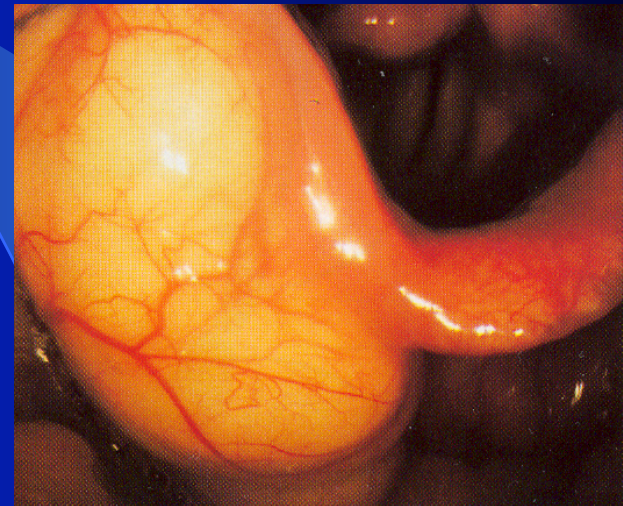
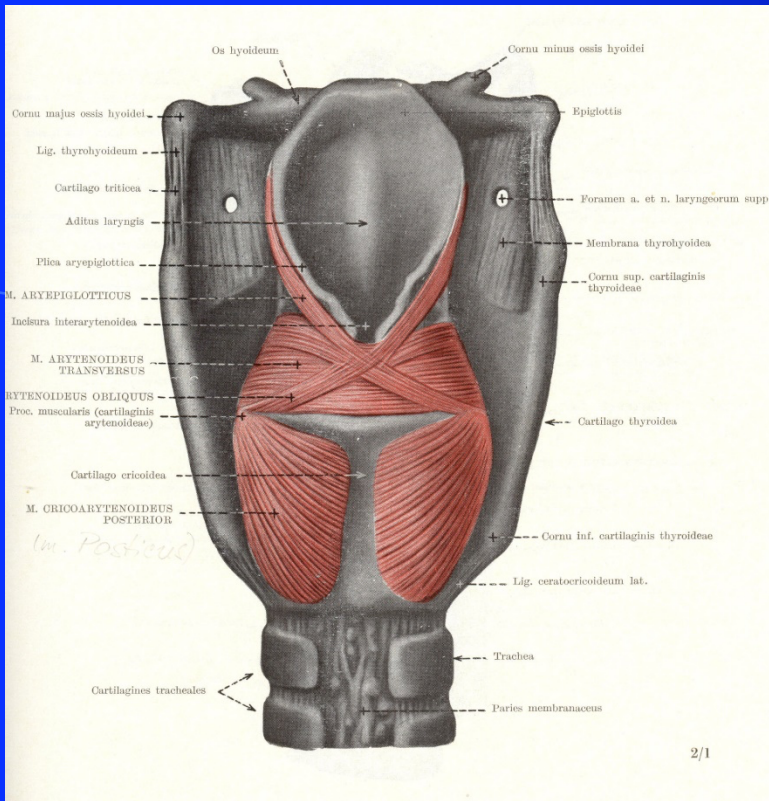


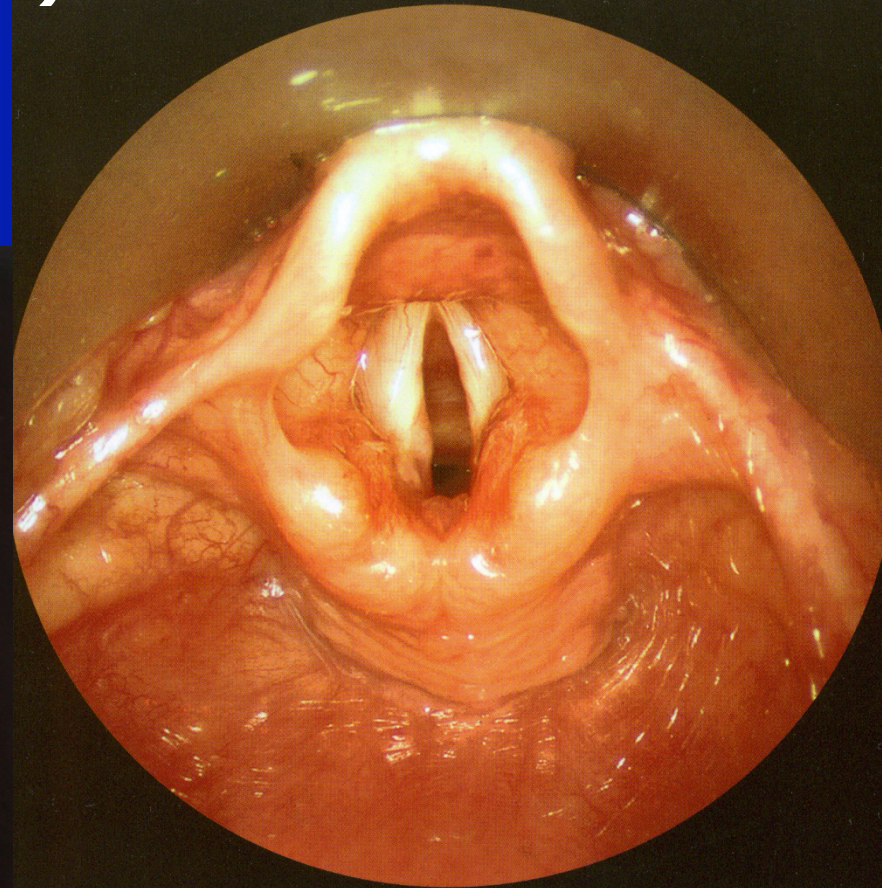
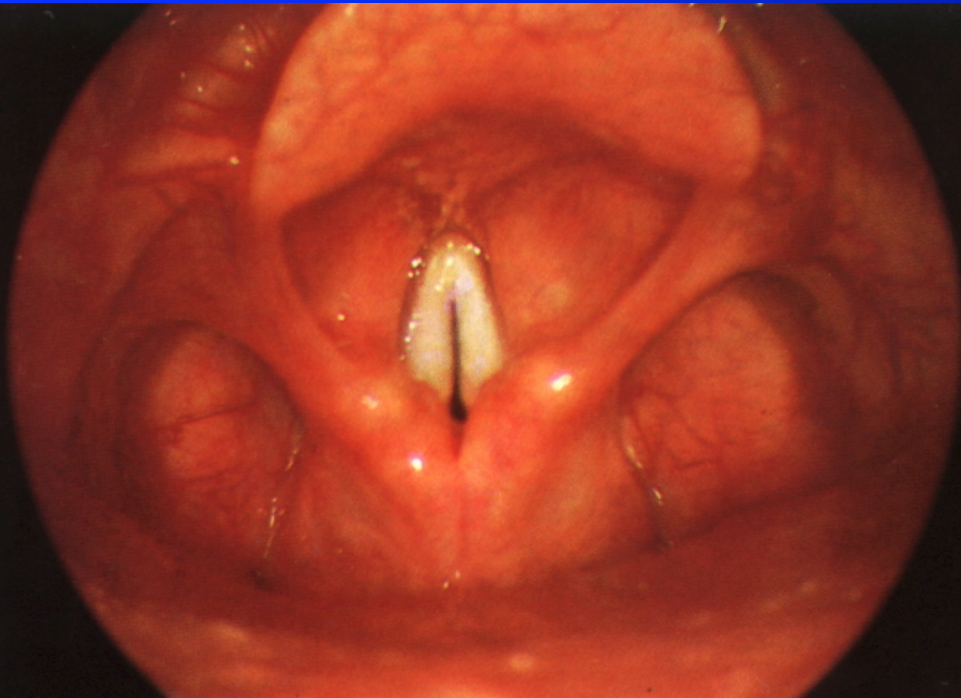
Larynx

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

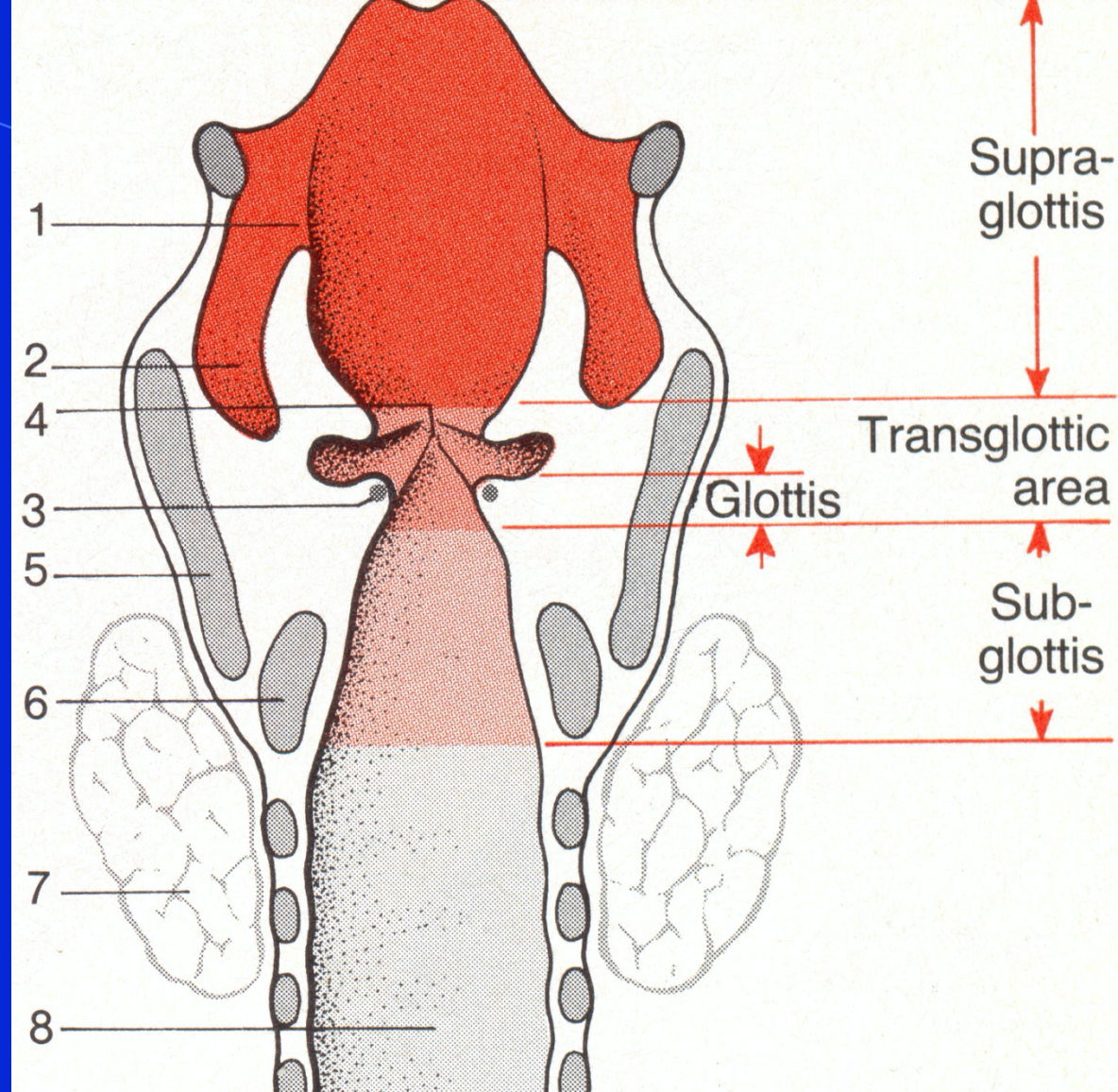


LARYNX - function

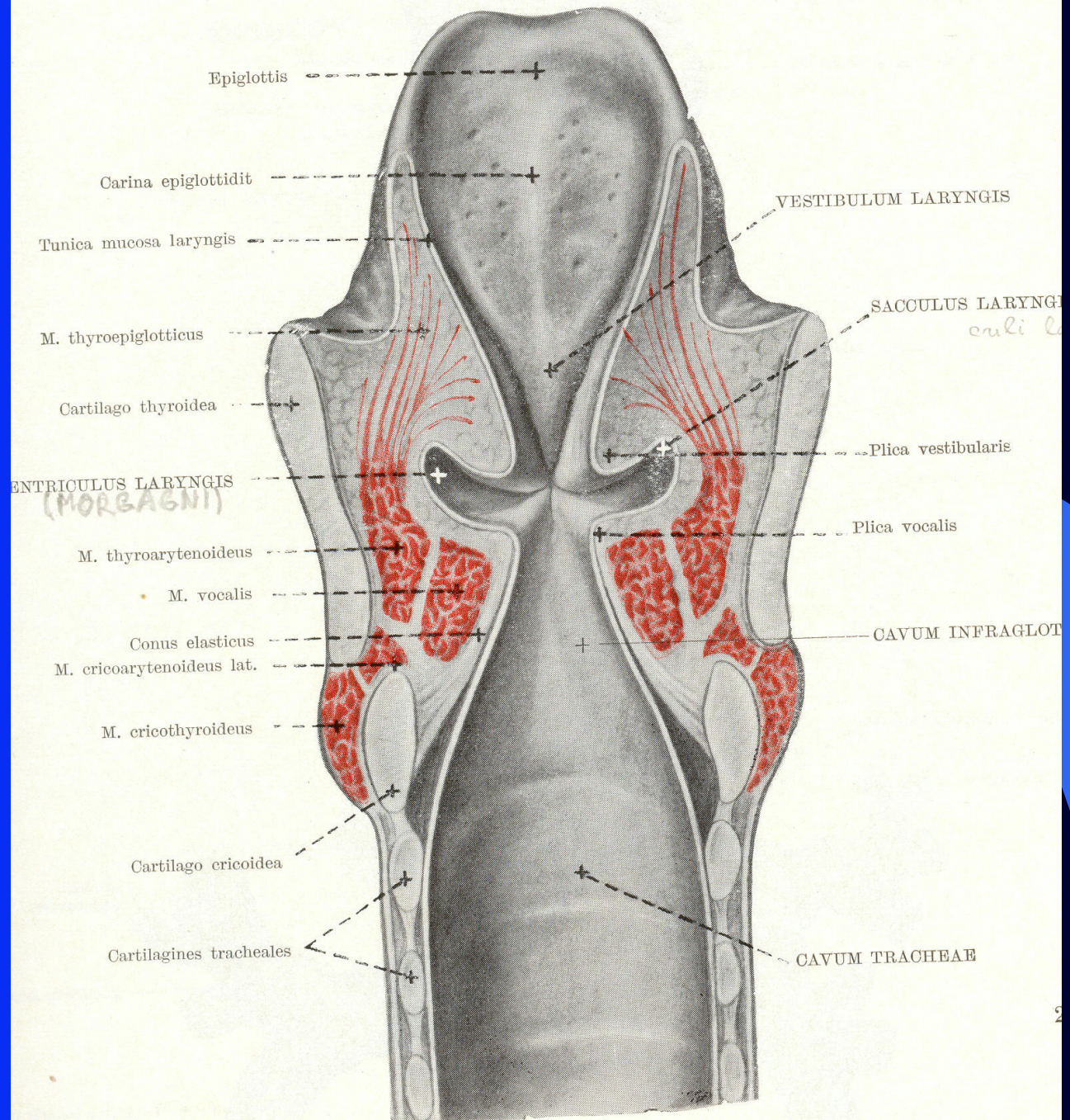
Function: **vital** (respiration), **social** (phonation), **protective of lower airways** (reflexes: closure of aditus, glottis, cough reflex etc.)



