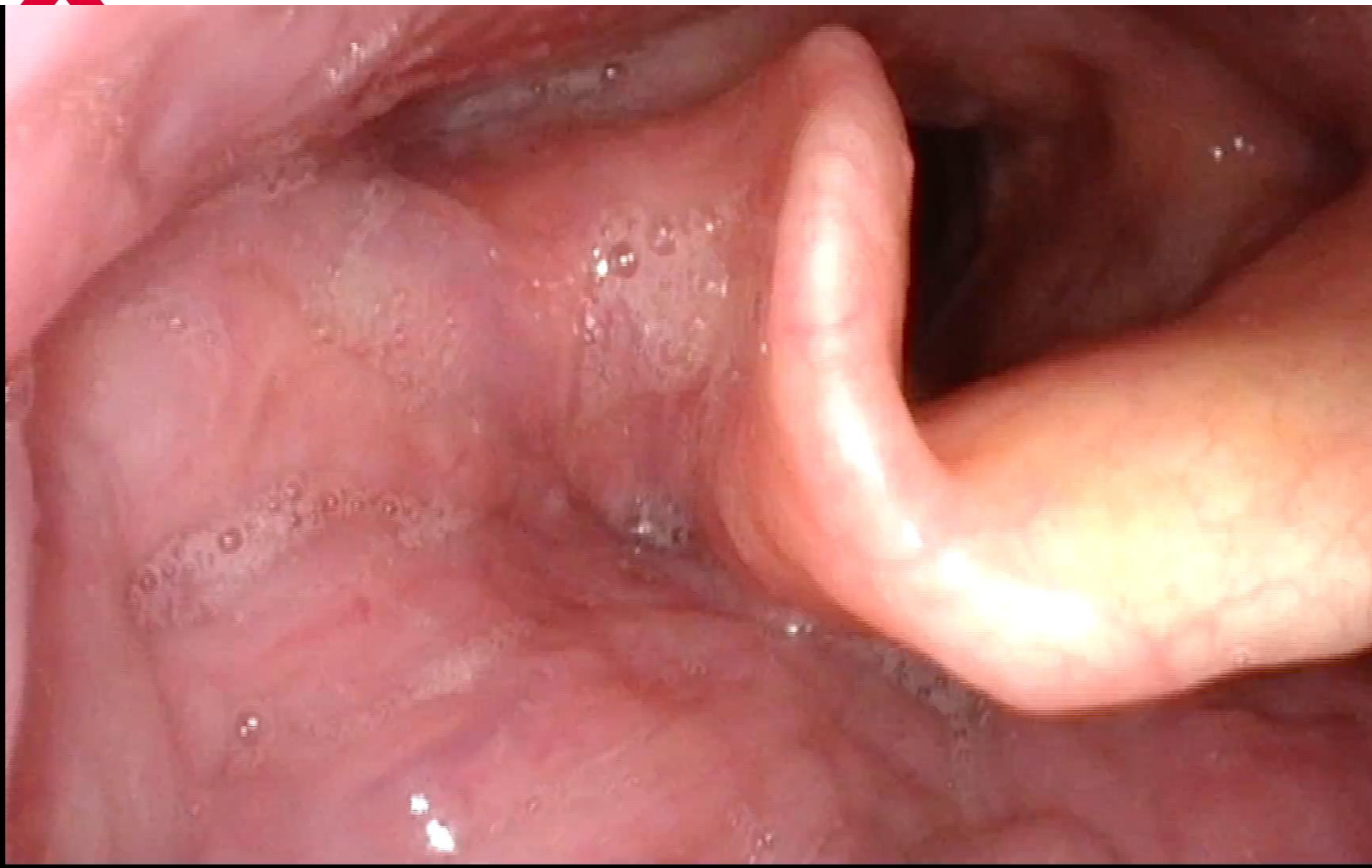
vocal abuse, dysphonia, pain on speaking



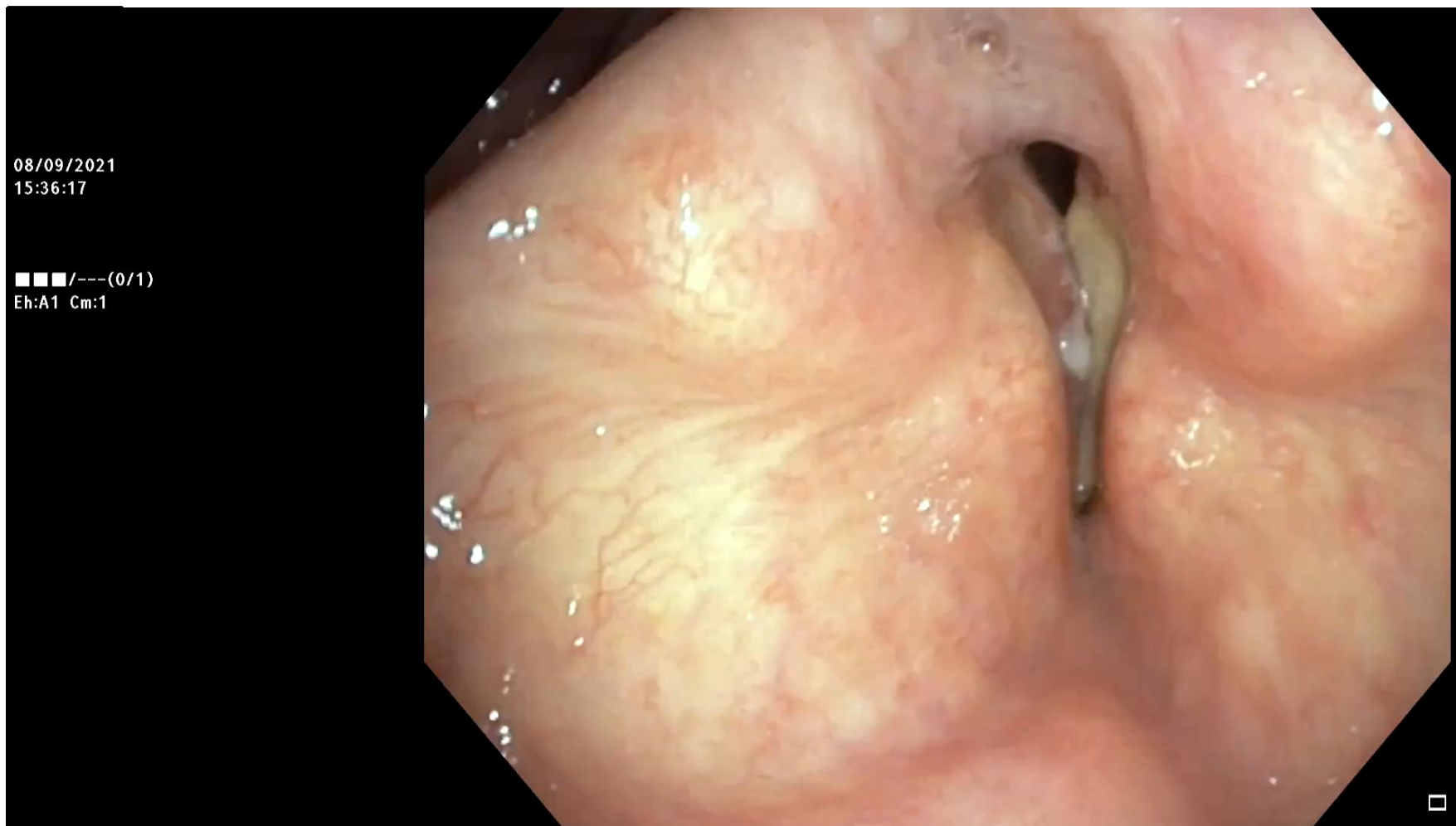
- in voice professionals
- microlaryngoscopy
- strict voice rest

Cystis epiglottidis





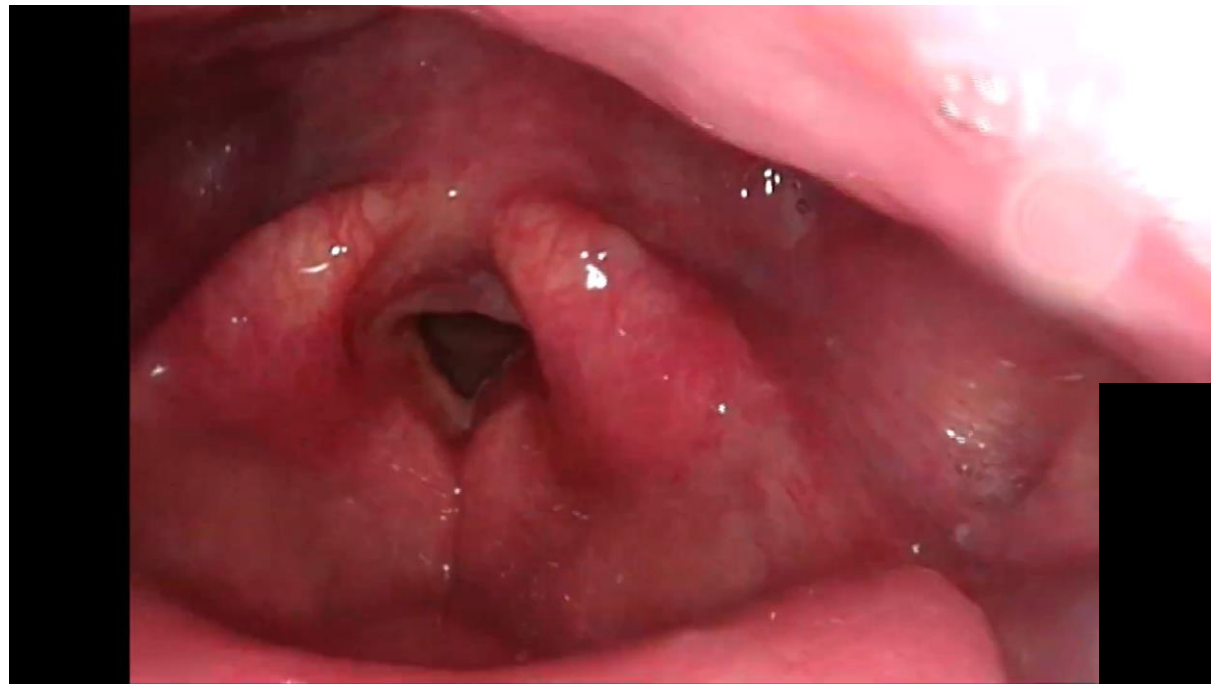
Right vocal cord tumor



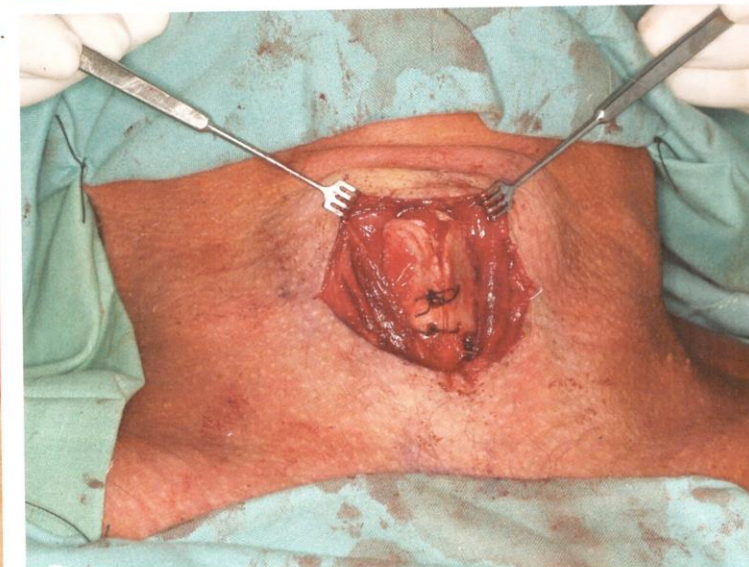
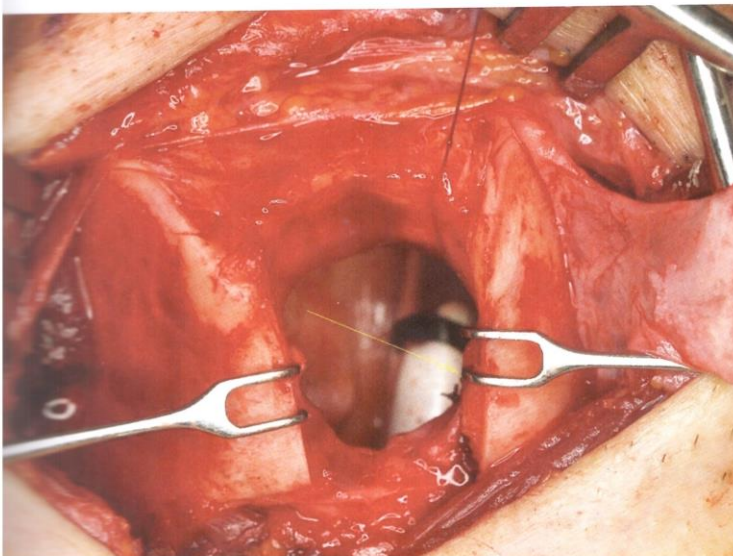
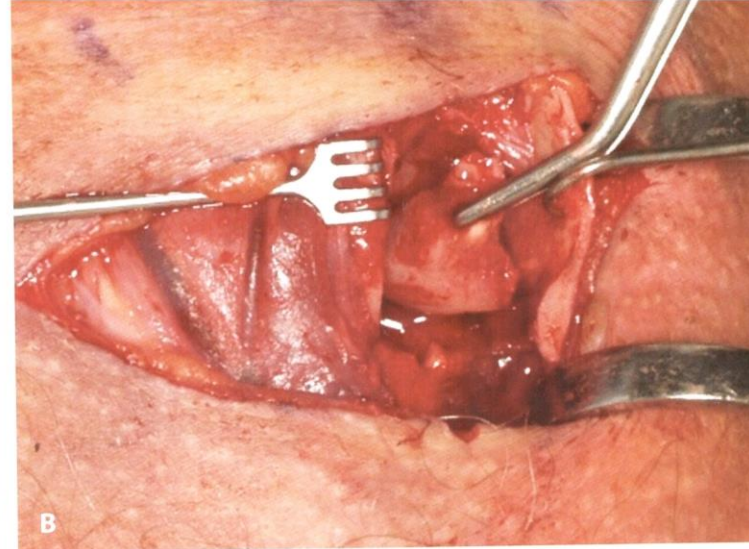
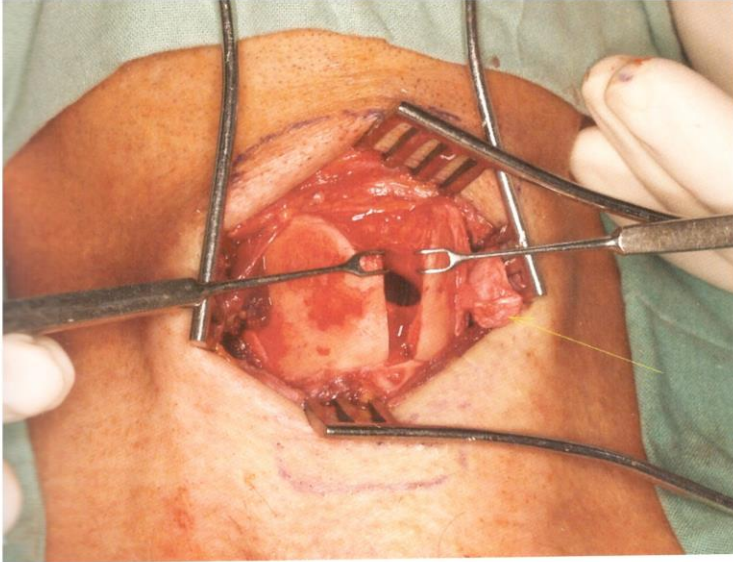
Transglottic cancer of left vocal cord



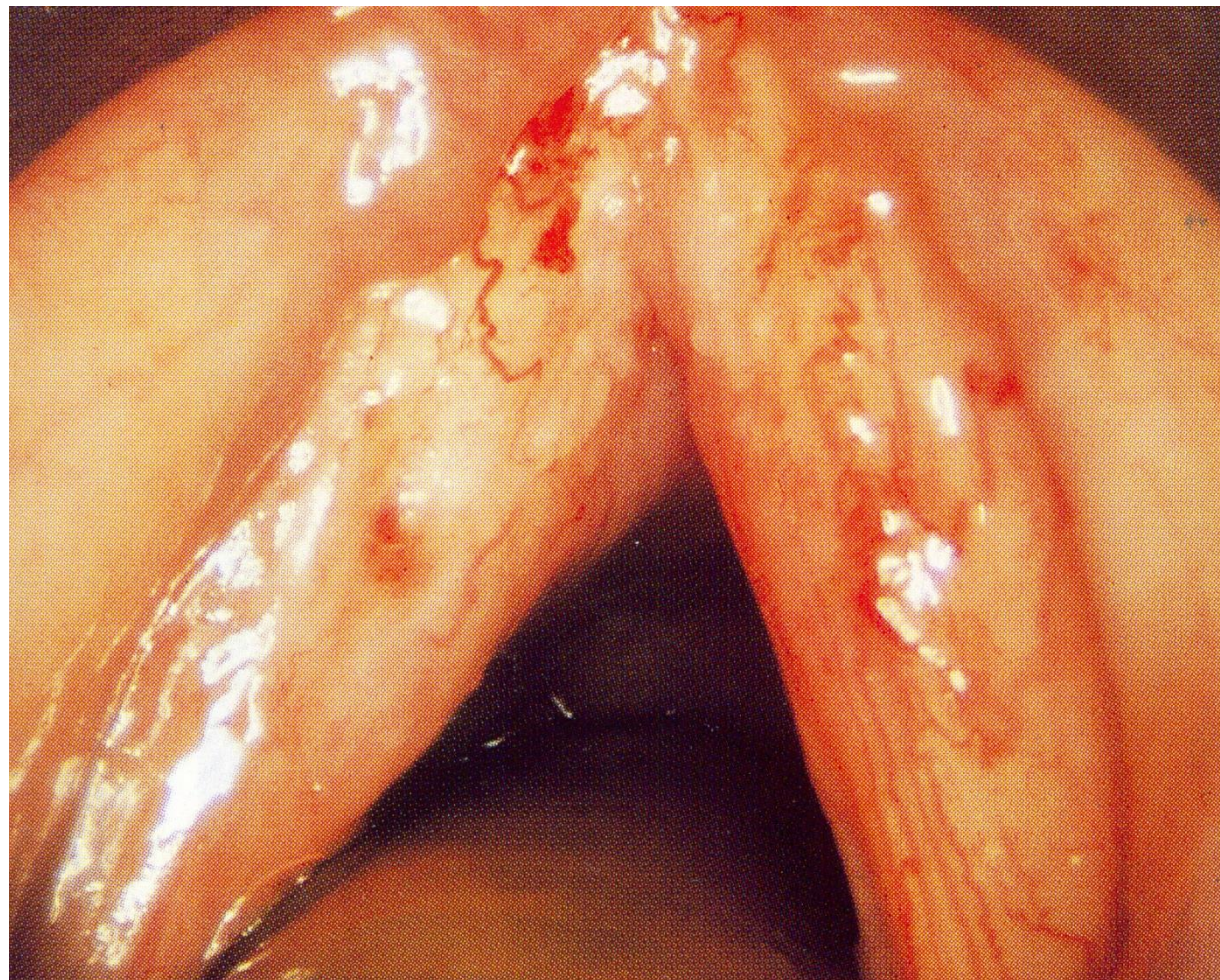
Ca spino plicae vocalis l.sin. (před léčbou a po RT)



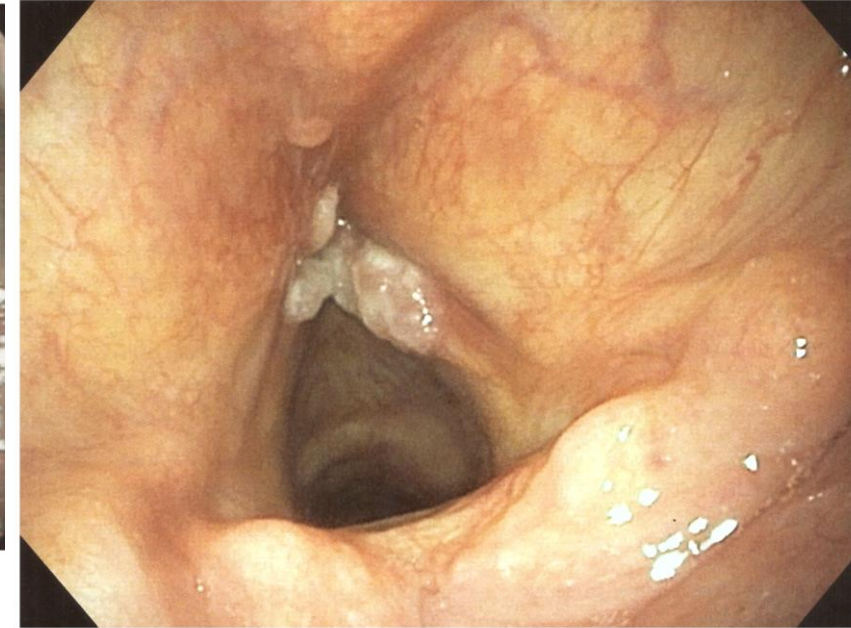
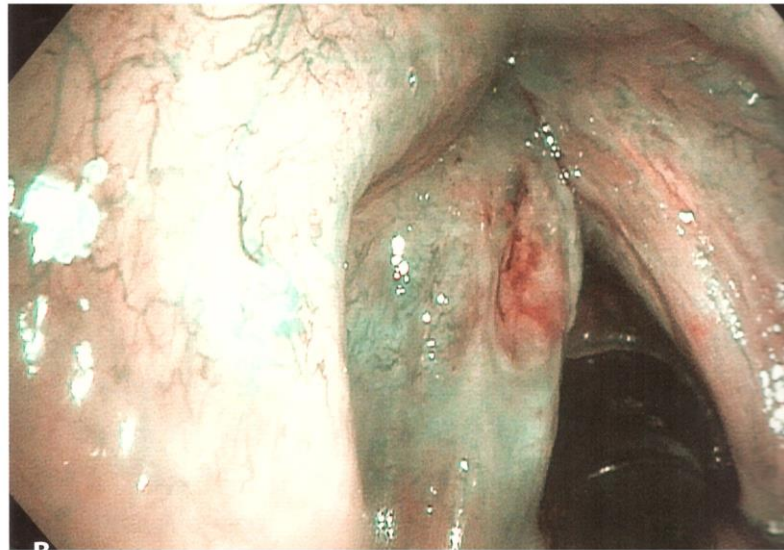
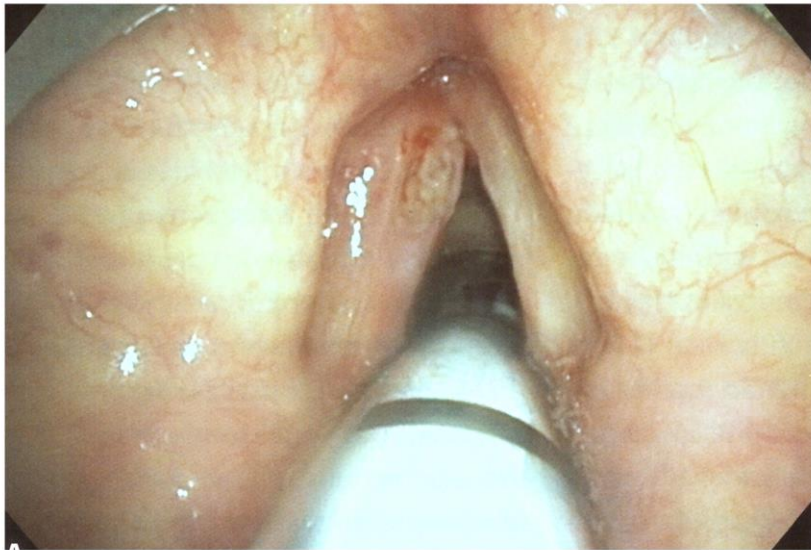
Vertical partial laryngectomy (Leroux-Robert)