Frontal laryngeal section



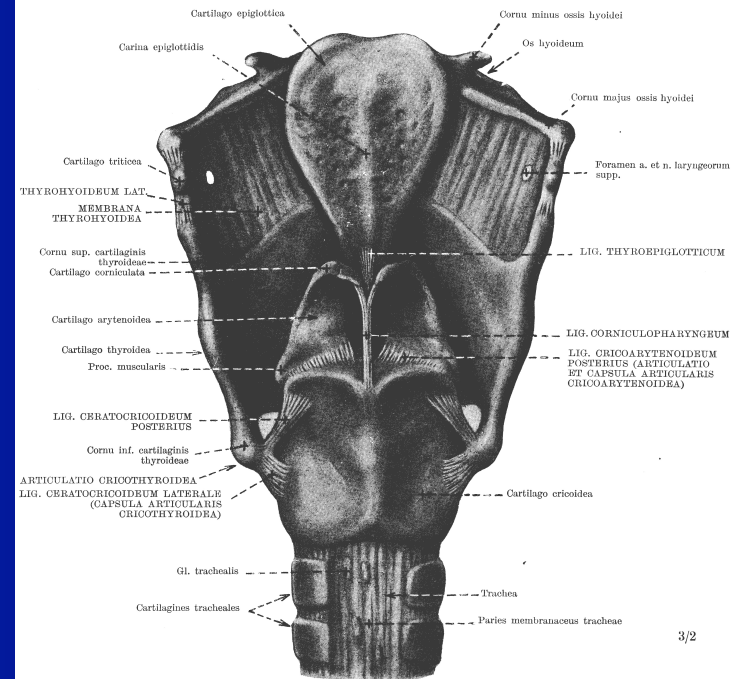
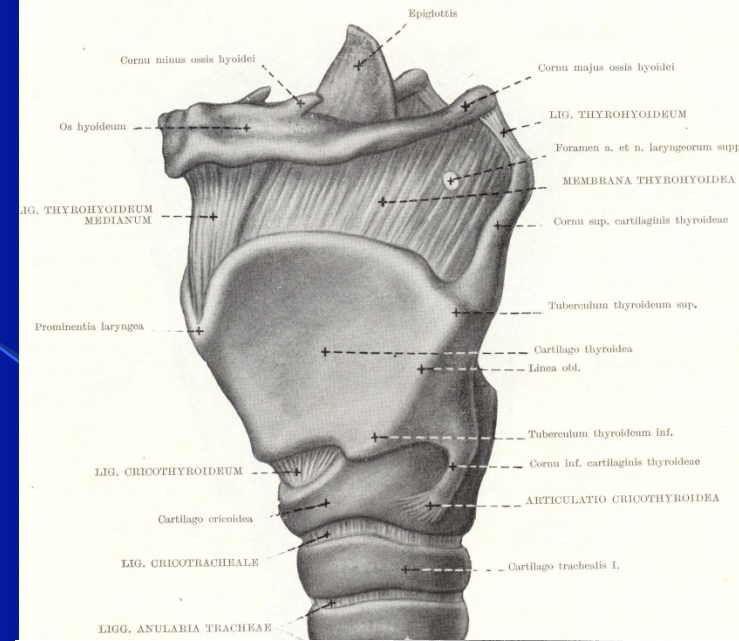
1. Aryepiglottic fold, 2. recessus piriformis, 3. vocal cord, 4. anterior commissure, 5. thyroid cartilage, 6. cricoid cartilage, 7. thyroid gland, 8. trachea. (Taken from Becker, Neumann, Pfaltz. Ear, Nose and Throat Diseases 1989)



Larynx

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

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



Laryngeal muscles

Muscle moving larynx:

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

Ones' own laryngeal muscles:

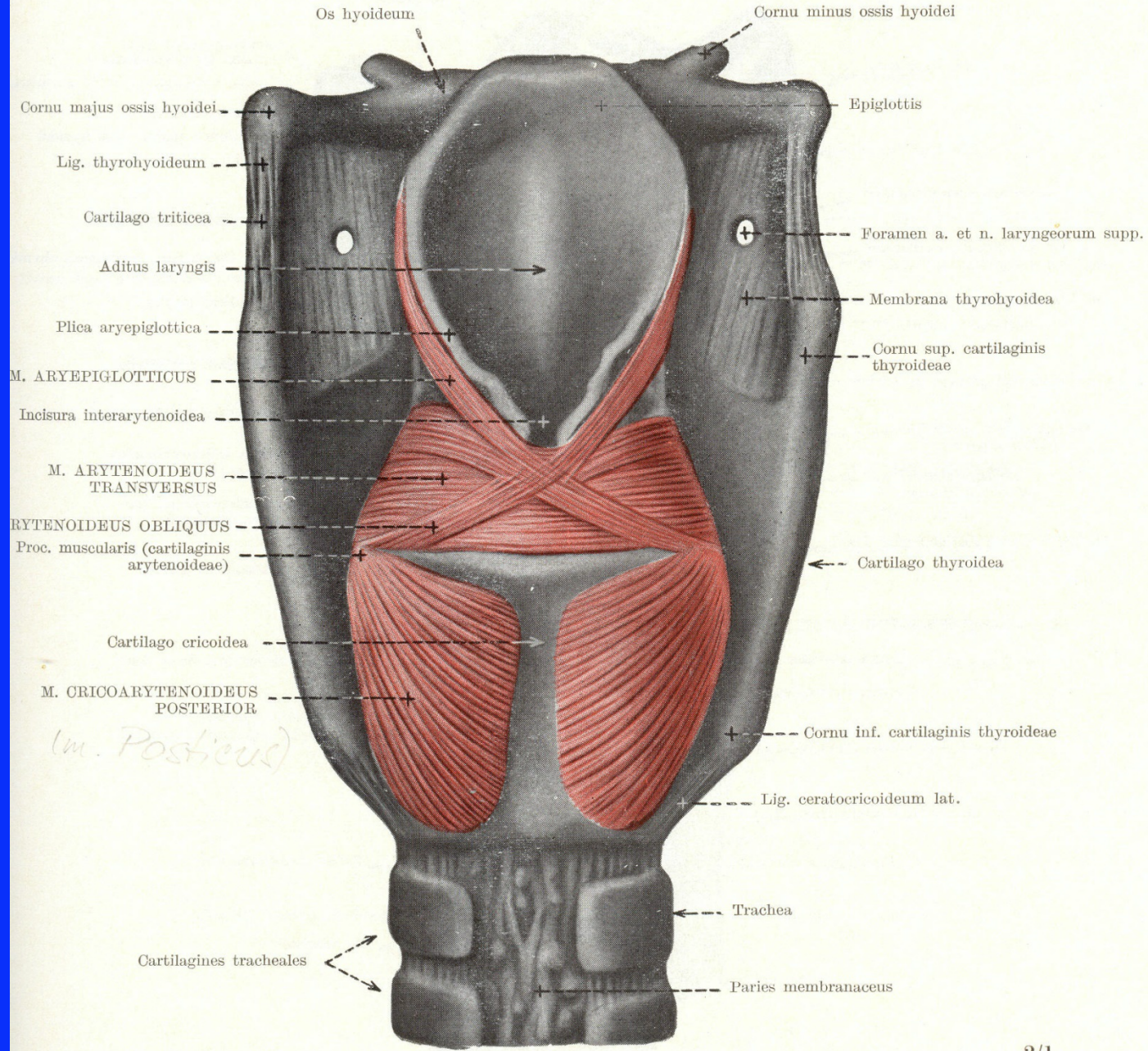
Abductores (open) – m. cricoarytenoideus post.
(POSTICUS)

Adductores (close) – cricoaryteoideus lat.,
arytenoideus transversus

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

Muscles moving aditus laryngis

m. aryepiglotticus, thyreoepiglotticus

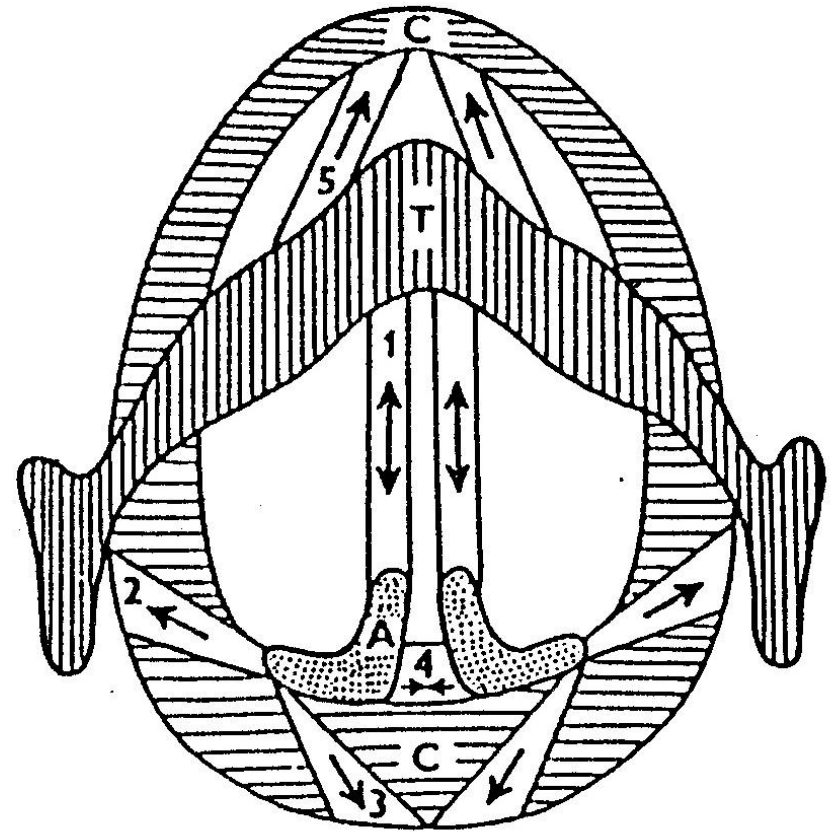


Schema of function of laryngeal muscles

A-cartilago arytenoidea

C-cartilago cricoidea

T-cartilago thyroidea



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

2.-m. cricoarytenoideus lateralis

3.-m. crycoarytenoideus posterior "posticus"

4.-m. arytenoideus transversus "transversus"

5.-m. cricothyroideus

Laryngeal muscles

Muscle moving larynx:

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

Ones' own laryngeal muscles:

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

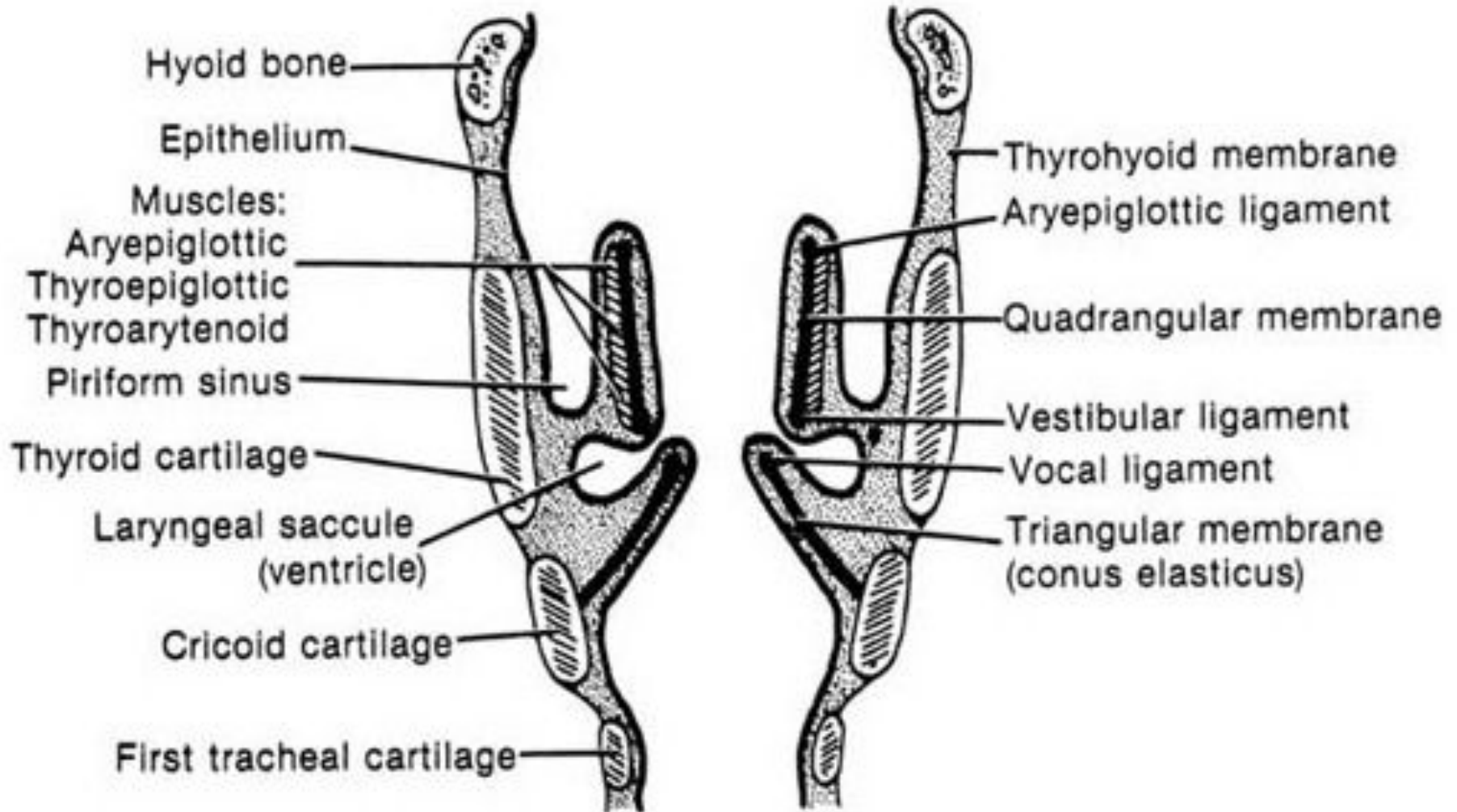
Adductores (close) – cricoaryteoideus lat.,
arytenoideus transversus