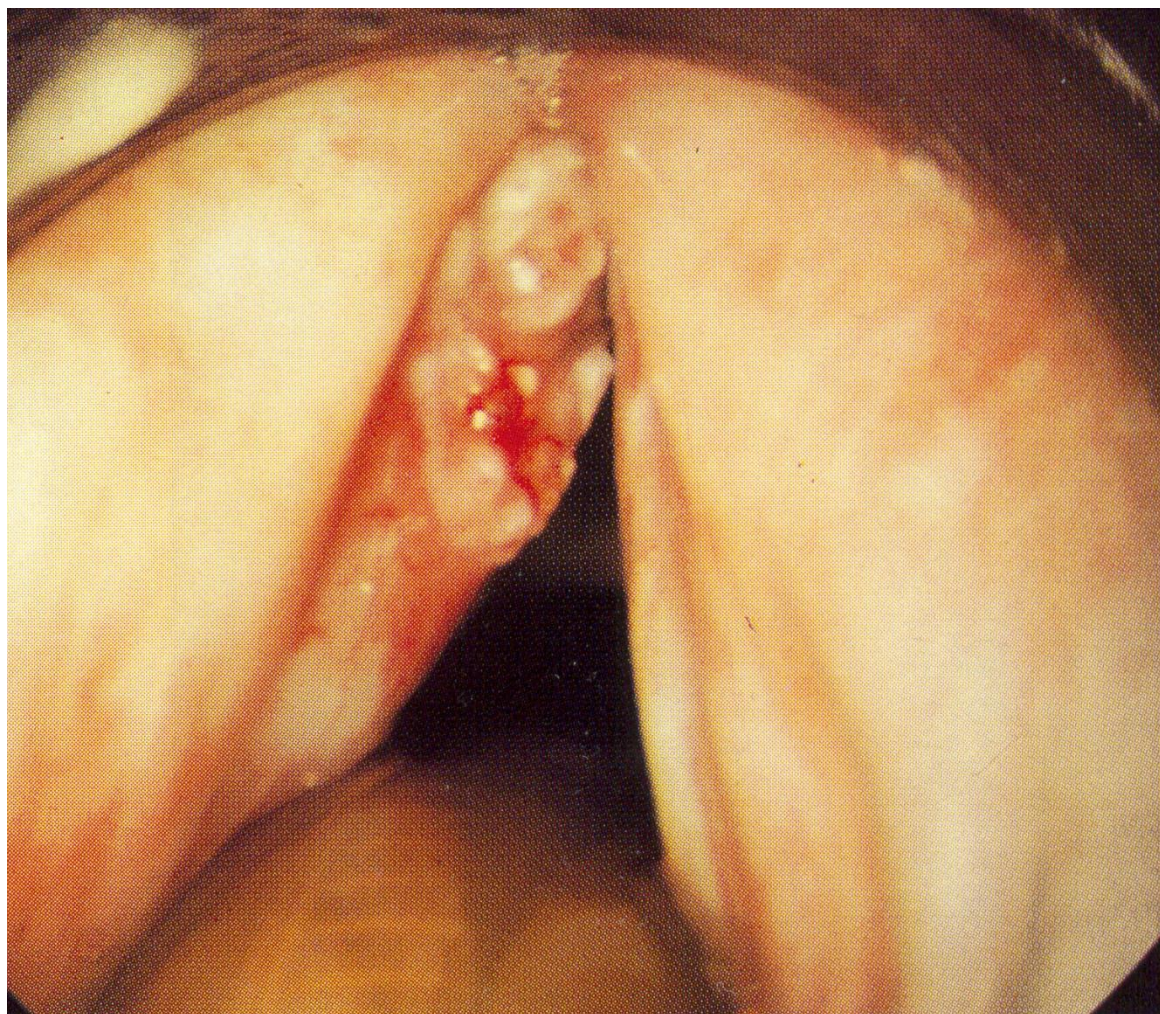
Ca in situ bilat



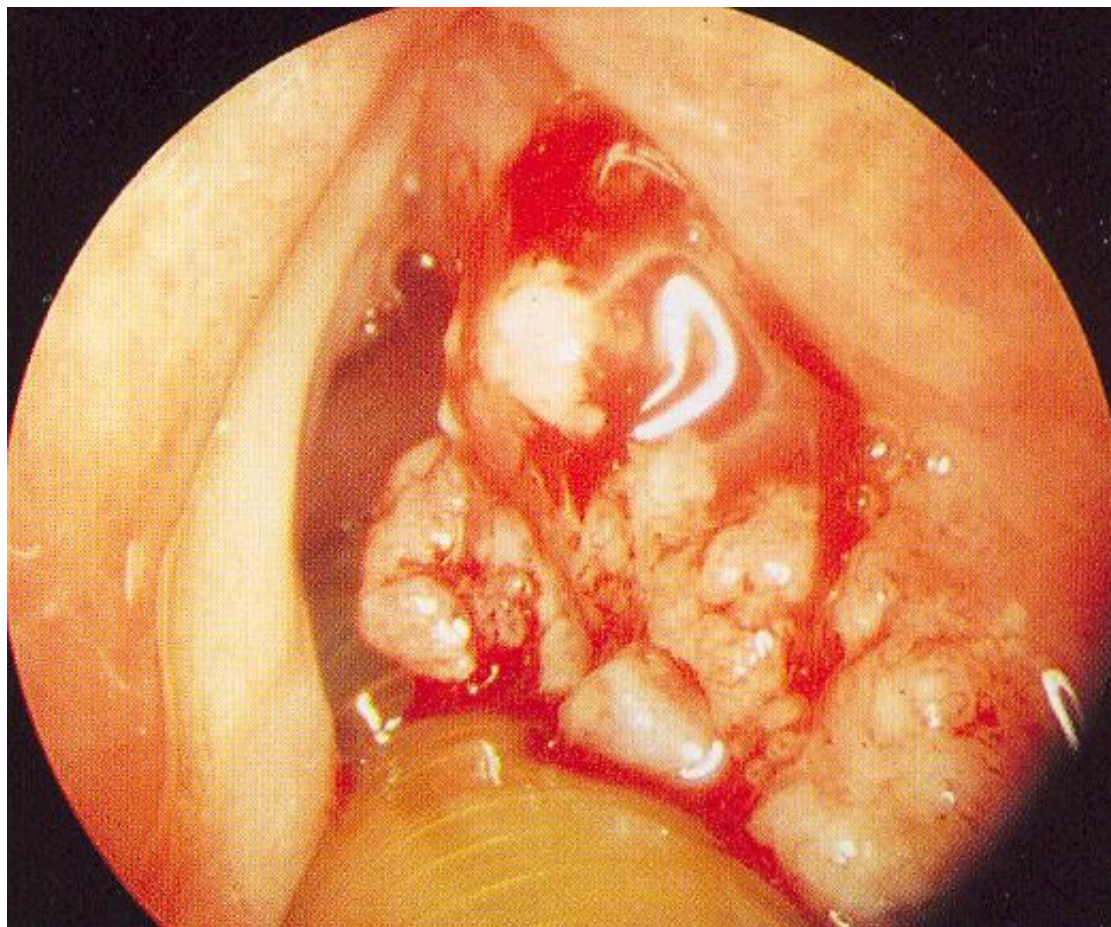
Ca spino plicae vocalis T1



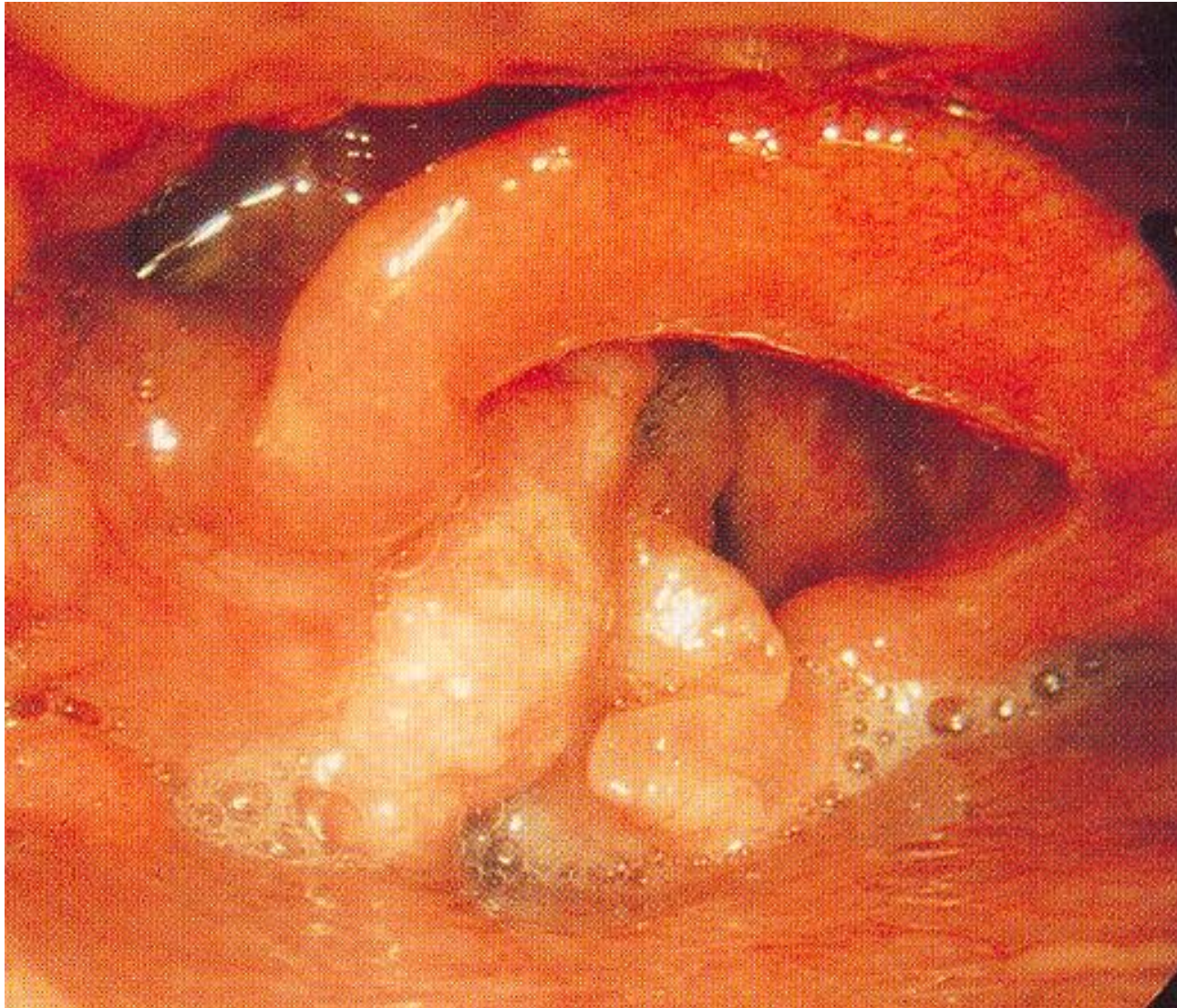
Ca spino plicae voc. l.sin. T2



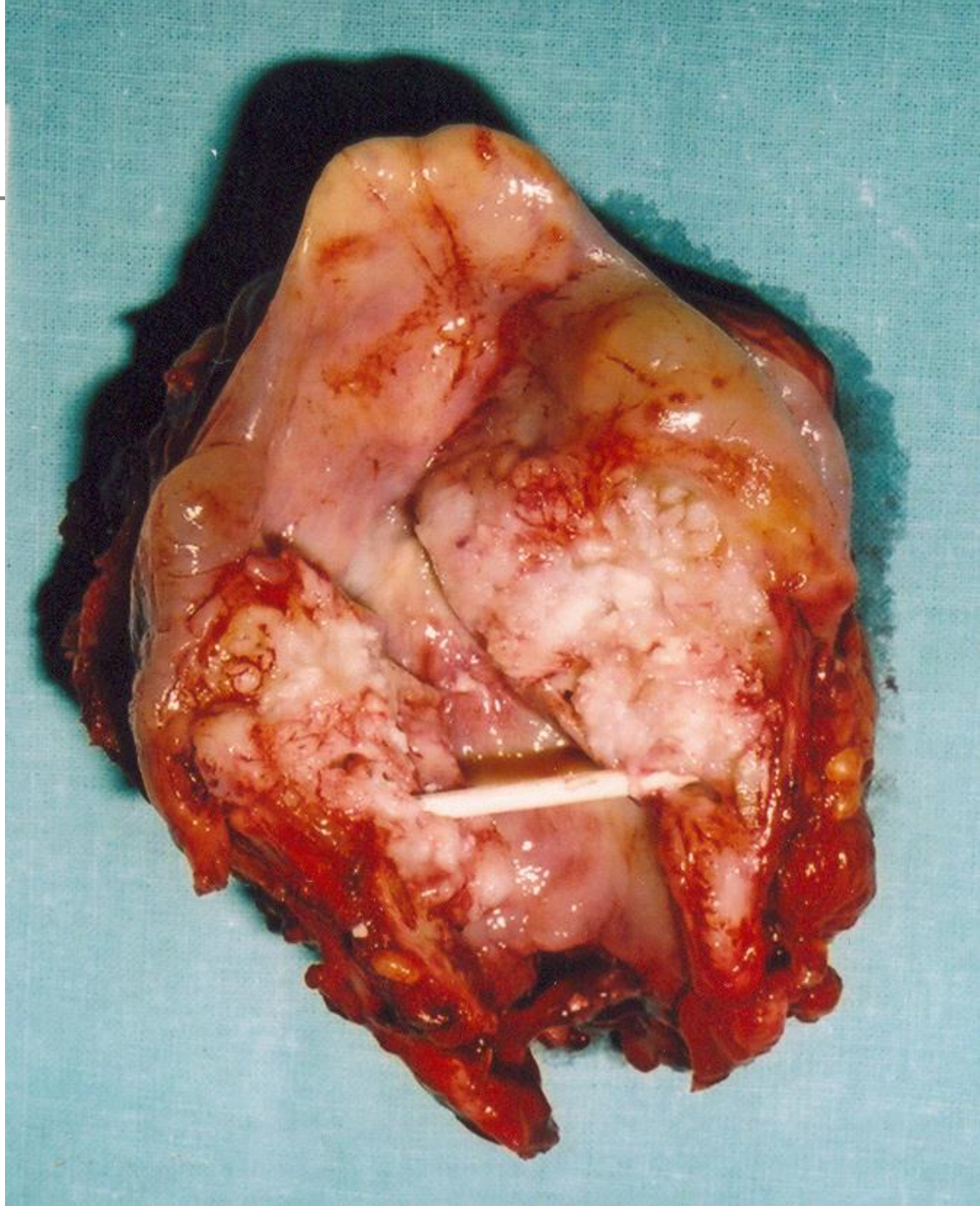
Ca spino plicae voc. l.sin. T3



Ca spino sinus piriformis

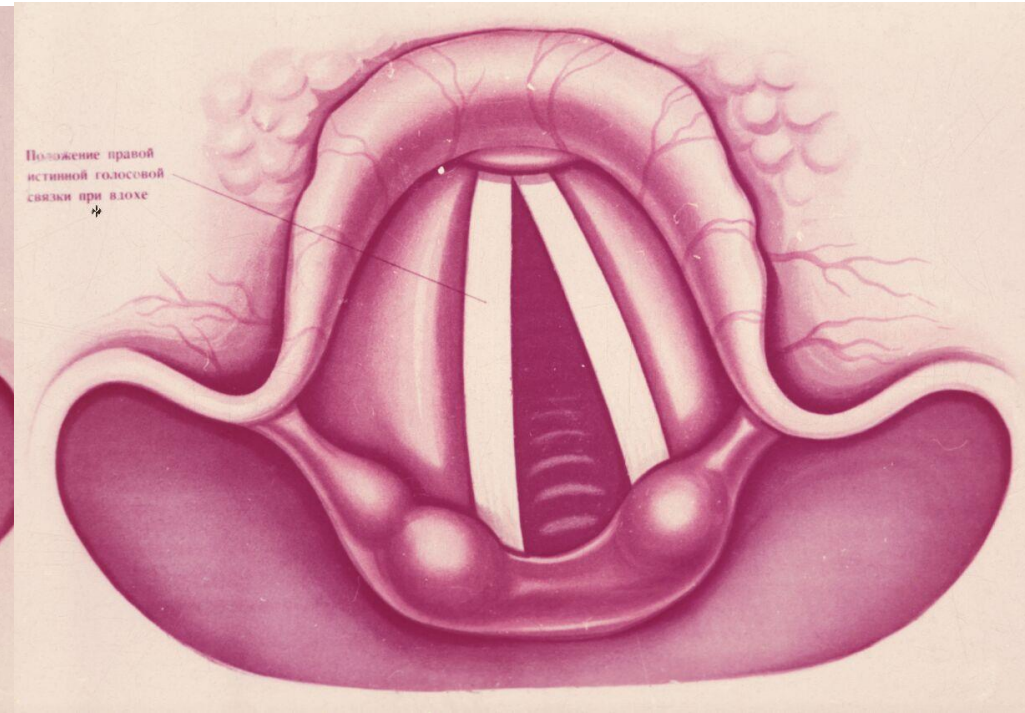
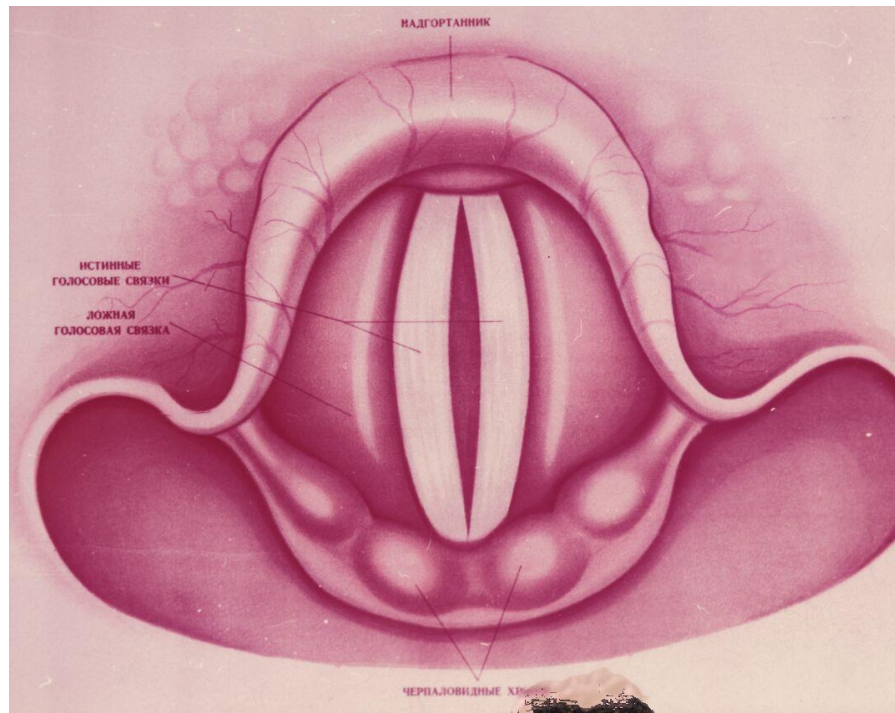


Ca glottis



Disorder of laryngeal motivity

Seeman-Rosenbach rule – in insidious toxic influence
on recurrent nerve - first damaged fibers
phylogenetically younger (for m. posticus)



Laryngeal injury

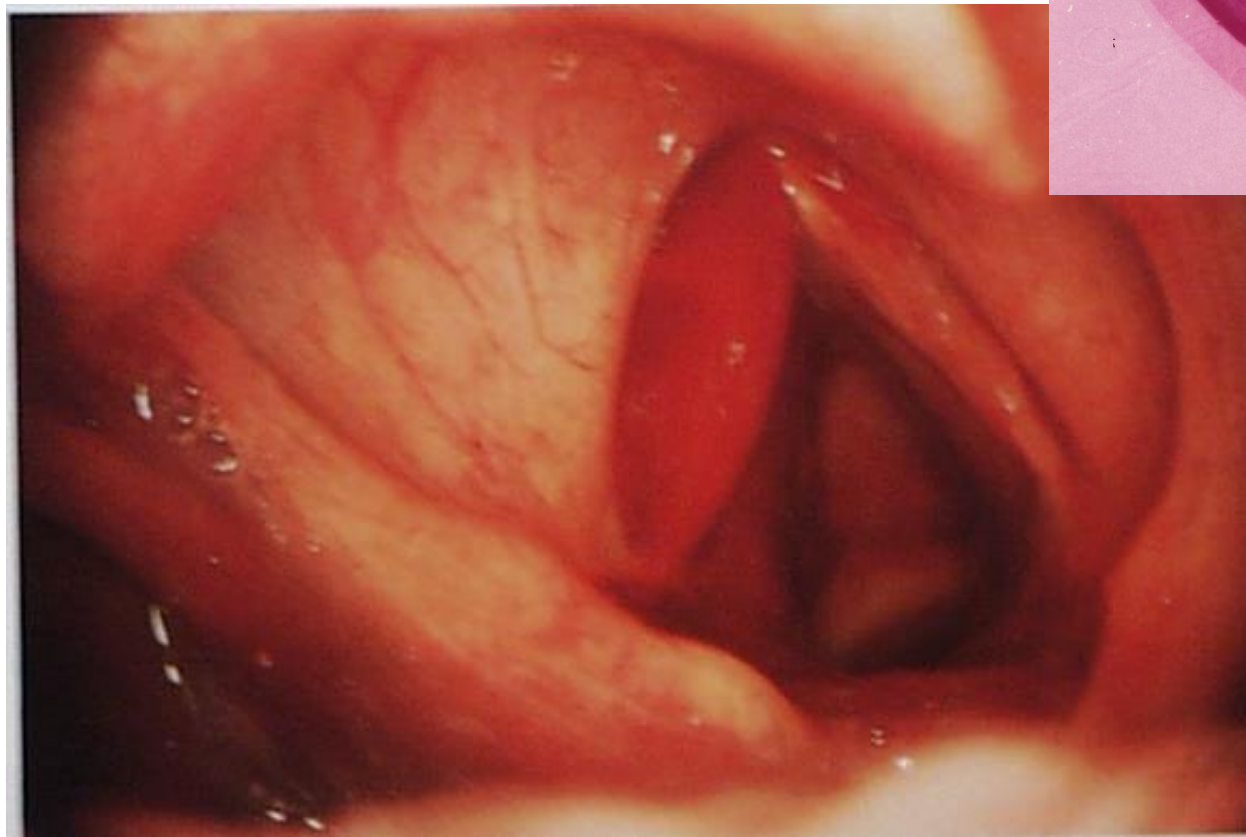
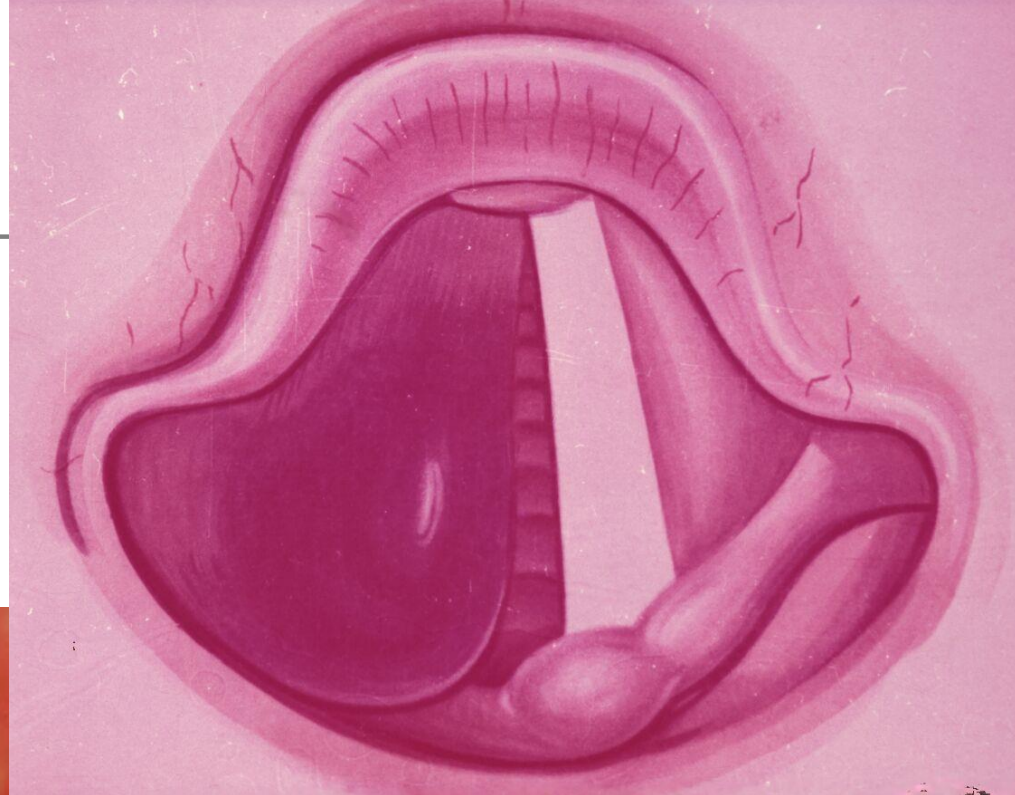
Laryngeal injury – external vs internal