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

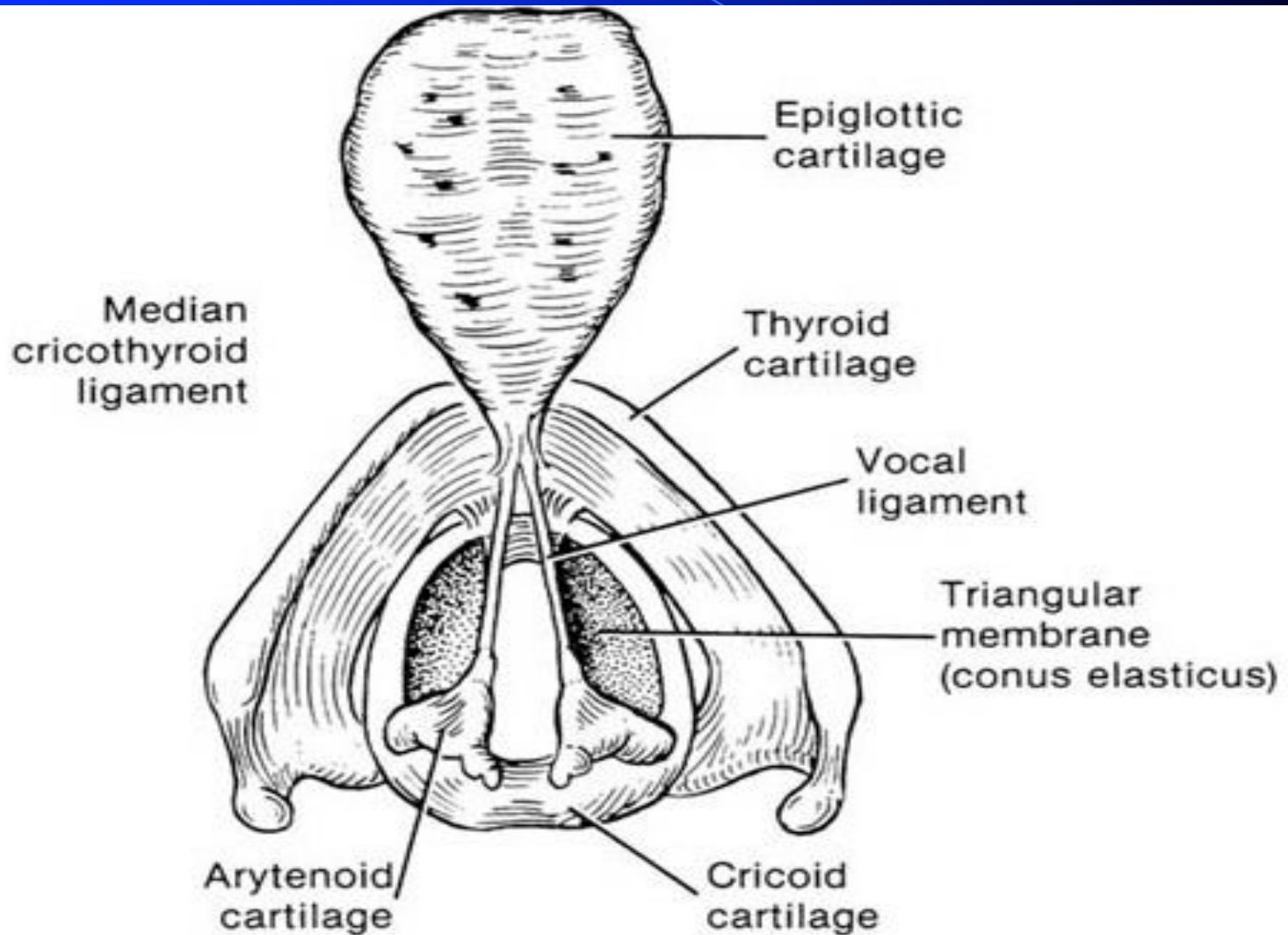
Muscles moving aditus laryngis

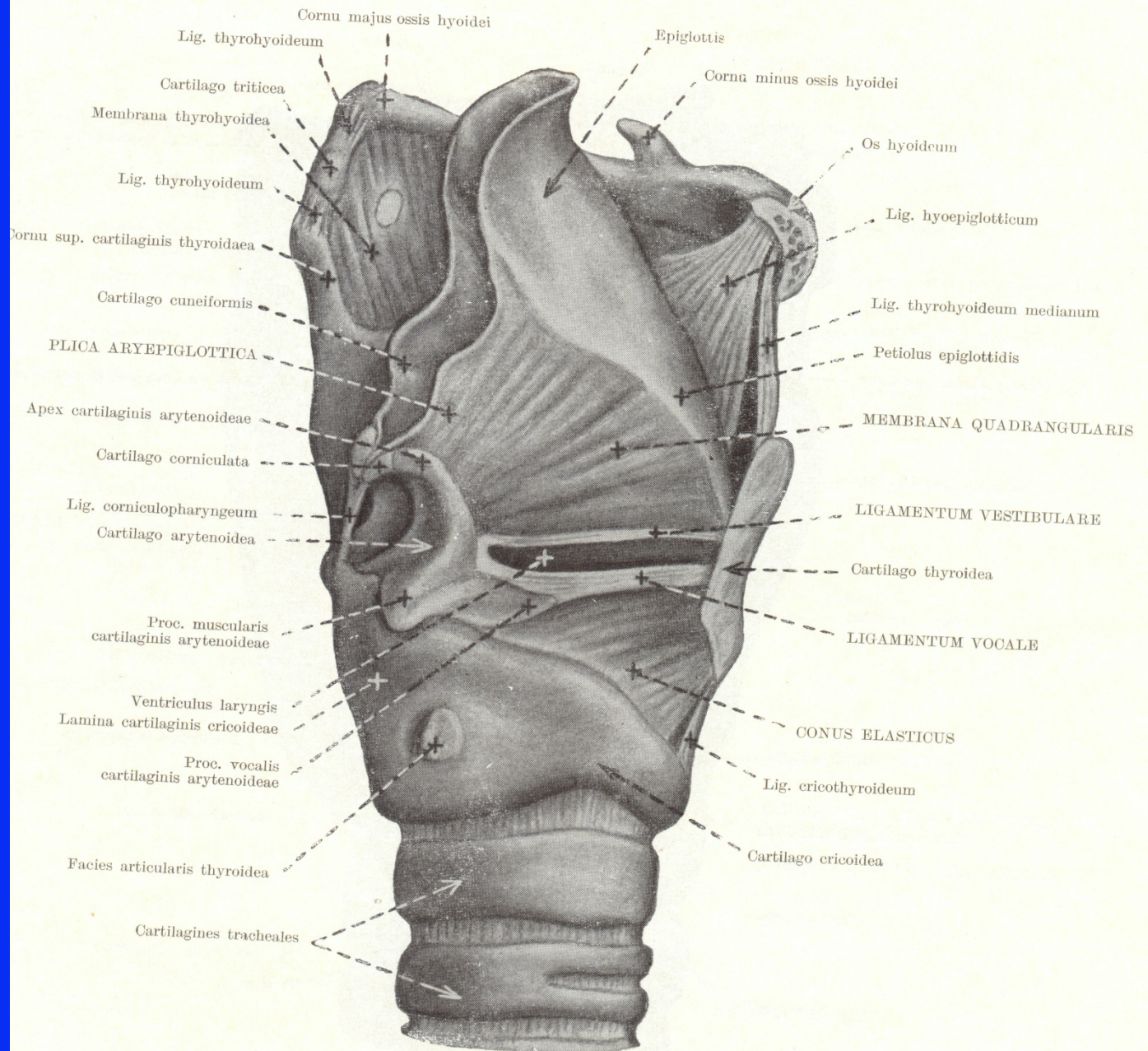
m. aryepiglotticus, thyreoepiglotticus

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



Conus elasticus





History of disorder

Breathing disorder

inspiratory stridor - stenosis localised upwards from bifurkation. Symptoms of usage of auxiliary breathing muscles (retraction of jugulum). There is longer inspirium as exspirium. 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

Chrapot – trvající déle jak 14 dní u mužů rizikové skupiny (kuřák nad 40 let věku) by měl být vyšetřen otolaryngologem.

Dyspnoe

```
graph TD; A[Dyspnoe] --> B[Respiratory]; A --> C[Cardiovascular]; A --> D[Extrathoracal origin]; B --> E[Obstructive]; B --> F[Restrictive]; D --> G[Hematologic]; D --> H[Neuromuscular]; D --> I[Psychogenic]; D --> J[Metabolic]; J --> K[Toxic]; J --> L[Uremy];
```

The diagram is a hierarchical flowchart on a blue background. At the top is a cyan box labeled 'Dyspnoe'. A vertical line descends from it to a horizontal line that branches into three arrows pointing to 'Respiratory' (green box), 'Cardiovascular' (cyan box), and 'Extrathoracal origin' (cyan box). From 'Respiratory', two arrows point to 'Obstructive' (green box) and 'Restrictive' (cyan box). From 'Extrathoracal origin', four arrows point to 'Hematologic' (cyan box), 'Neuromuscular' (cyan box), 'Psychogenic' (cyan box), and 'Metabolic' (cyan box). From 'Metabolic', two arrows point to 'Toxic' (cyan box) and 'Uremy' (cyan box). 'Cardiovascular' has no further sub-classifications shown.

Respiratory

Cardiovascular

Extrathoracal origin

Obstructive

Restrictive

Hematologic

Neuromuscular

Psychogenic

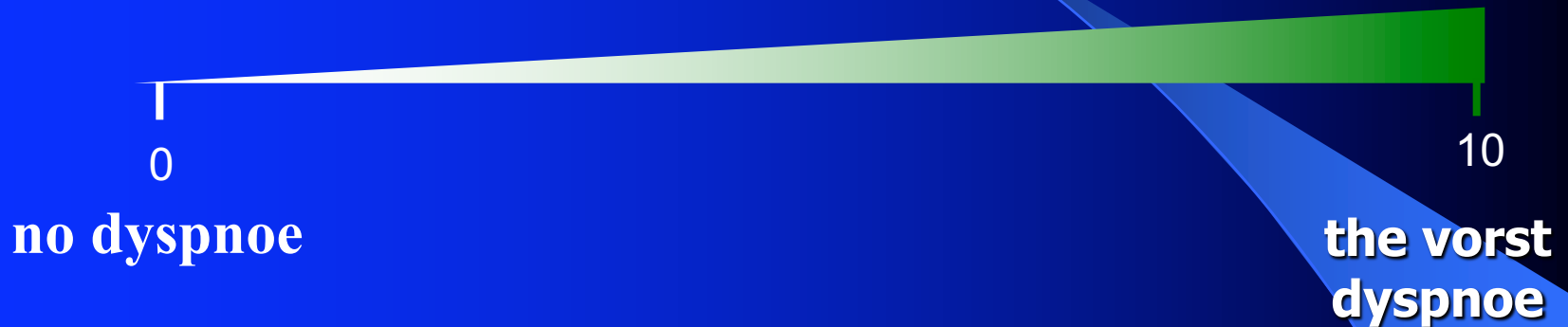
Metabolic

Toxic

Uremy

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)

Patofysiology of obstructive respiratory insufficiency

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

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

Stage of decompensation – mild tachypnoea, motoric agitation, hyperkapnia, anoxemia, respiratory acidosis, larynx in anteflex position, anxiety, exhaustion. Hyperkapnia 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“ dyspnoe

inspiratory stridor (stage of decompensation) -

stenosis localised upwards from bifurkation.

Symptoms of usage of auxiliary breathing muscles (retraction of jugulum). There is longer inspirium as expirium. General symptoms -

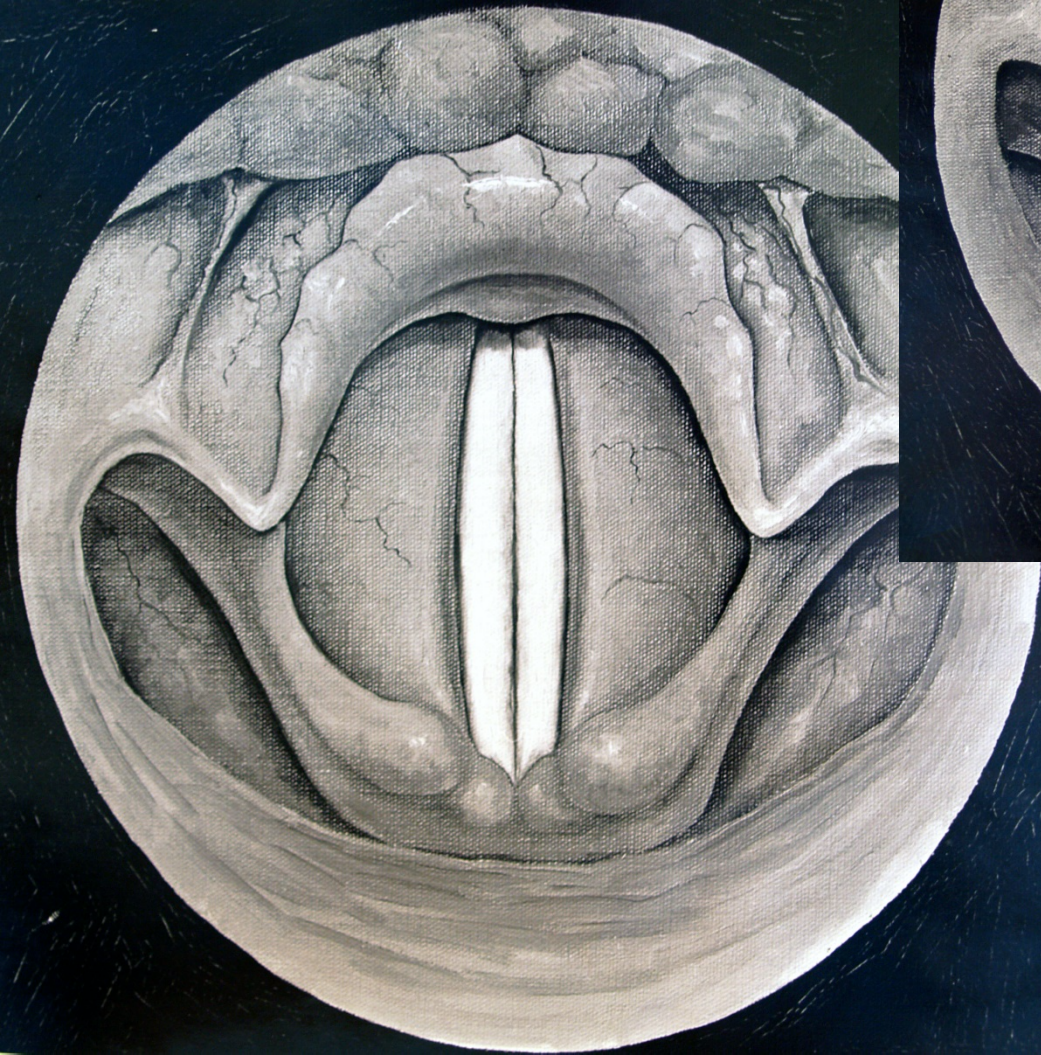
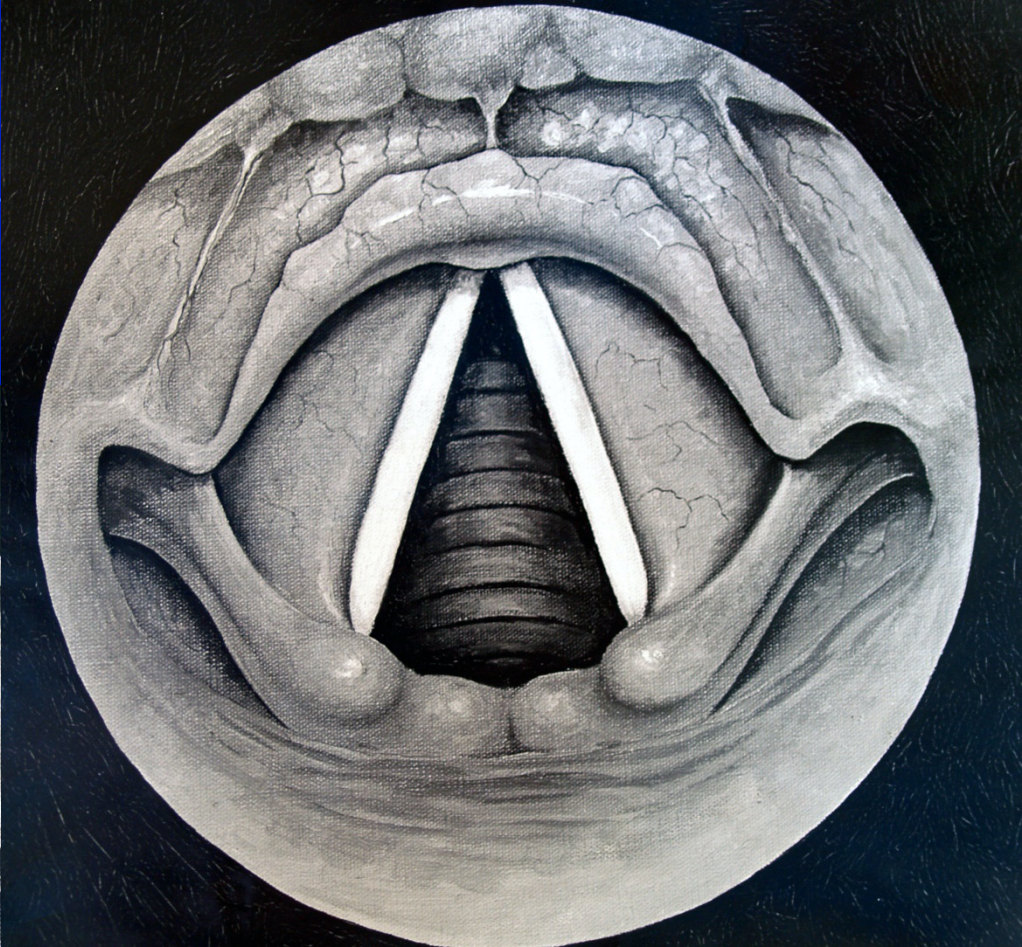
agitation with anxiety, loss of orientation, **loss of conscience**, **tachycardy**, usually **bradypnoe**. Auscultation the most noisy stridor above stenosis. **Skin colour** pale, then cyanotic. Growing **exhaustion**, alarm face.