- **Commotio**
- **Contusion**
- **Fractures of laryngeal cartilages**

Symptoms – according to degree of laryngeal injury

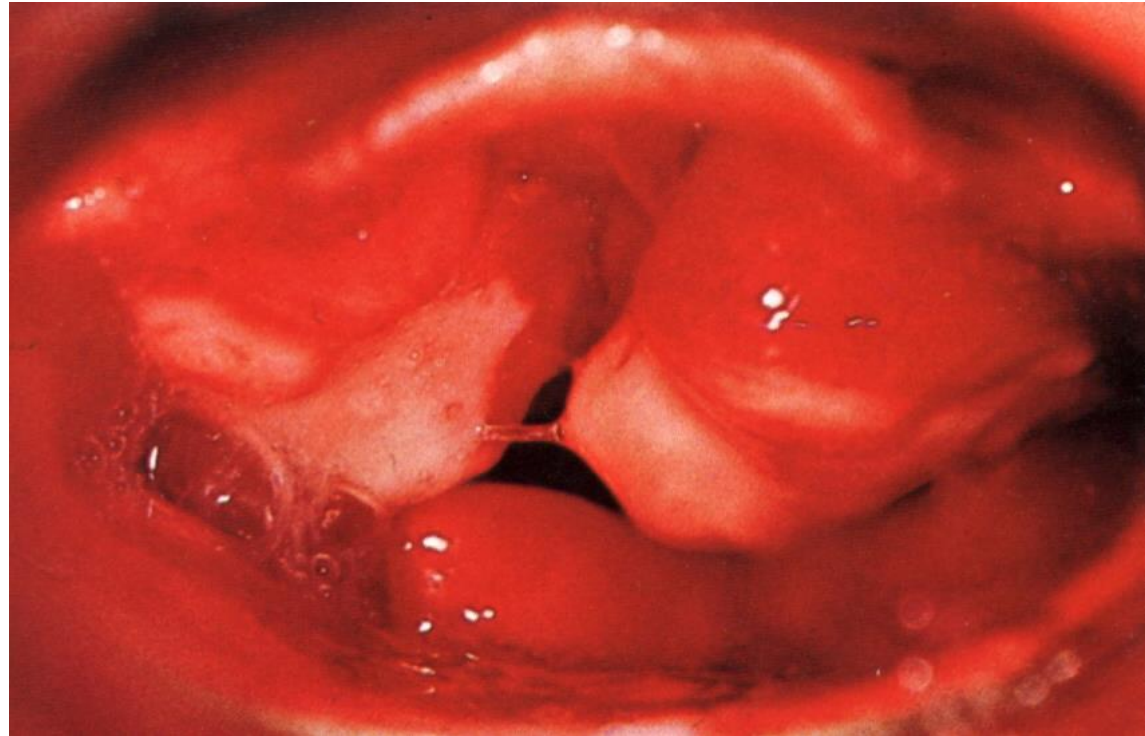
- Dyspnea
- Dysphonia
- Bleeding – not very extensive
- Dysphagia – in connection to injury of pharyngeal and esophageal muscles

Hematoma of the right vocal cord

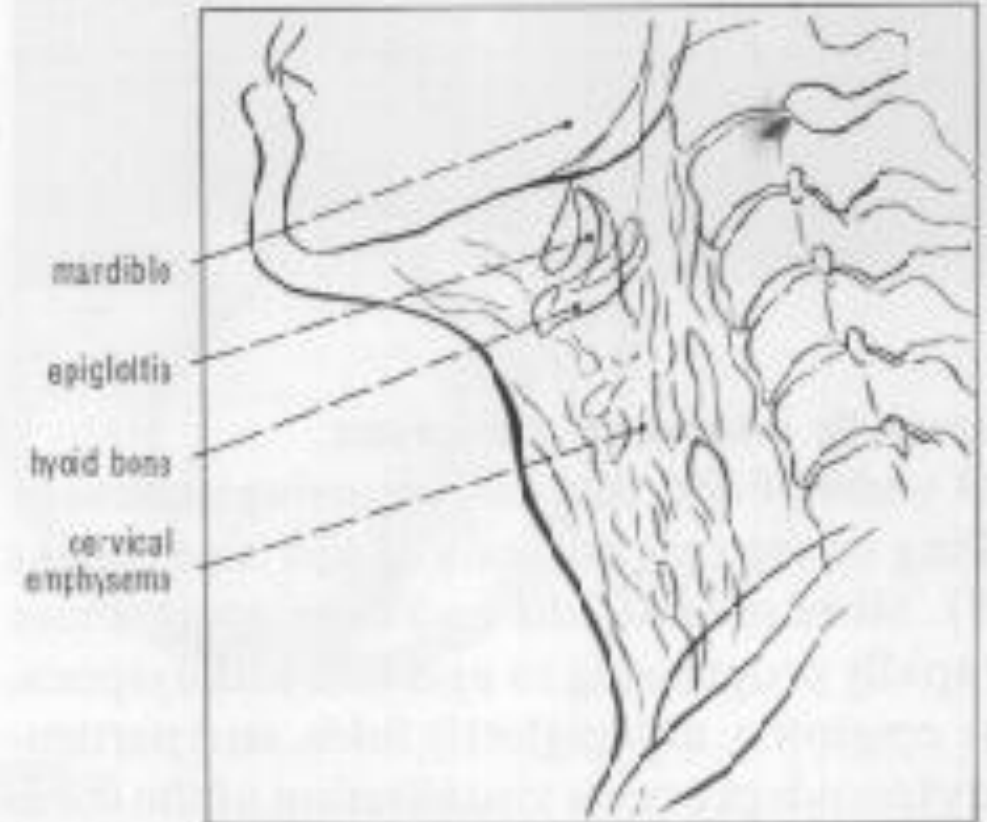
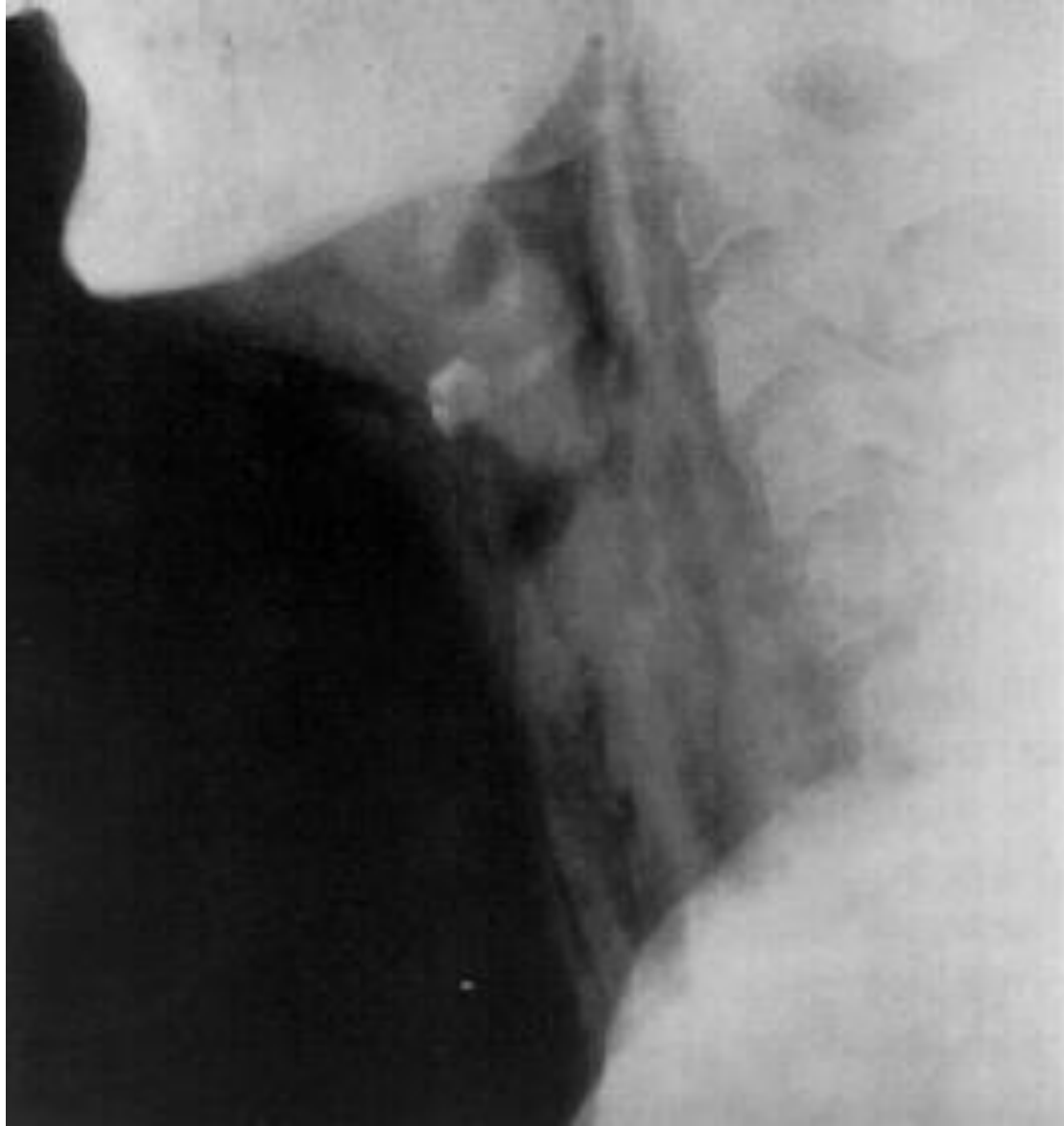


Fracture of laryngeal skeleton

Laryngeal fracture
with a mucosal
hematoma and
dislocation of the
arytenoid



Laryngeal fracture, neck emphysema





External laryngeal injury, first physician aid

- Anti- shock treatment
- care for airway
- Management of bleeding

Light injury (blunt trauma) conservative treatment-

- 1) antihistaminic, corticosteroids, antibiotics, analgesics', oxygen
- 2) cold compress on neck
- 3) in dyspnea – coniotomy, intubation, tracheotomy

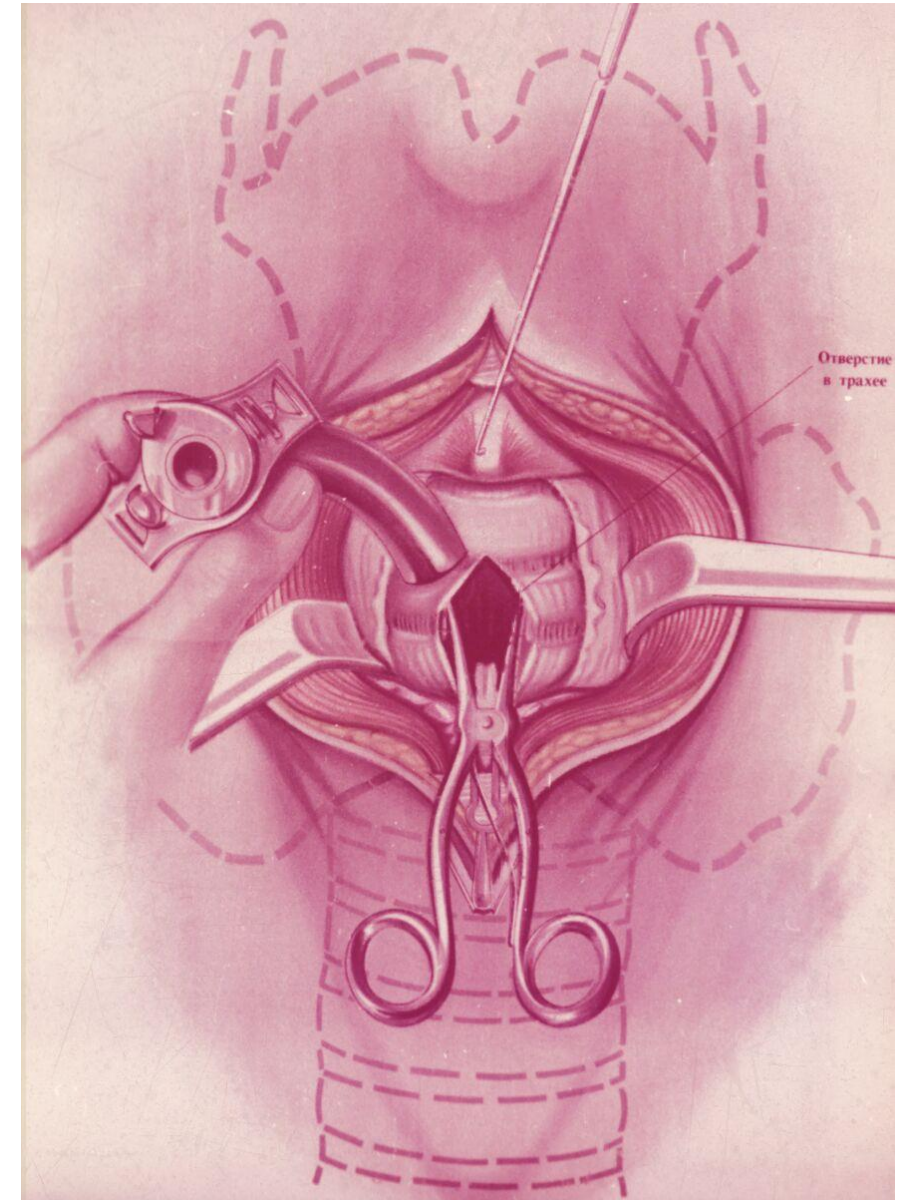
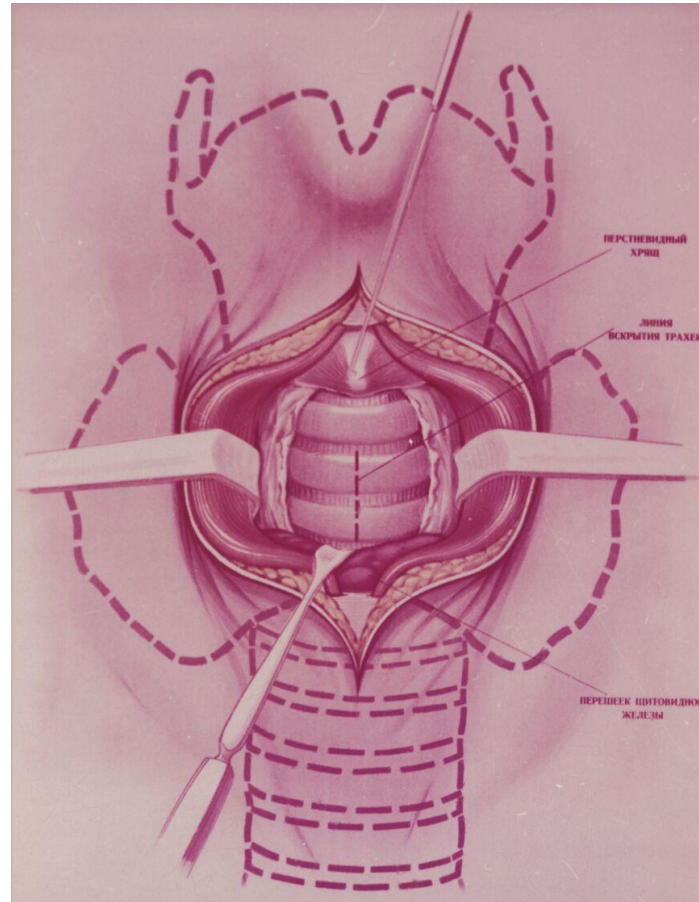
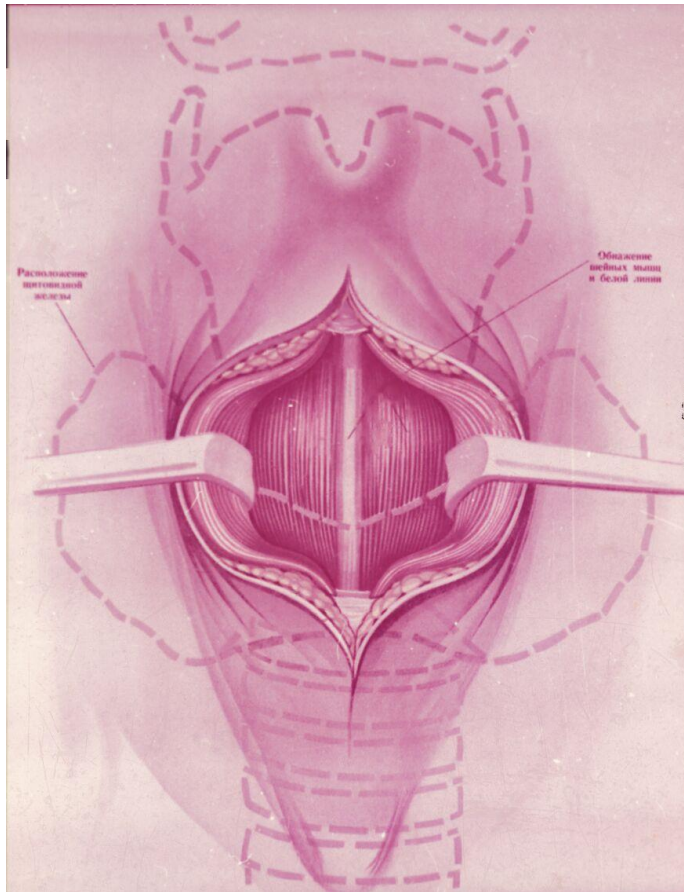
Indication for tracheotomy

„Classic“ – to bridge stenosis caused by inflammation, tumor, foreign body, injury, palsy

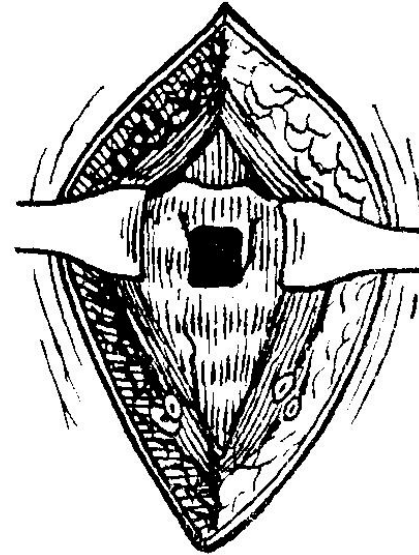
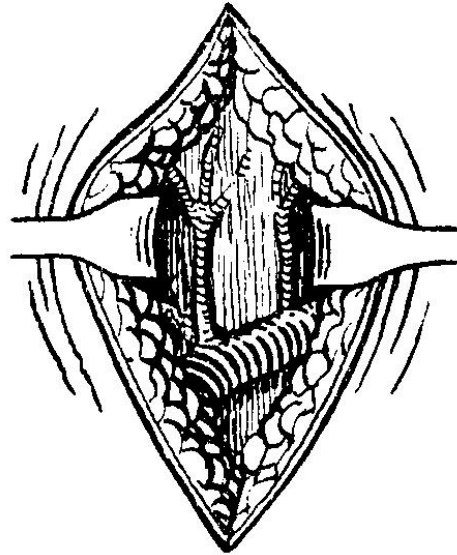
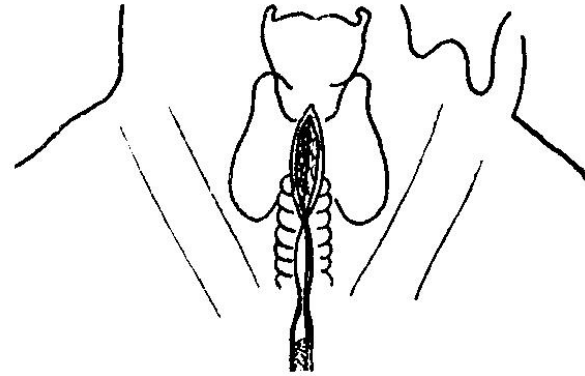
„Anesthesiologic“ long term intubation of patient (prophylaxis of intubation injury, aspiration; reduction of dead space in airway, suction...etc.)

„Prophylactic“ – if we suppose possible stenosis (big surgery, swelling, bleeding, irradiation...)