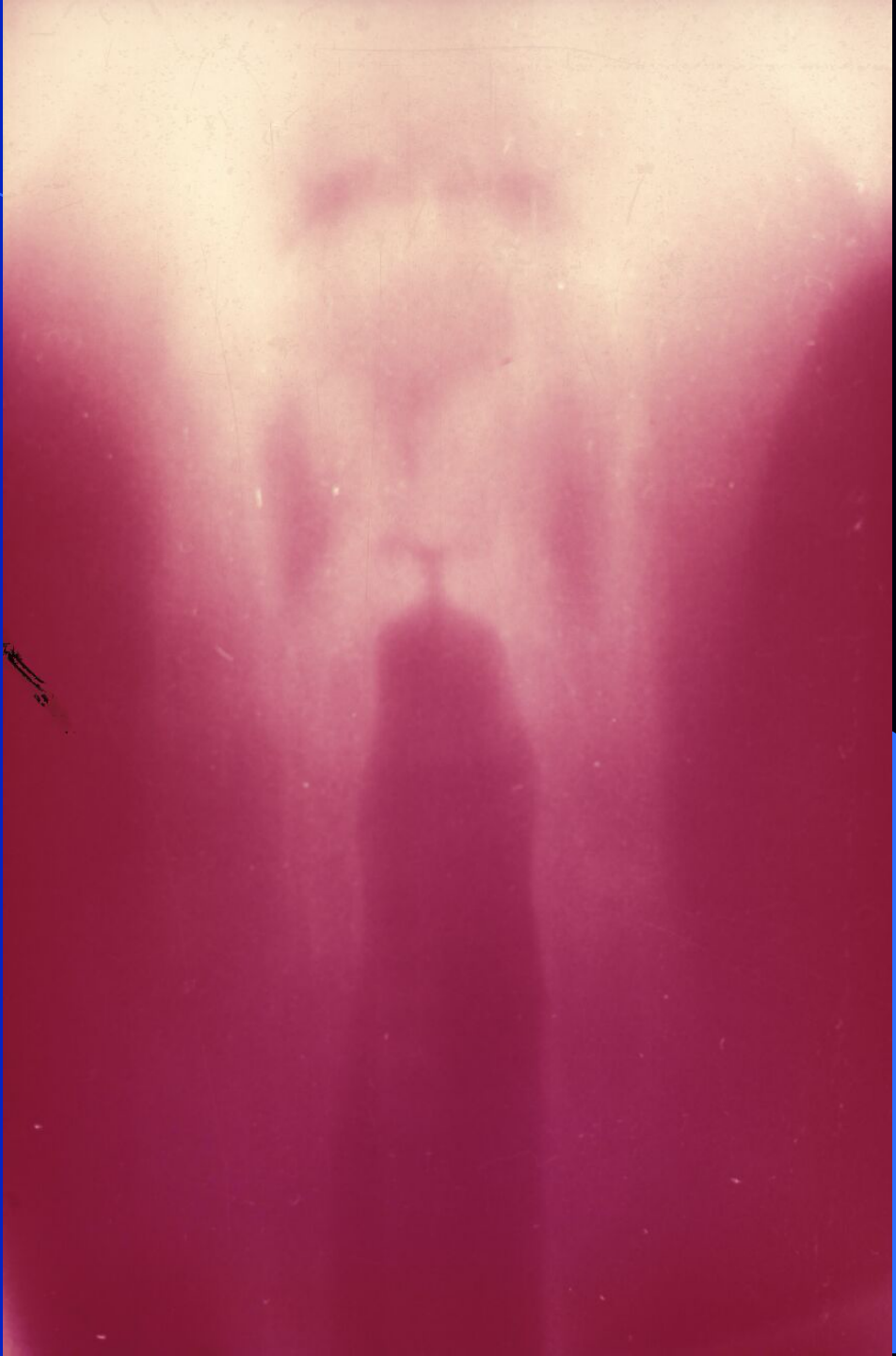
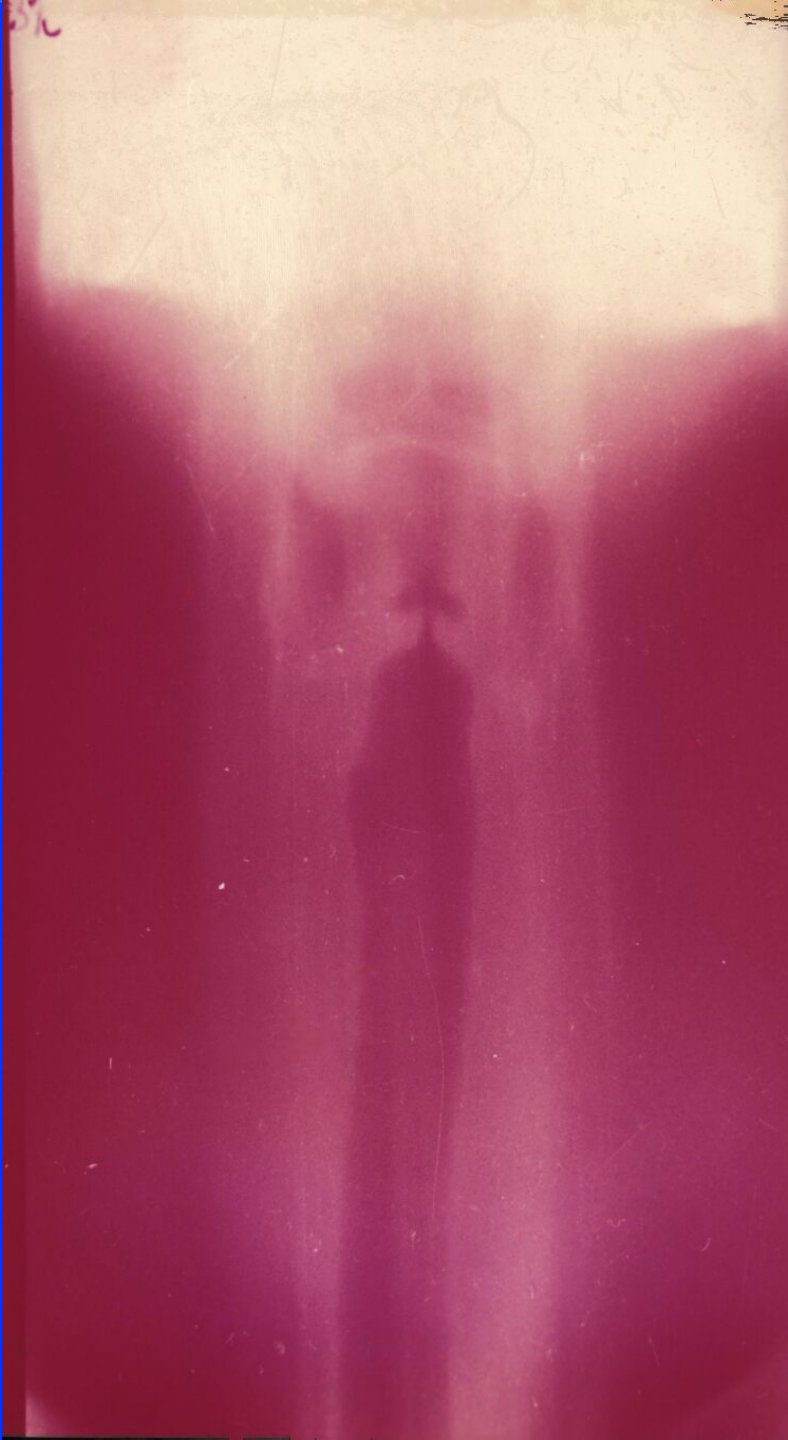
2. Distal part of airways. *Expiratory stridor*

- longer expiration. Asthma bronchiale

Methods of investigation

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





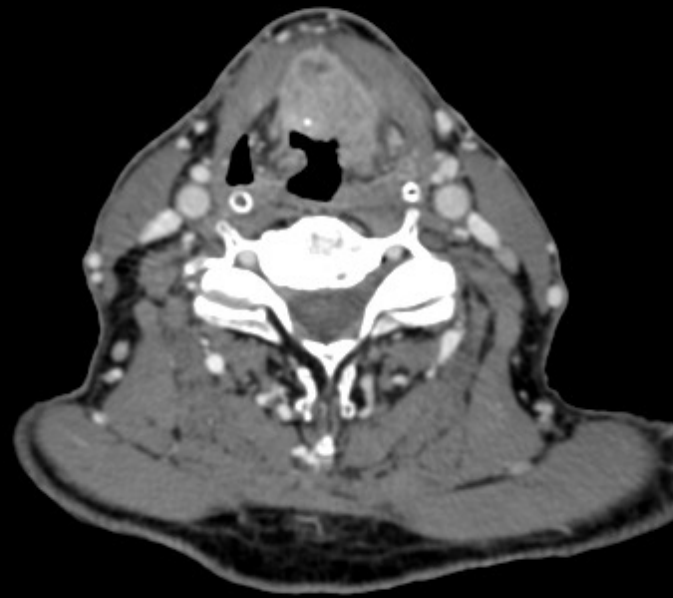
CT/4/187
Axial F->H
Recon 2: K.L.
IOMERON 300

A

FN U sv. Anny v Brme

**Transglottic cancer
spreading into
preepiglot. space,
subglottic spread**

65Y M
4284-4117/08
2088/5/26
10:49:11



120.0 kV
650.0 mA
Pixel size: 0.494 mm
Position: 78.0 mm
W: 359 L: 82

P

DFOV: 25.3

A

CT/451/28
Sagittal L->R
krk-sag
IOMERON 300

H

FN U sv. Anny v Brme

65Y M
4117/08
2088/5/26
10:49:11



120.0 kV
788.0 mA
Pixel size: 0.313 mm
Position: -6.4 mm
W: 273 L: 45

F

DFOV: 16.00 x 16.00 cm

CT/452/16
Axial F->H
hrtan
IOMERON 300

A

FN U sv. Anny v Brne



65Y M
4117/08
2008/5/26
10:49:11

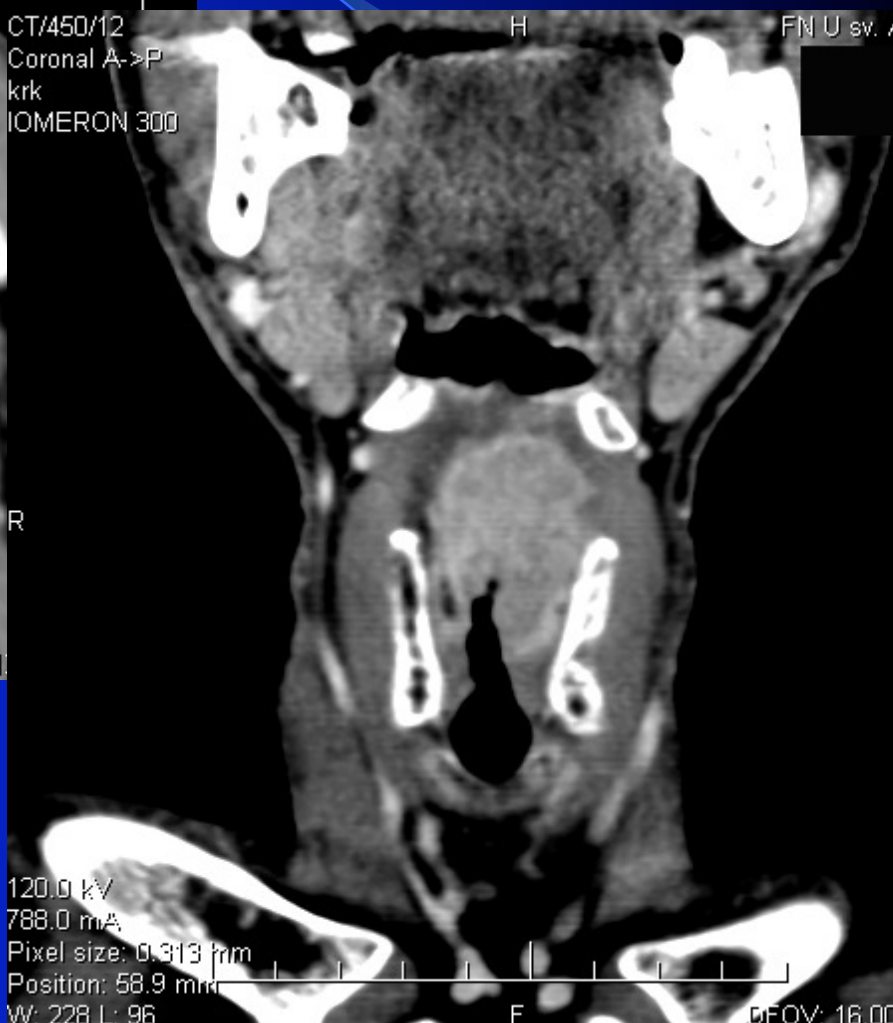
120.0 kV
788.0 mA
Pixel size: 0.234 mm
Position: 91.9 mm
W: 239 L: 64

DFOV: 1

CT/450/12
Coronal A->P
krk
IOMERON 300

H

FN U sv. Anny v Brne



65Y M
4117/08
2008/5/26
10:49:11

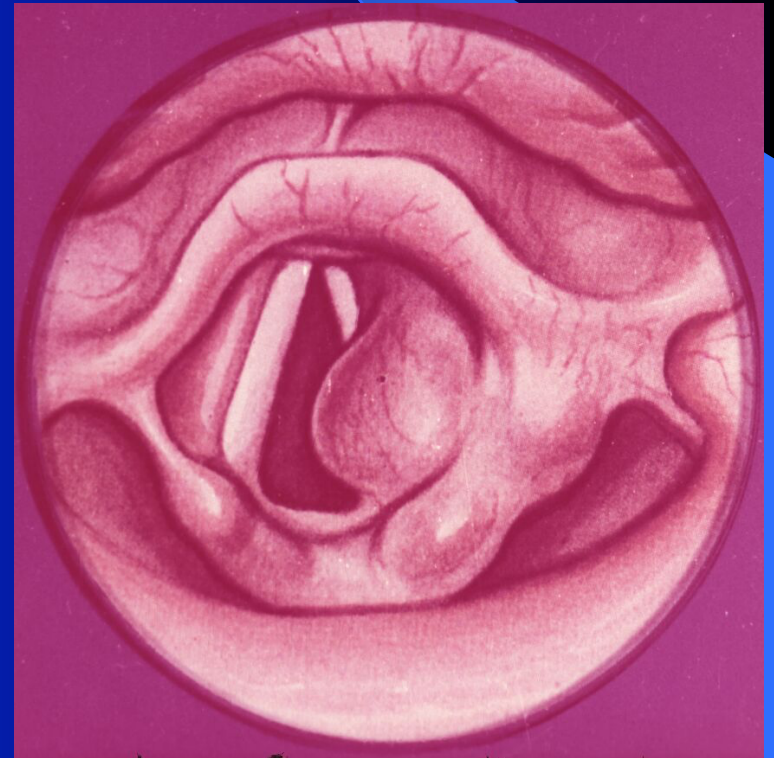
120.0 kV
788.0 mA
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W: 228 L: 96