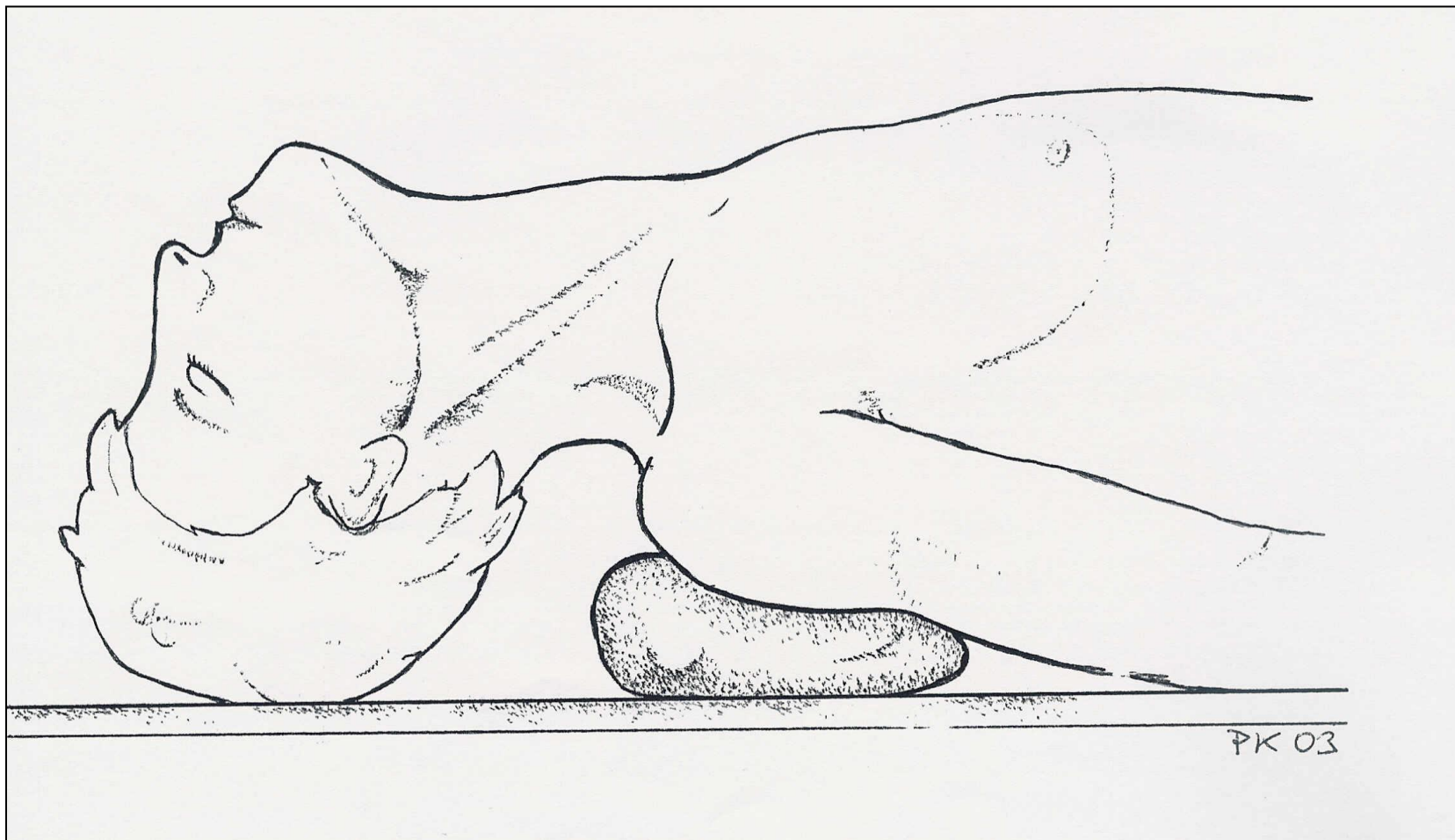
Tracheotomy



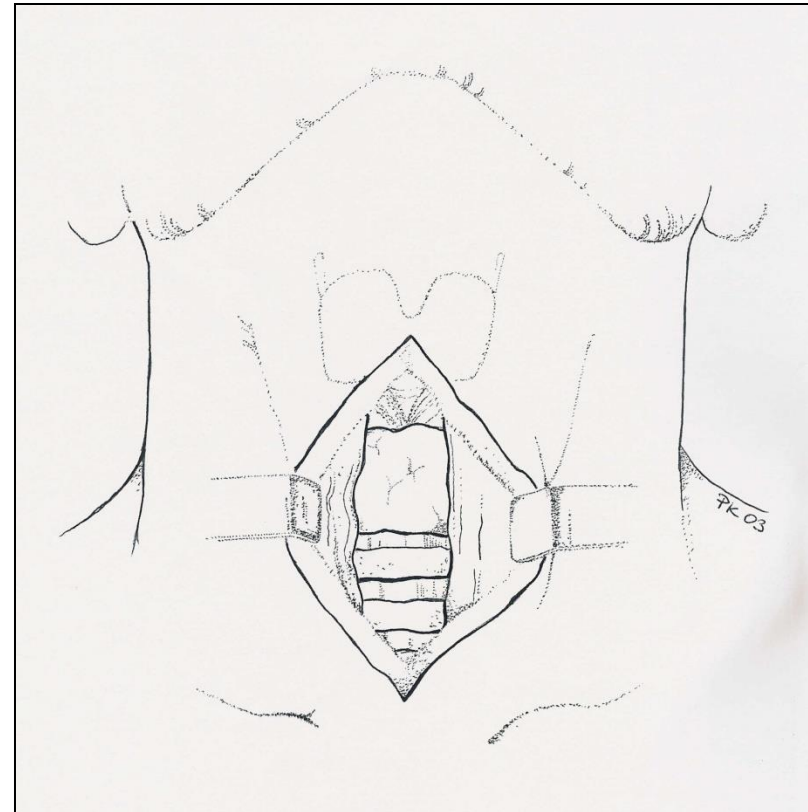
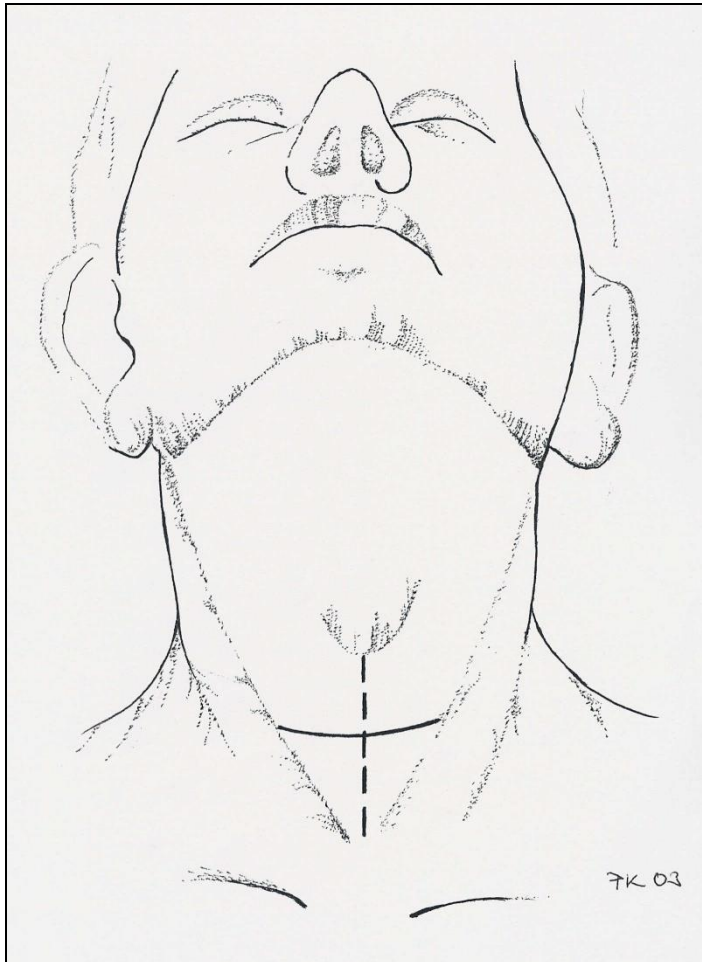
Tracheotomy



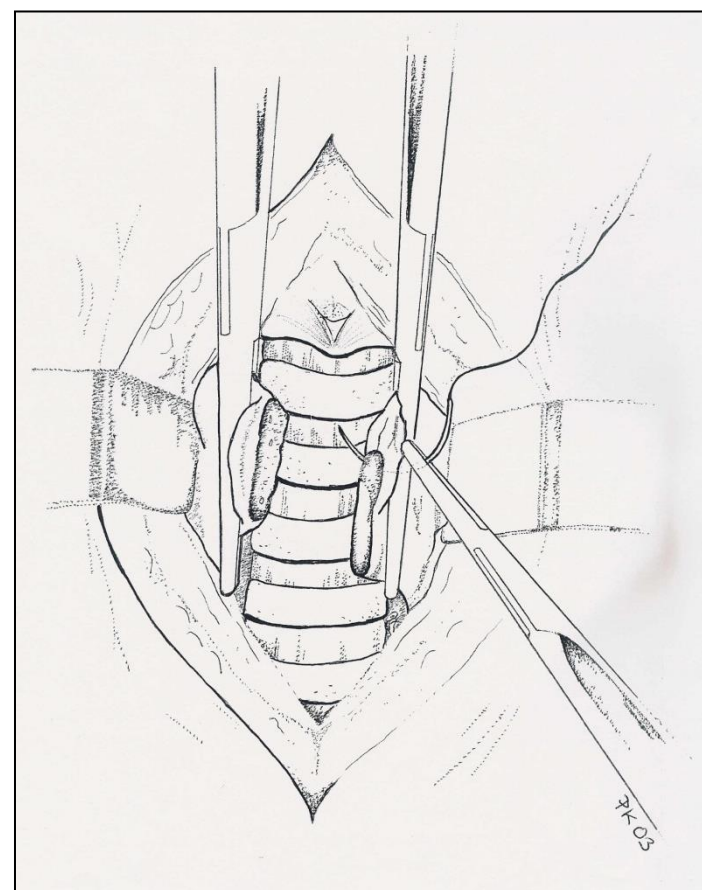
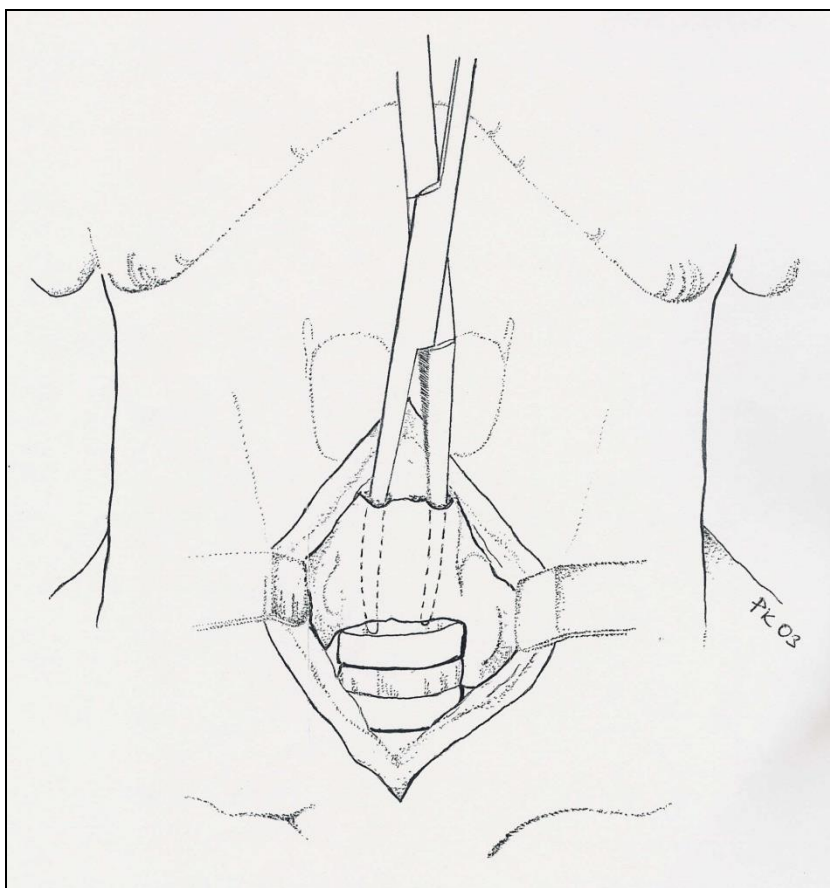
Position in tracheotomy



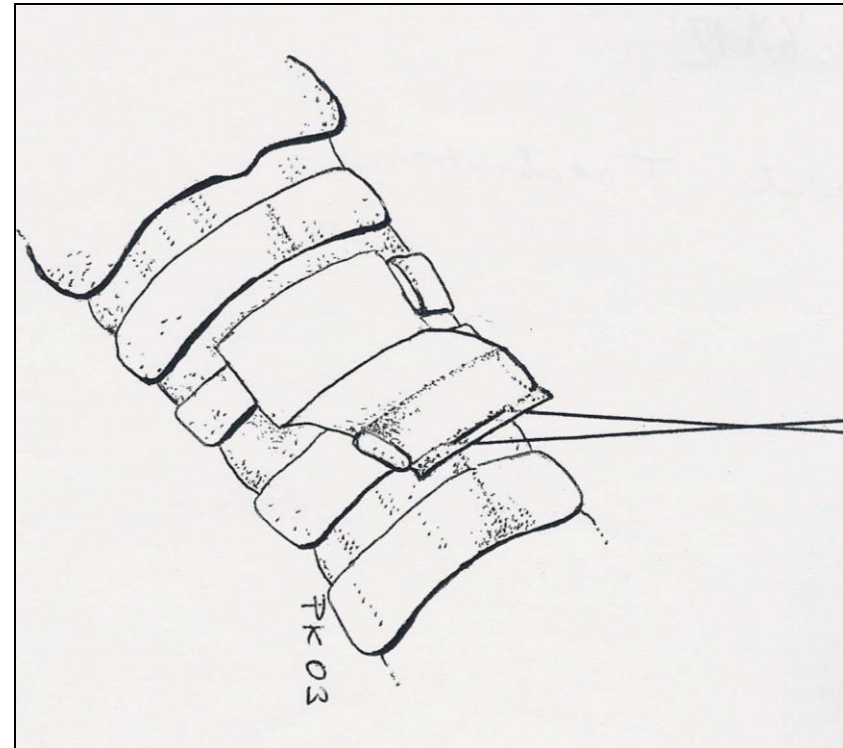
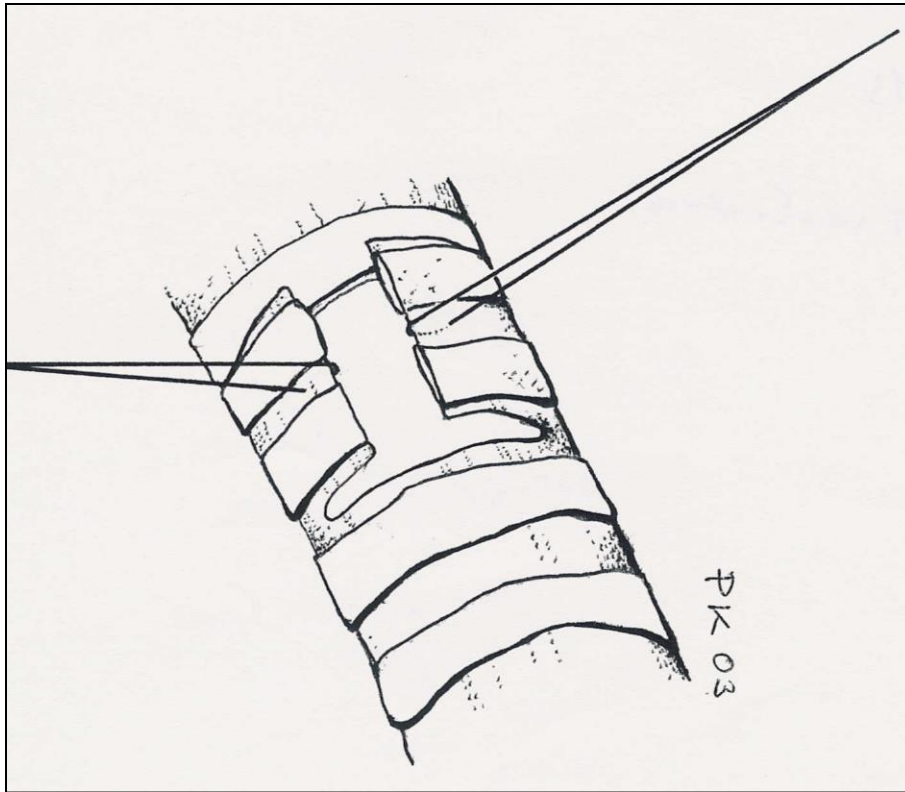
Skin section – horizontal or vertical