DFOV: 16.00 x 16.00cm

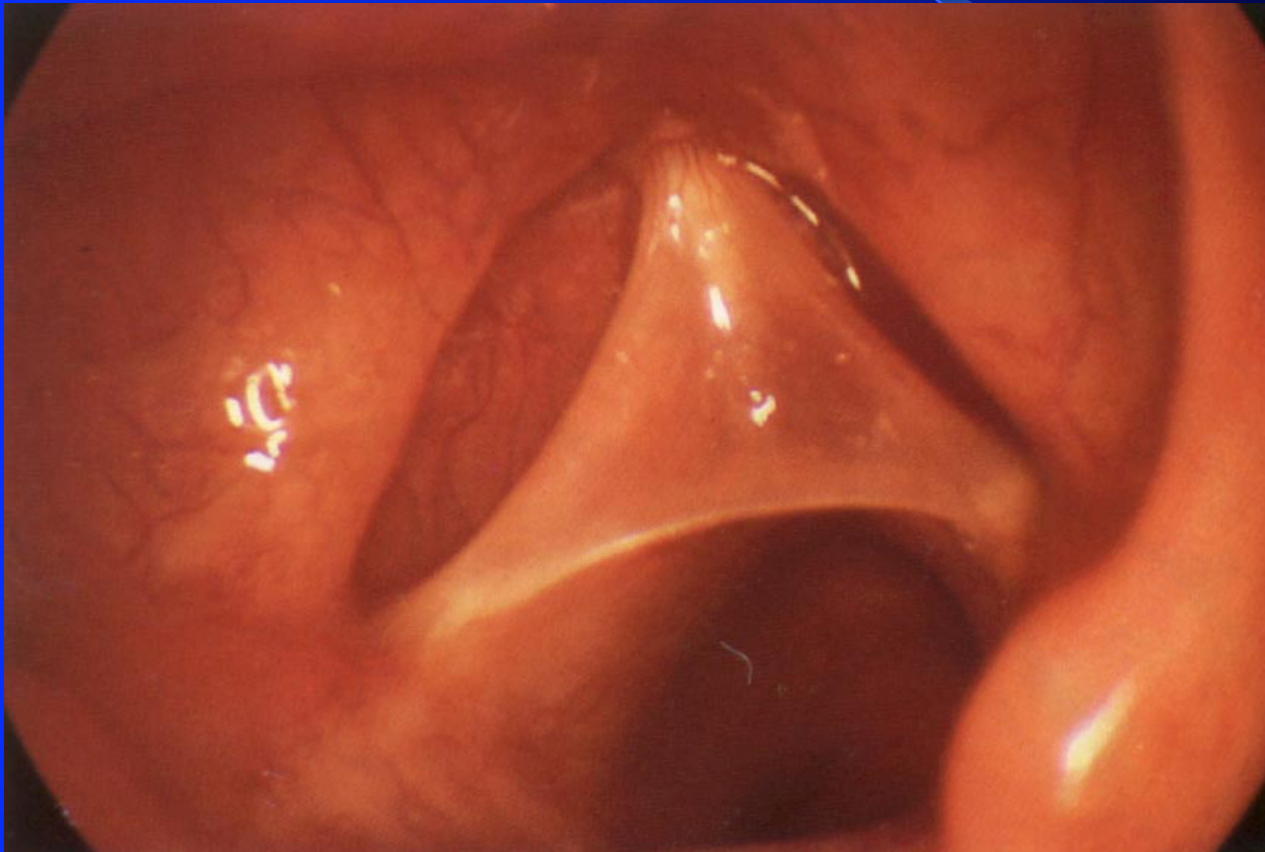
Congenital laryngeal anomalies

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

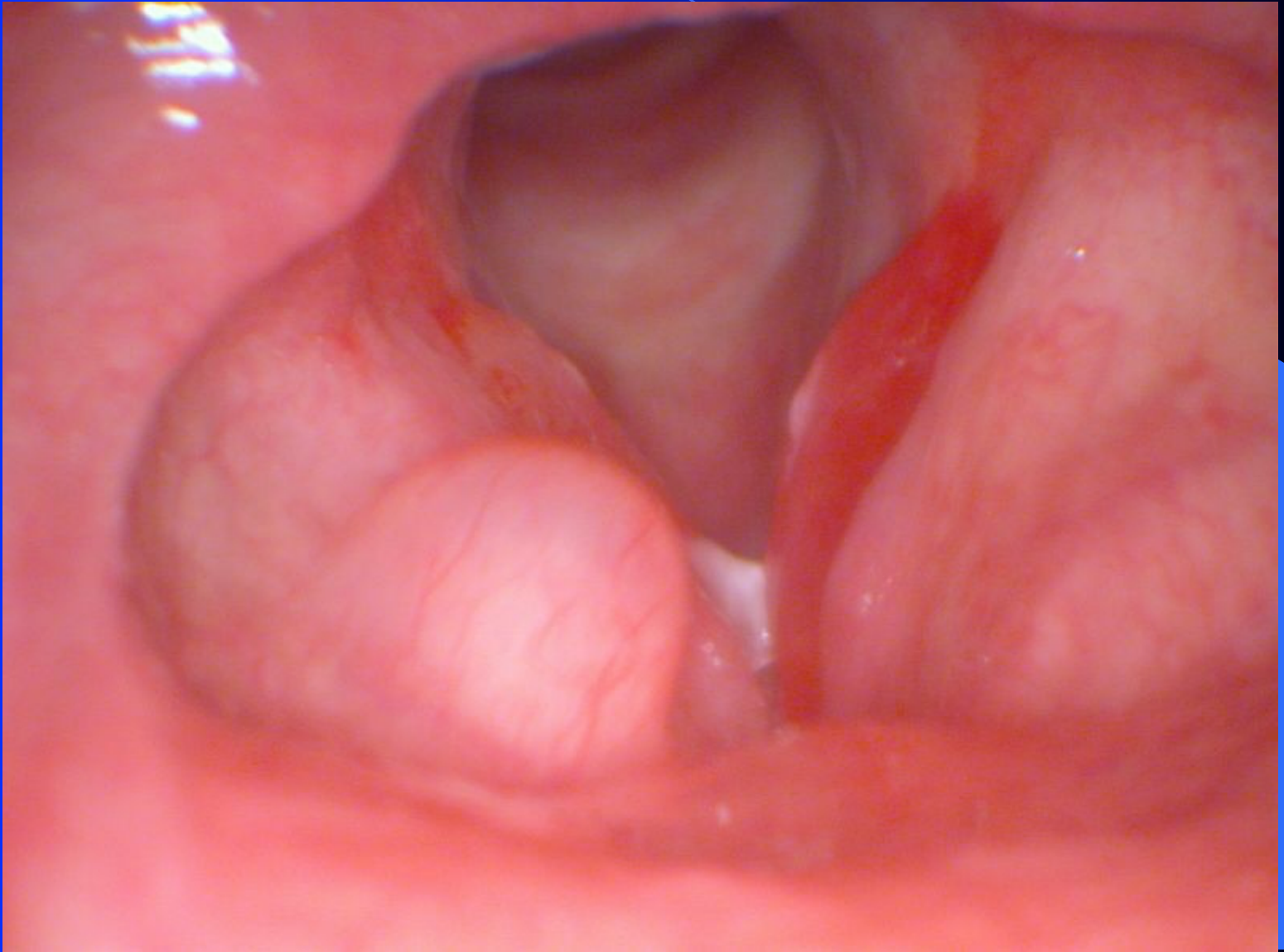
Laryngoceles – lie within the larynx in the vestibular fold – dyspnoea, dysphonia



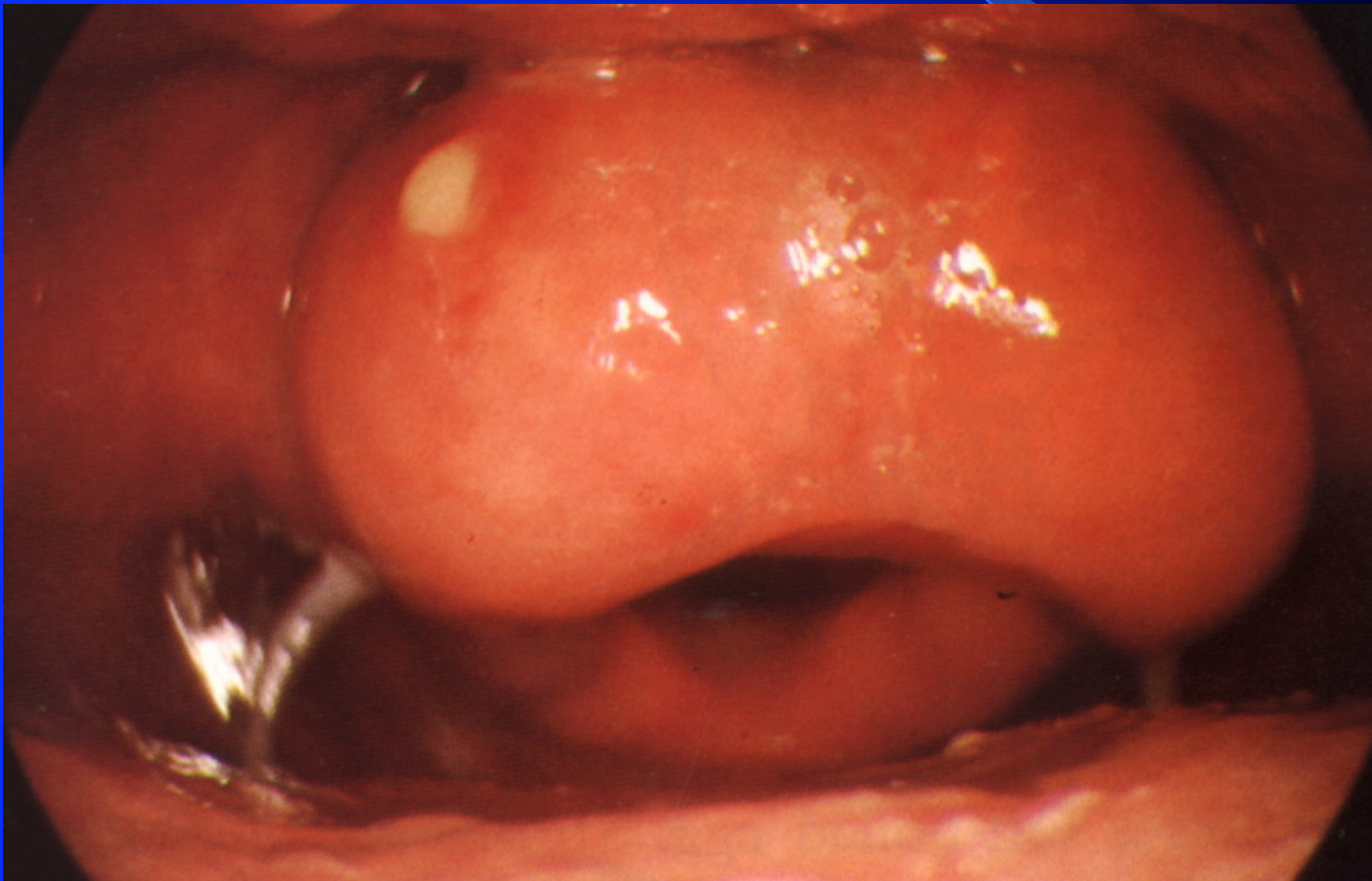
Atresia and membranes



Laryngitis acuta (restricted x diffused)

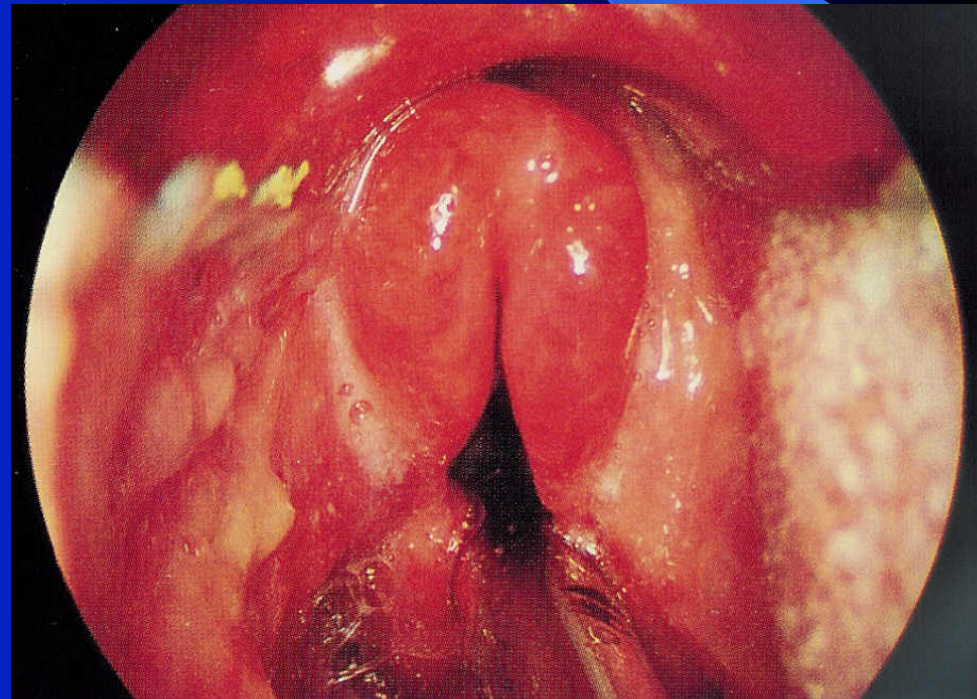


Abscesus epiglottidis



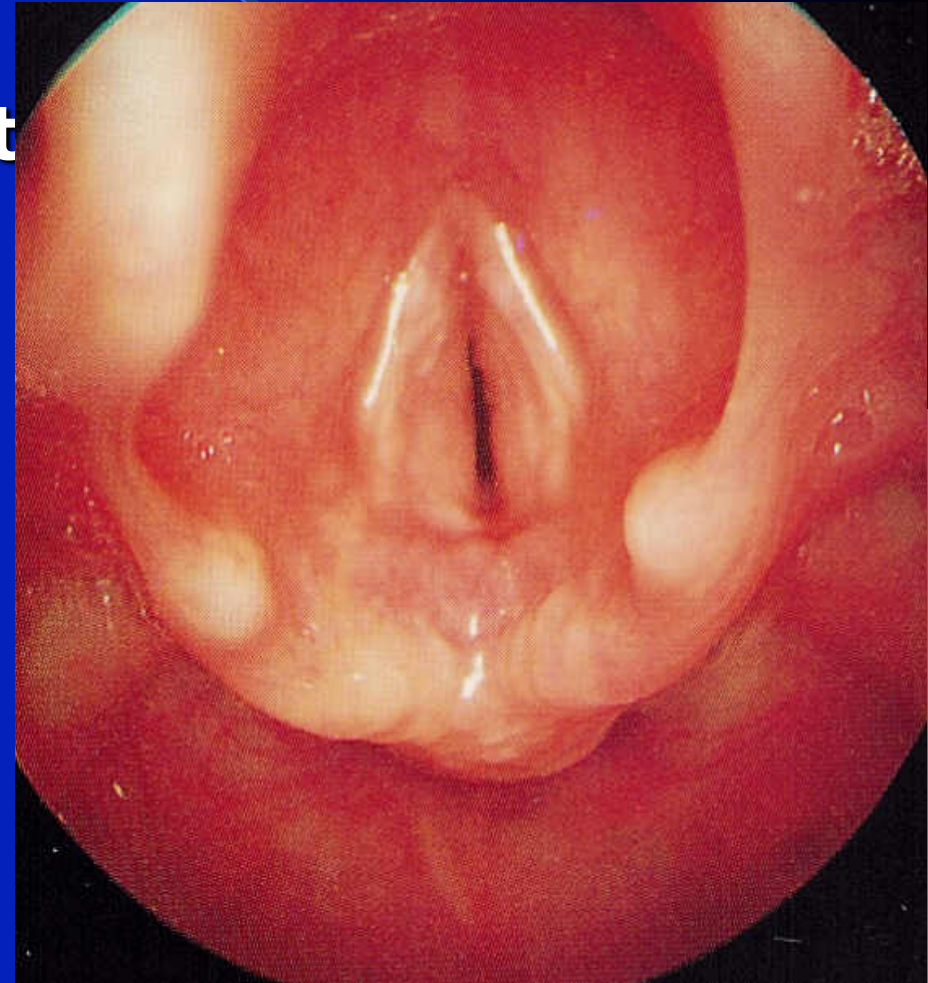
Acute supraglottic laryngitis - epiglottitis

- **Hemophilus influenzae**
- **inspiratory stridor**
- **dysphagia**
- **Antibiotic treatment**
- **steroids**
- **tracheal intubation**
- **tracheostomy**

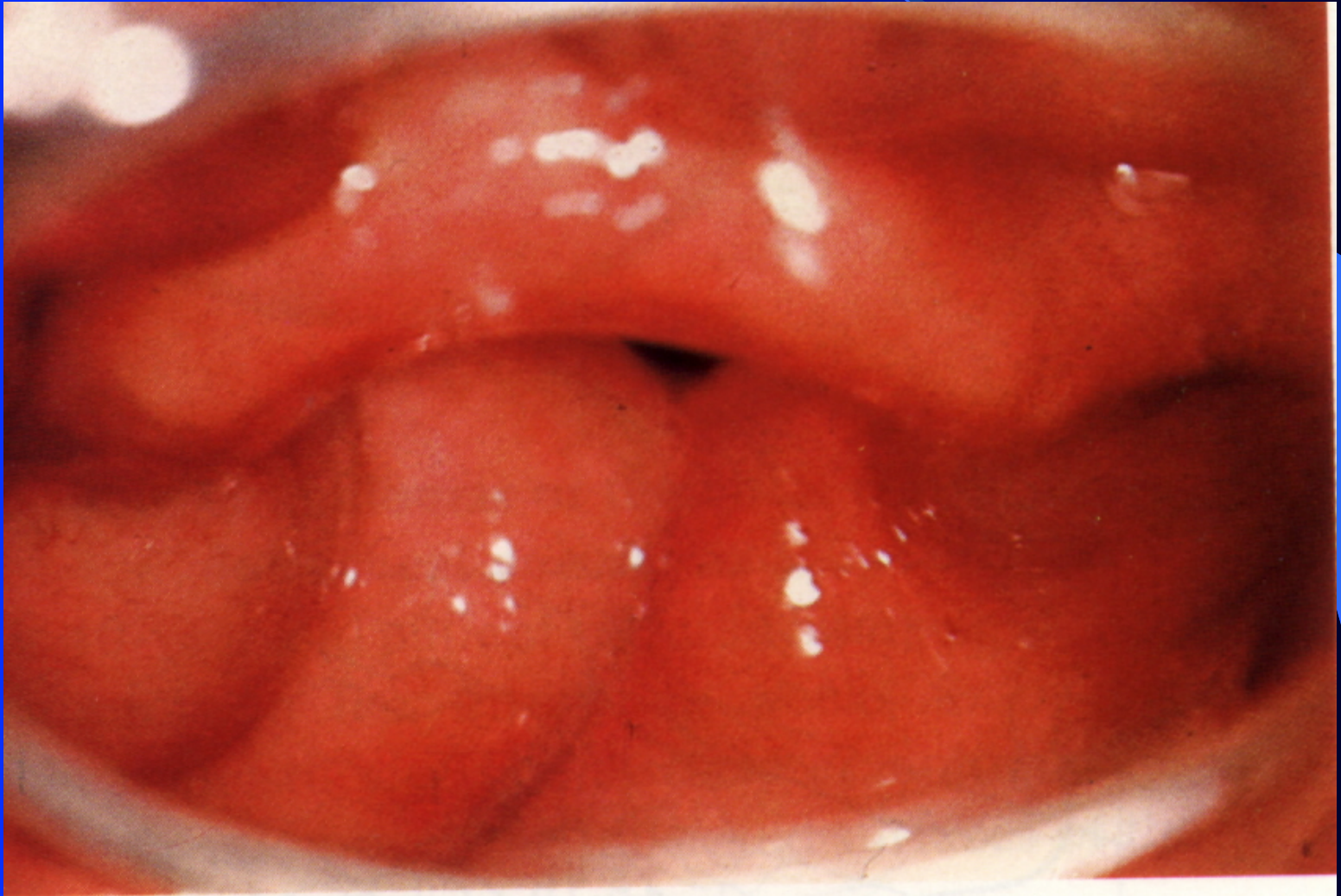


Acute subglottic laryngitis

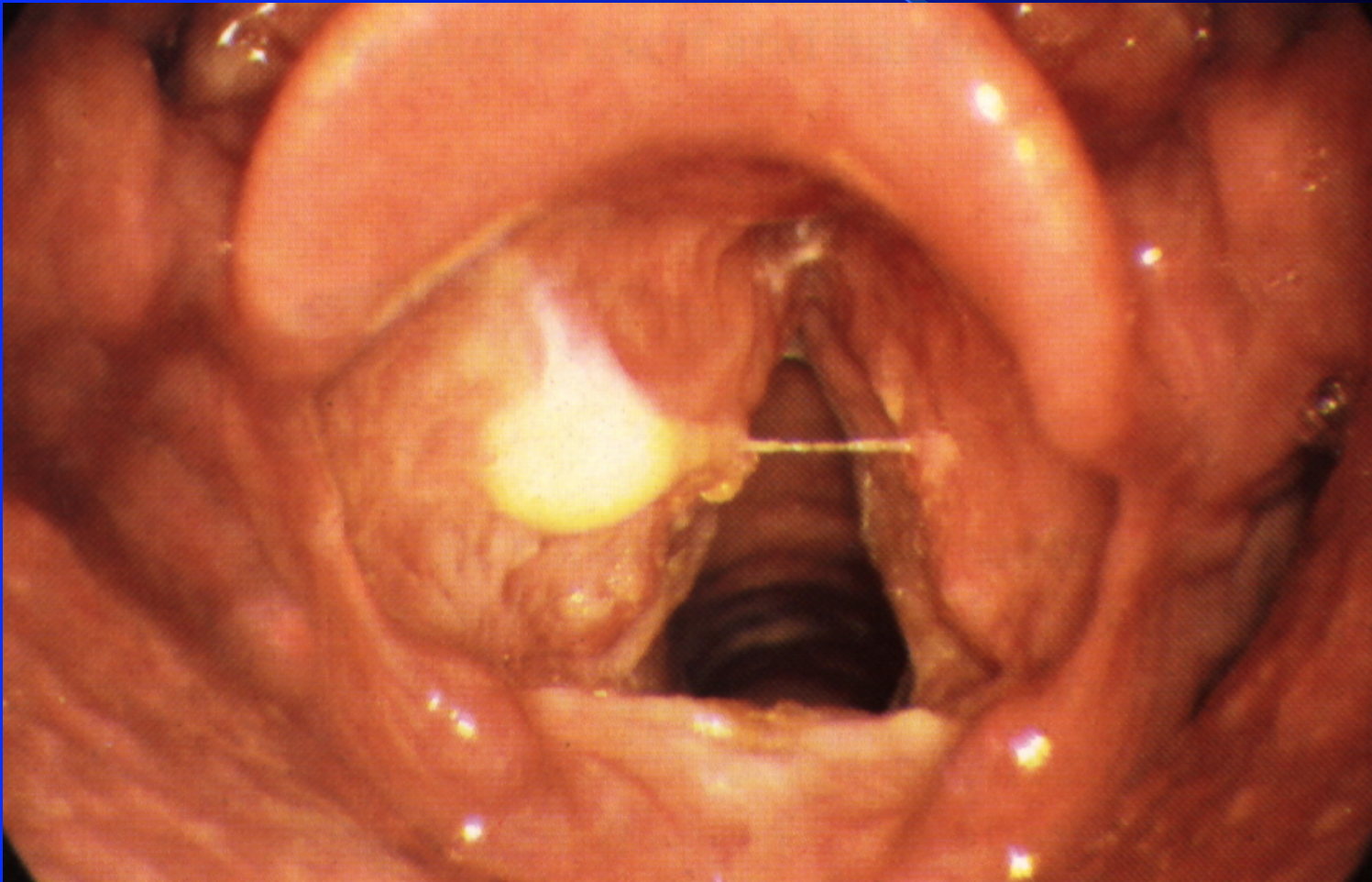
- **Viral infection**
- **Rapid growth at night**
- **cough**
- **inspiratory stridor, inspiratory dyspnea**
- **steroids, sedation, ATB,**
- **Mikroclima (steam inhalation)**