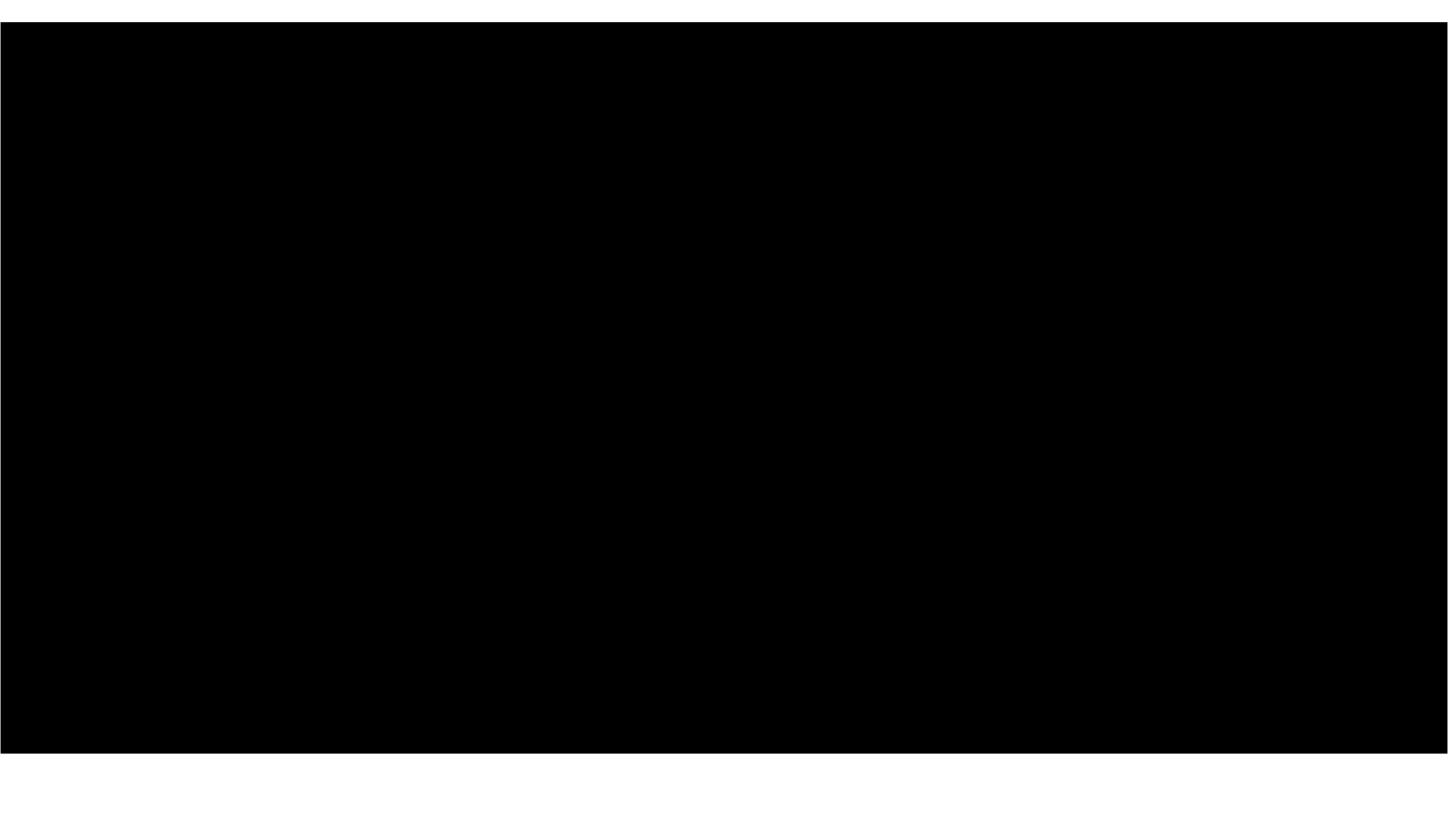


Thyroid gland isthm resection

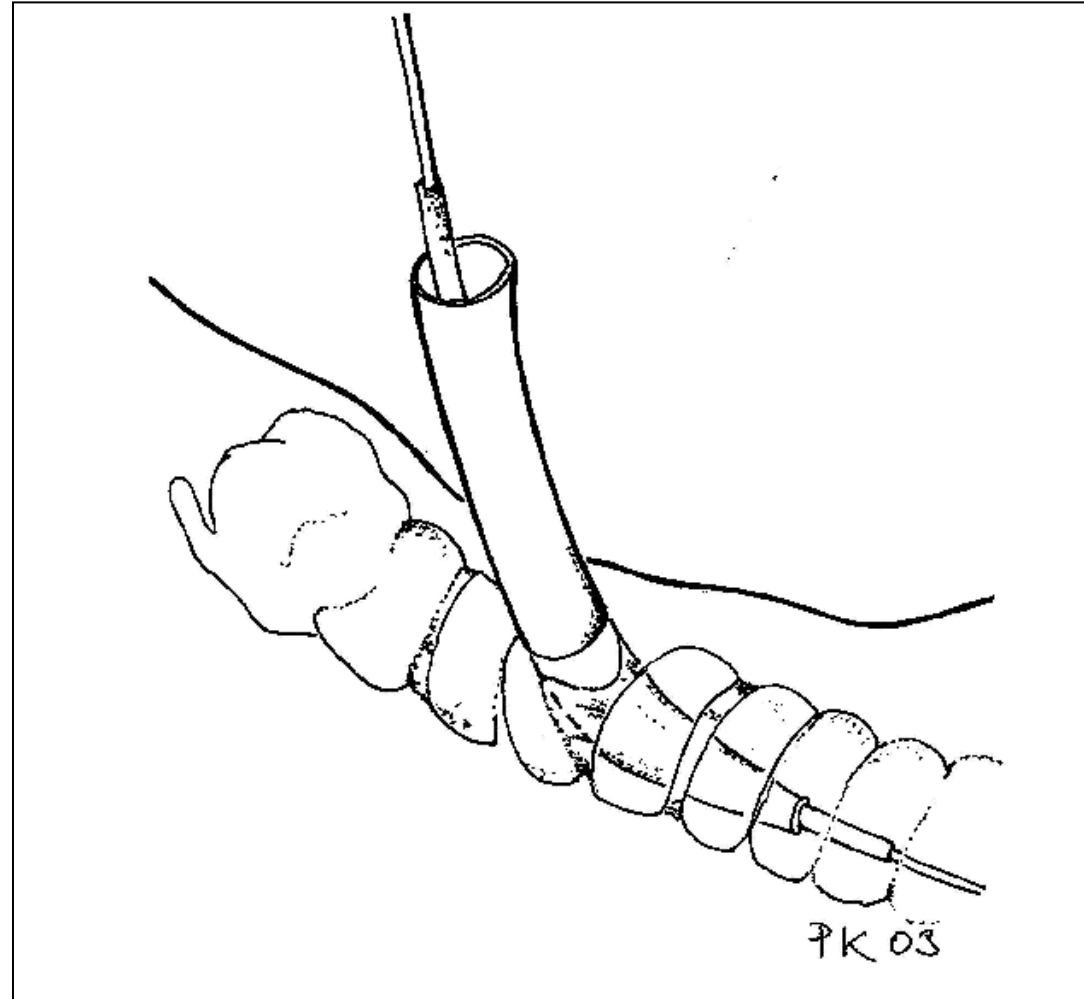


Trachea opening

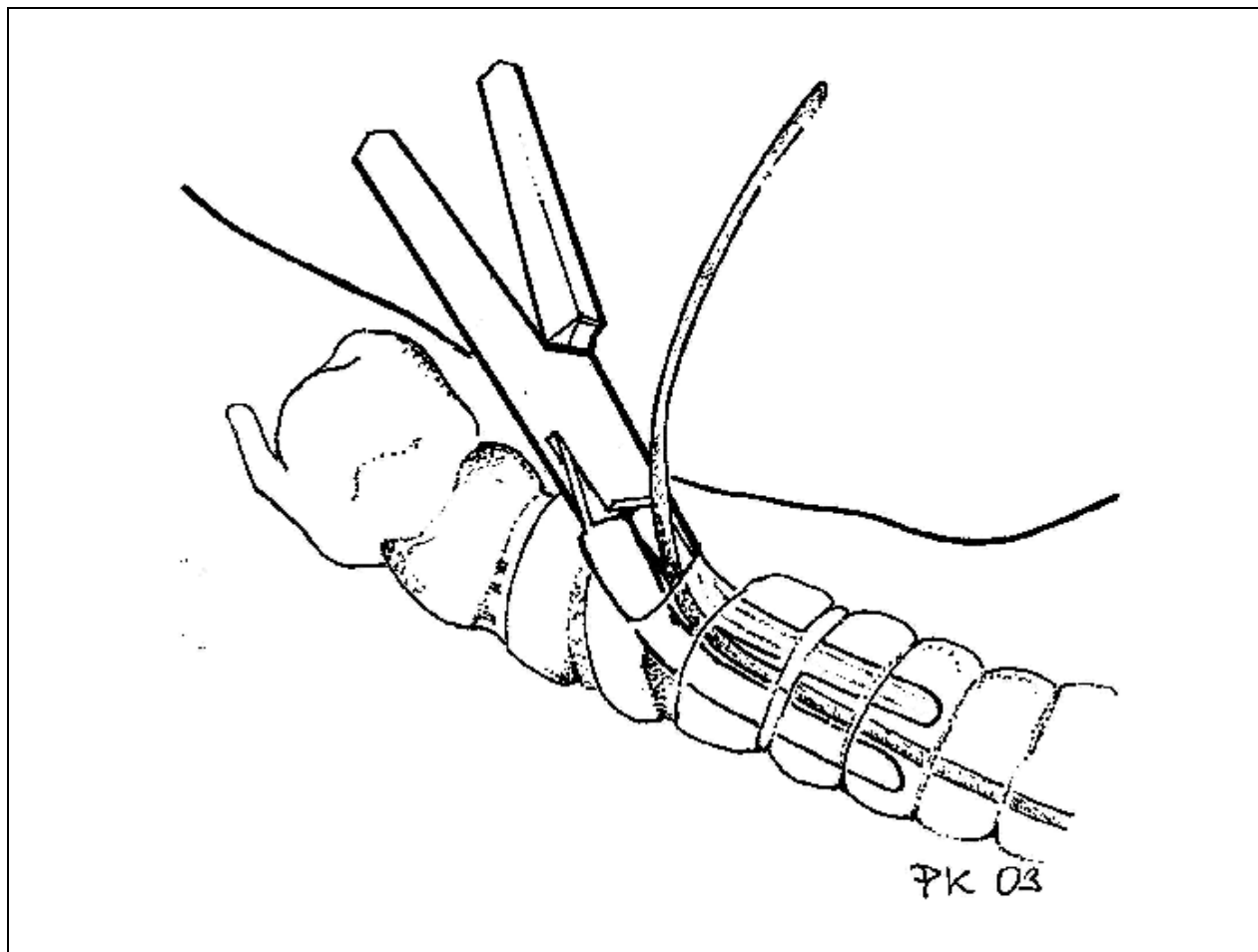




Punction, dilatation tracheotomy - Ciaglia (1985)



PDT – Griggs (1990)

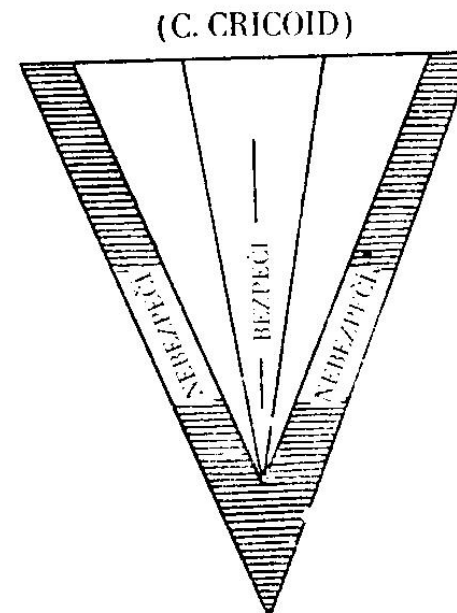


Complication in tracheotomy

During surgery bleeding, dyspnea, lost of orientation,

Early after surgery emphysema, embolism, mediastinal emphysema, pneumothorax, inflammation bleeding, no corresponding opening in trachea and on the skin – problems with exchange o tracheal cannula

Late after surgery stenosis



Orientační trojúhelník při tracheotomii

(podle Ch. Jacksona):

Černá ramena trojúhelníku značí nebezpečnou oblast svazku velkých krčních cév. Střední čára značí bezpečí jak před krvácením, tak před funkčními poruchami hrtanu. Směrem kaudálním od chrupavky prstencové, která tvoří základnu trojúhelníku, bezpečí ubývá, poněvadž se obě nebezpečné zóny sbližují