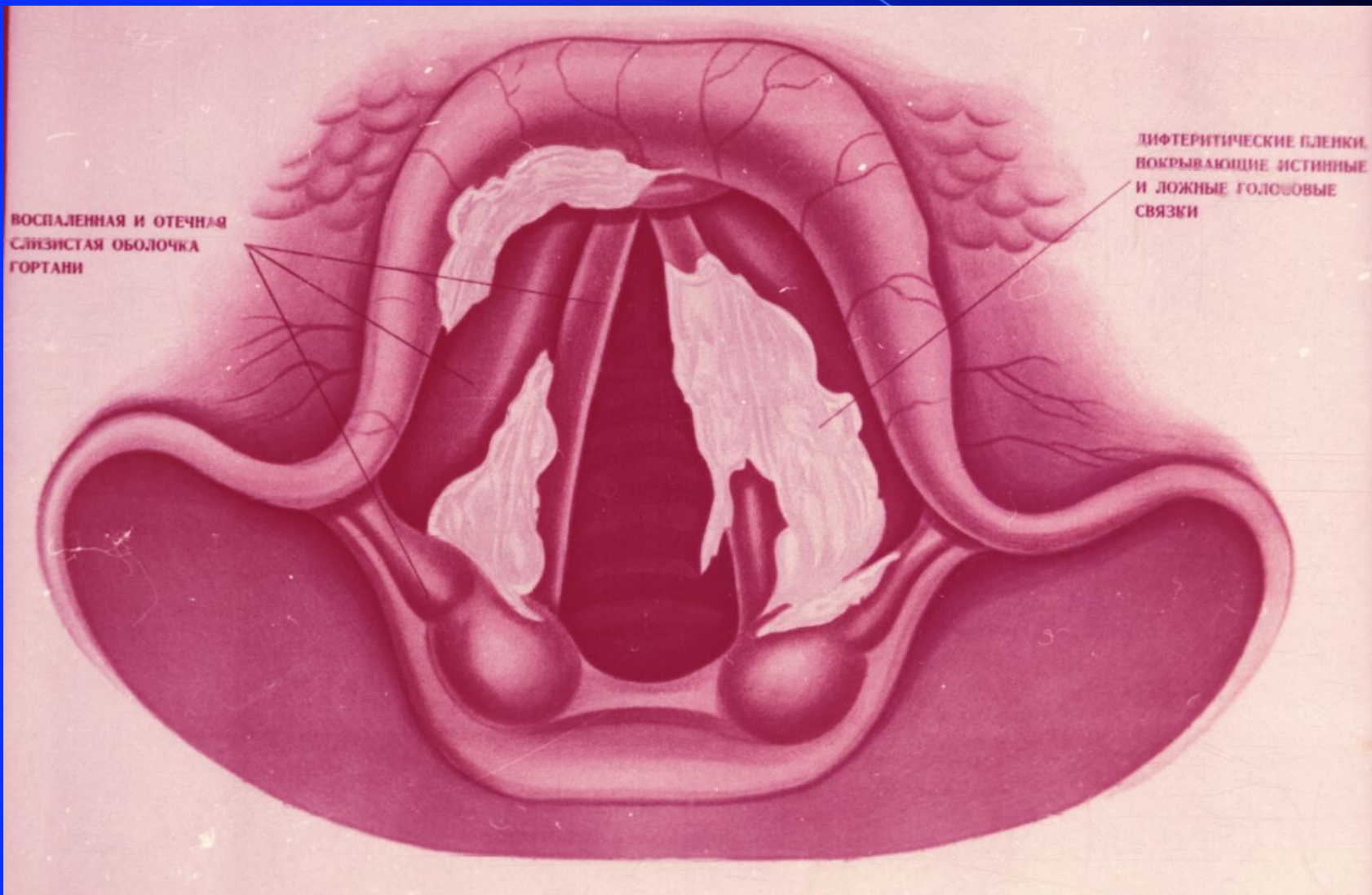
Angioneurotic swelling of larynx



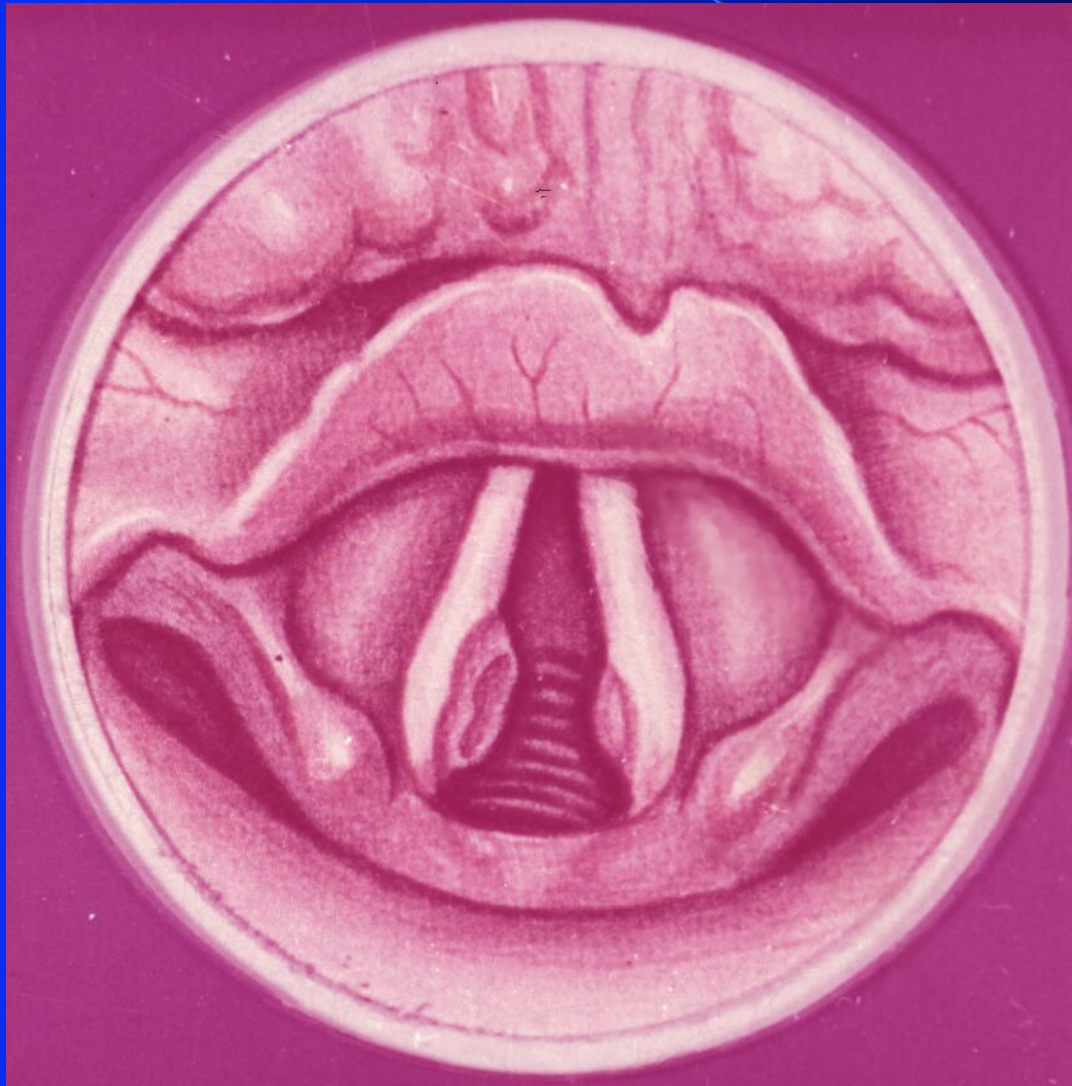
Laryngitis chronica



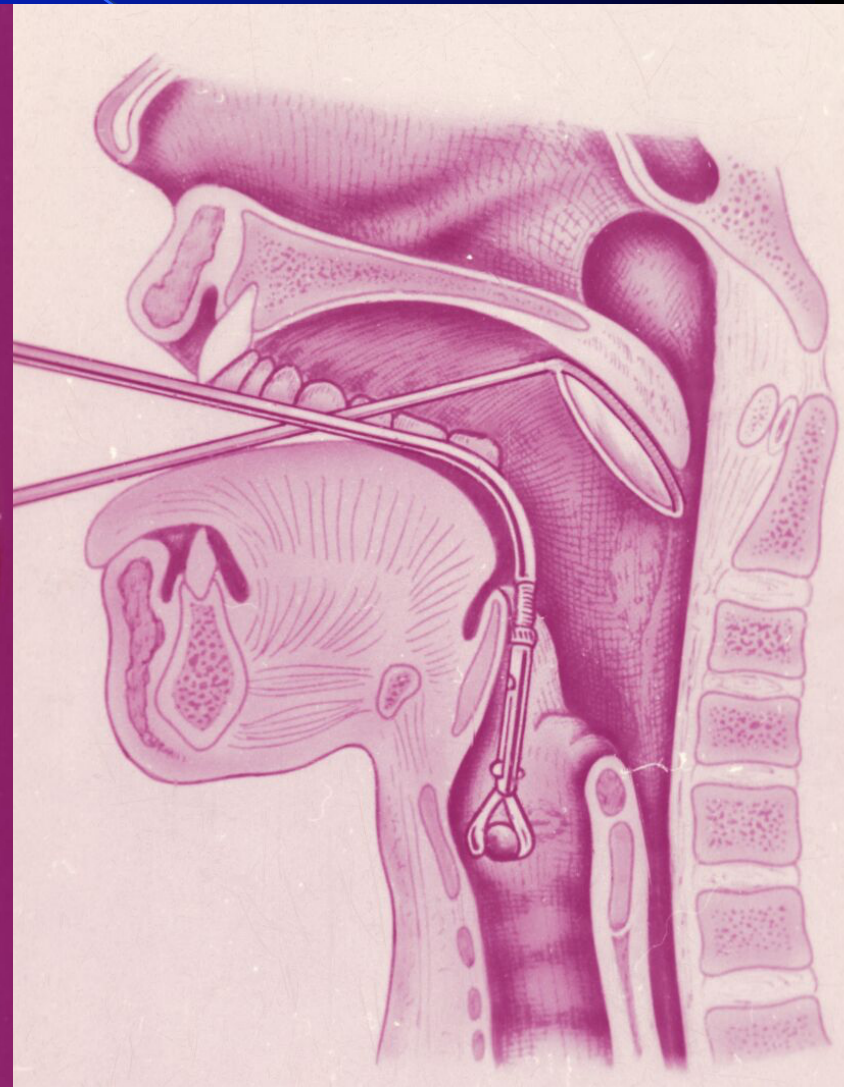
Diphtheria



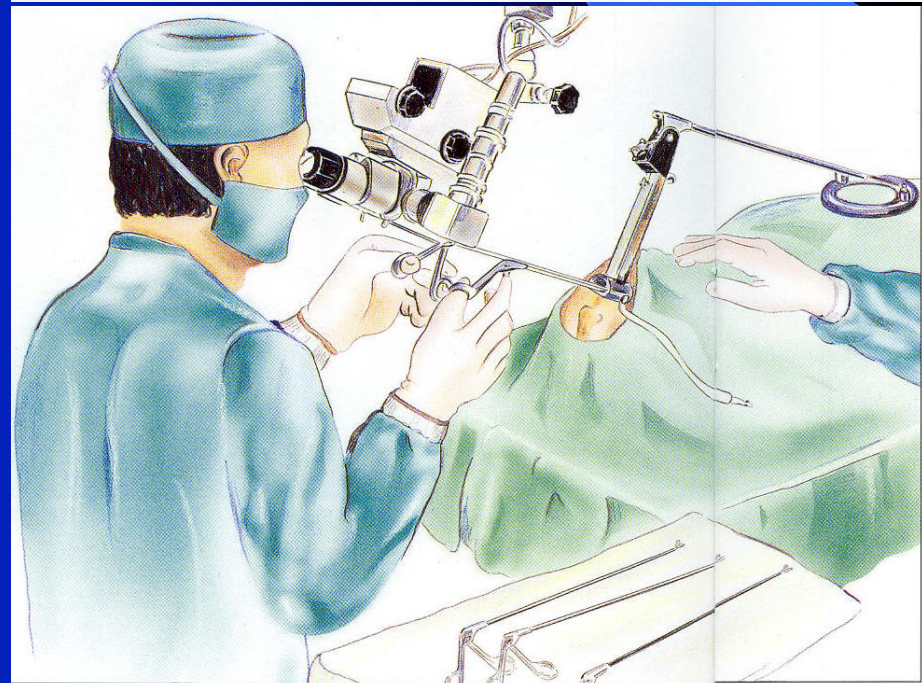
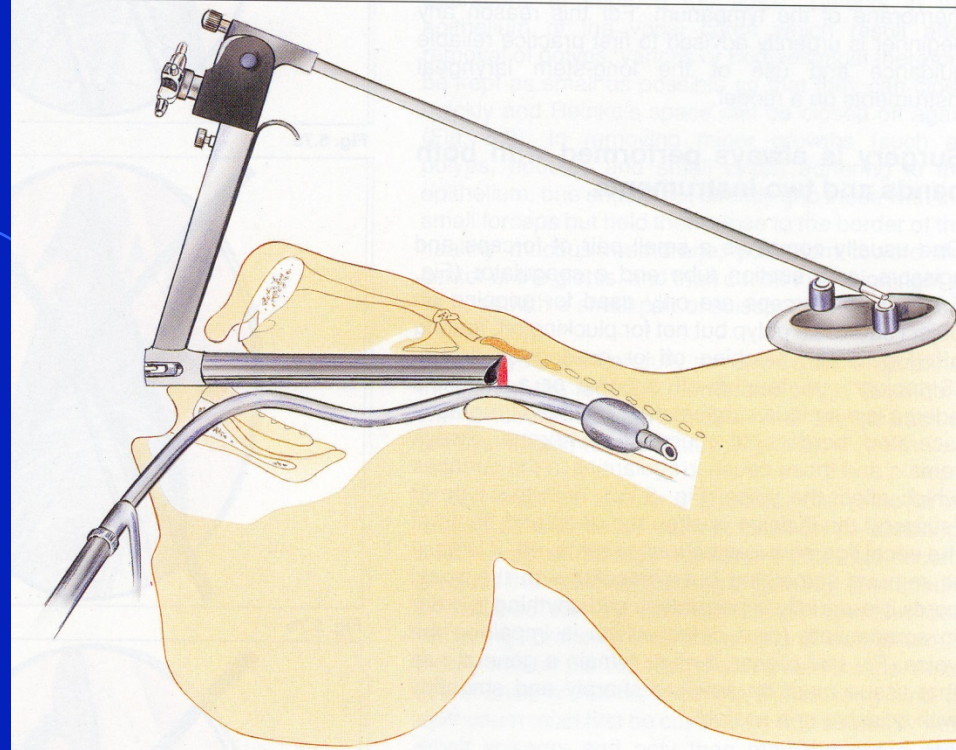
Laryngitis chron. hyperplastica



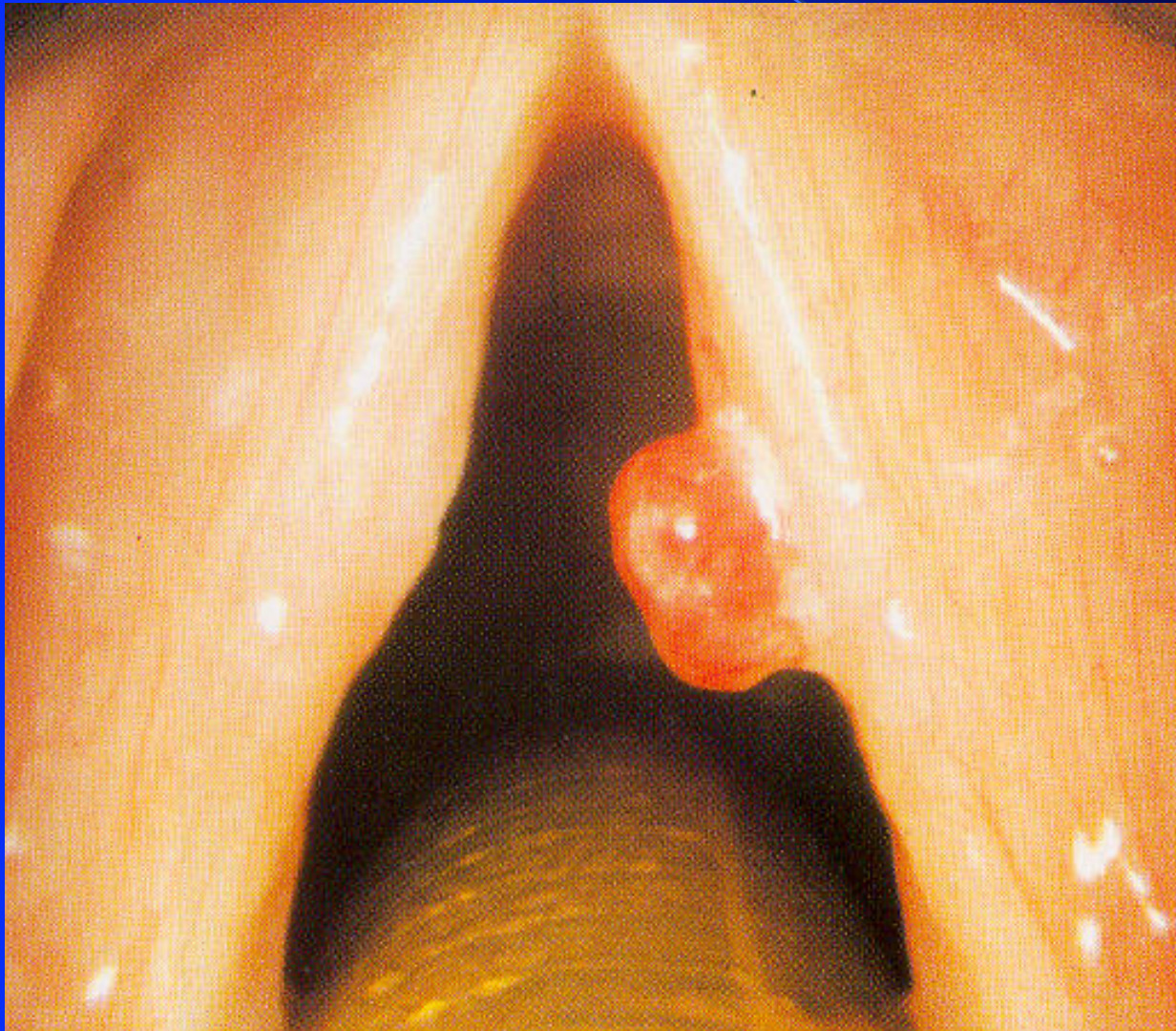
Polypus laryngis



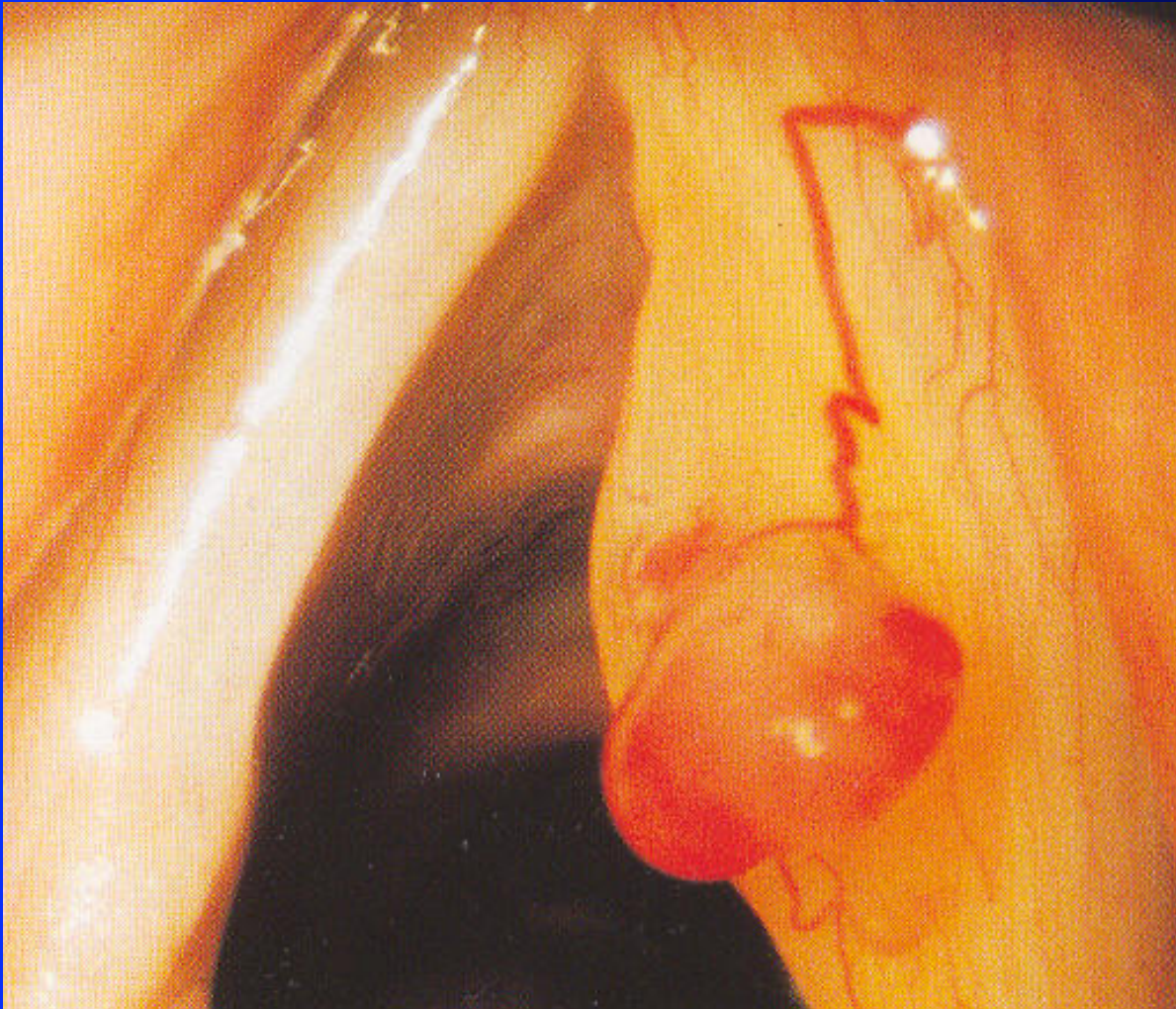
Microlaryngoscopy sec. Kleinsasser



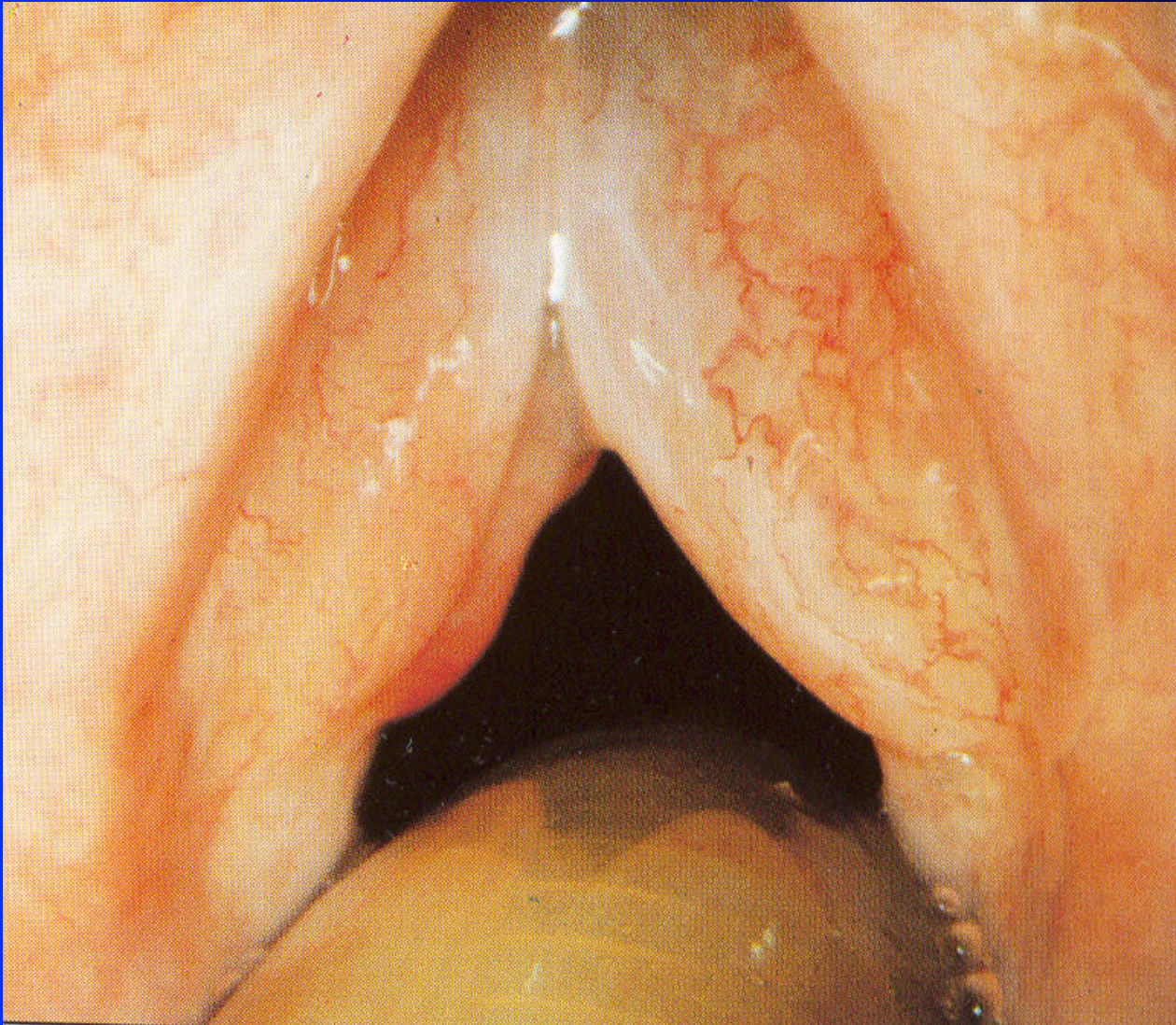
Polypus plicae vocalis l.dx.



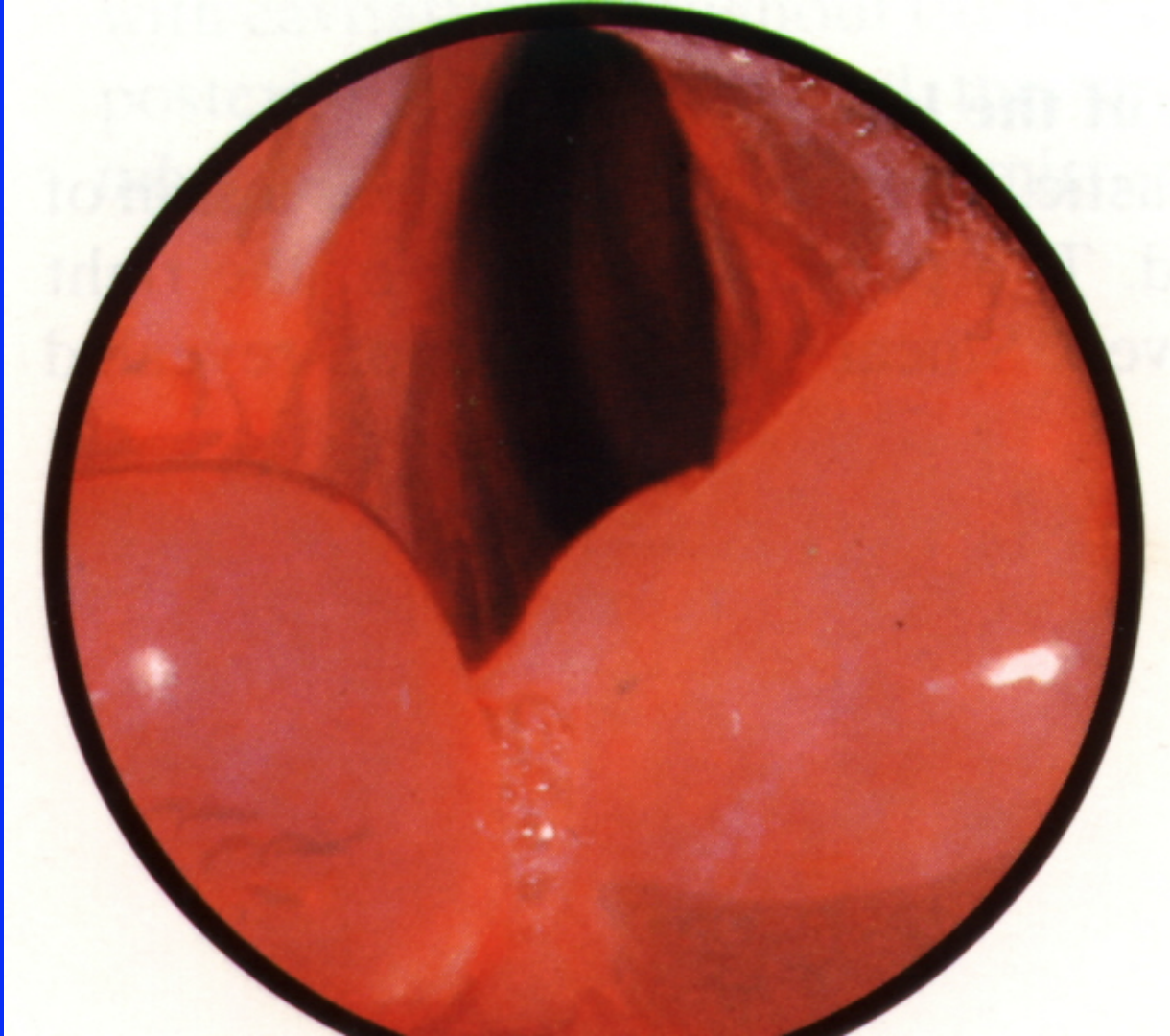
Polypus plicae vocalis l.dx.



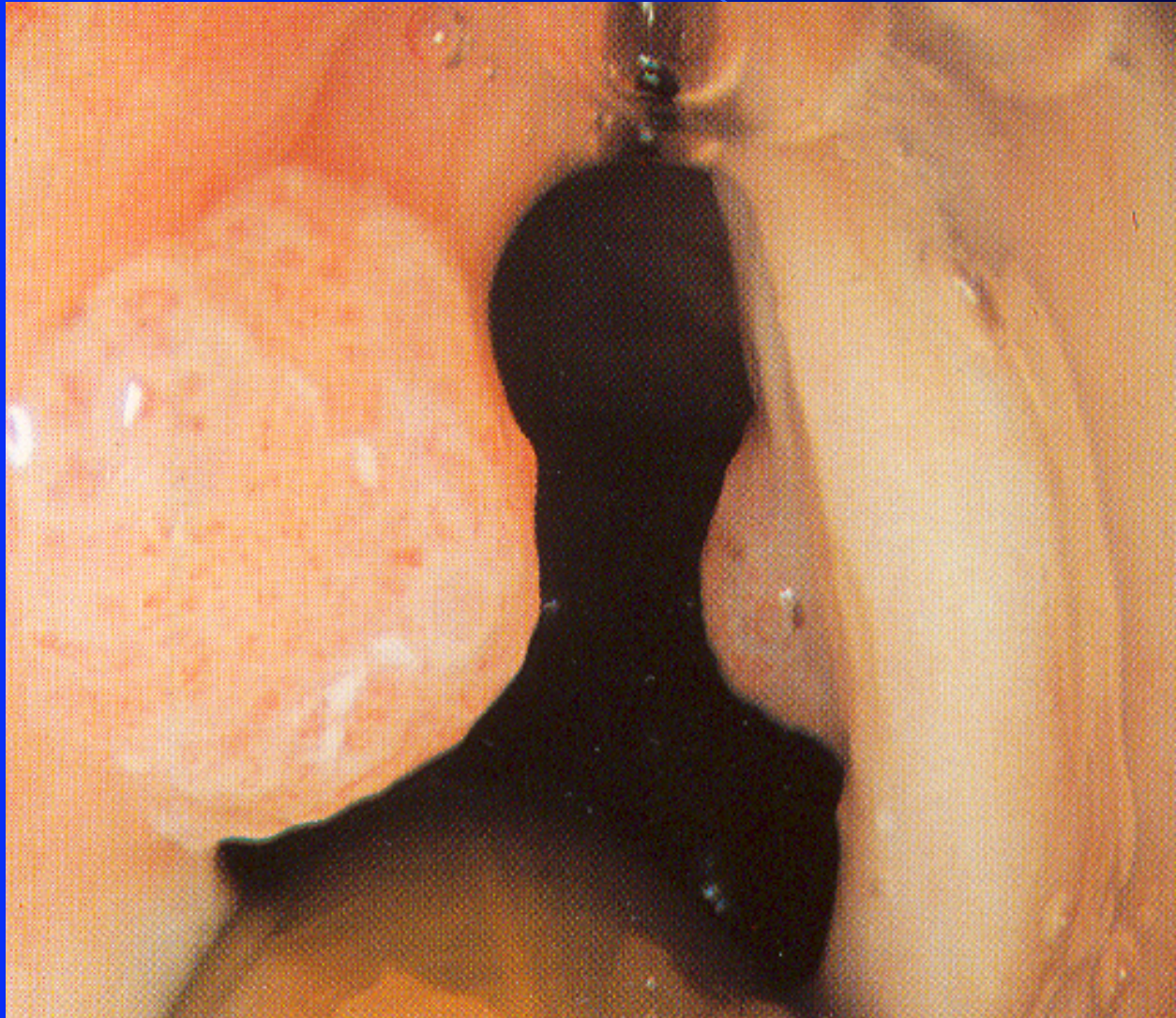
LARYNGITIS CHRONICA- OEDEMA REINCKE



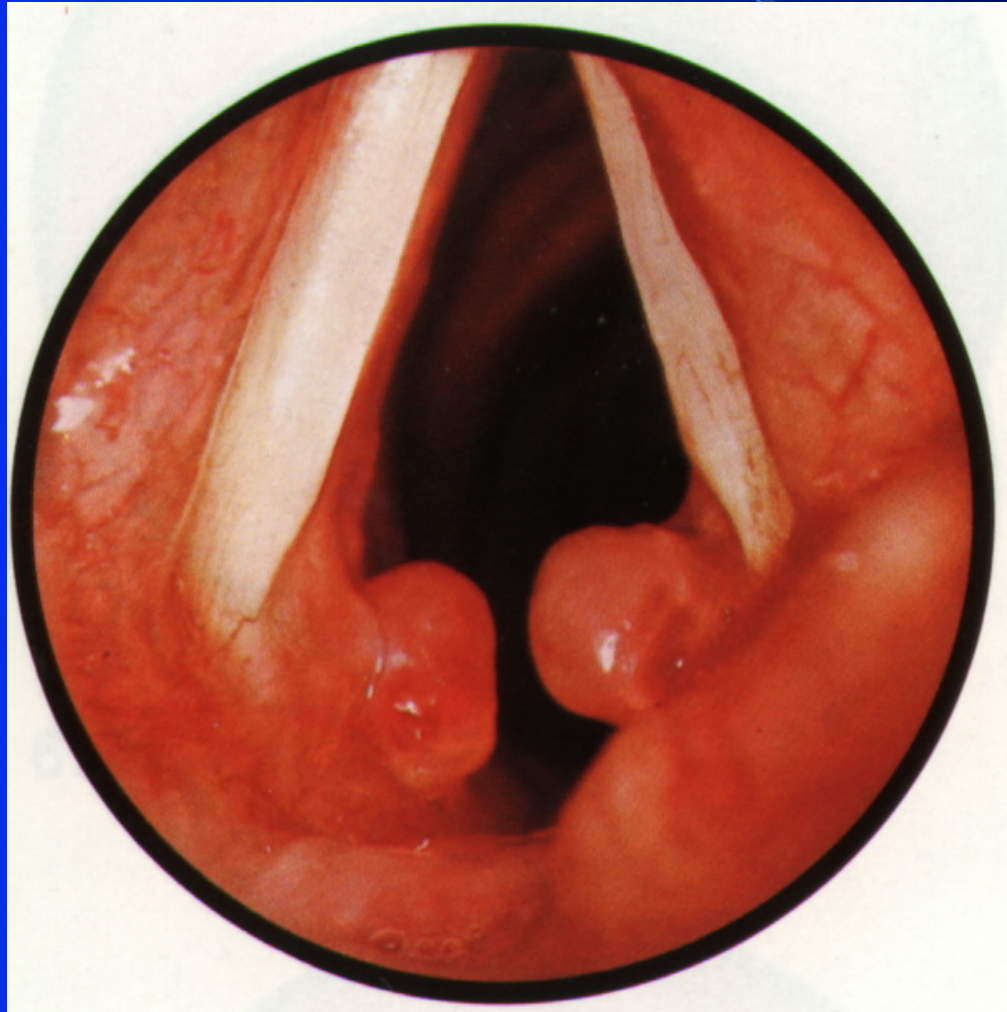
Oedema laryngis



Papillomatosis laryngis, HPV virosis

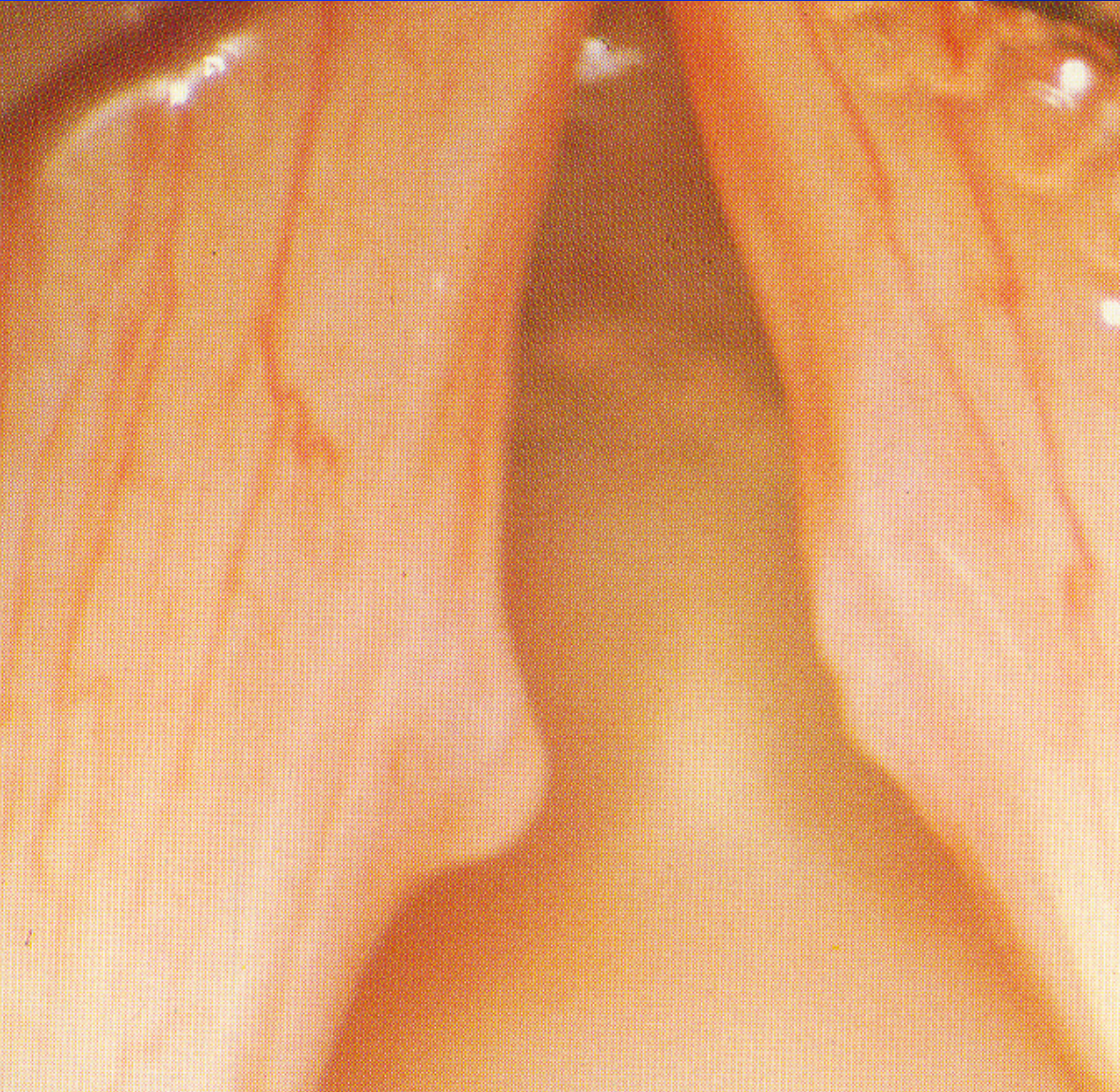
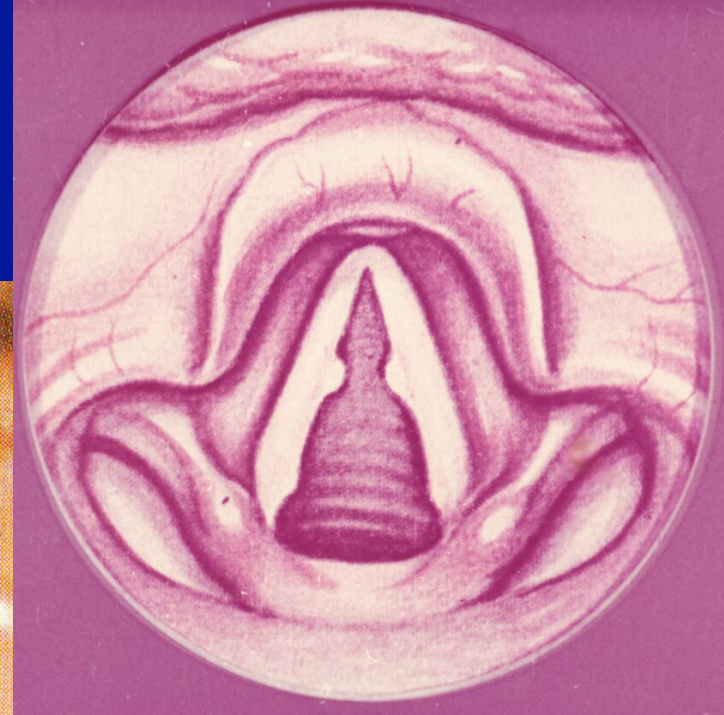


Intubation injury, granulomas



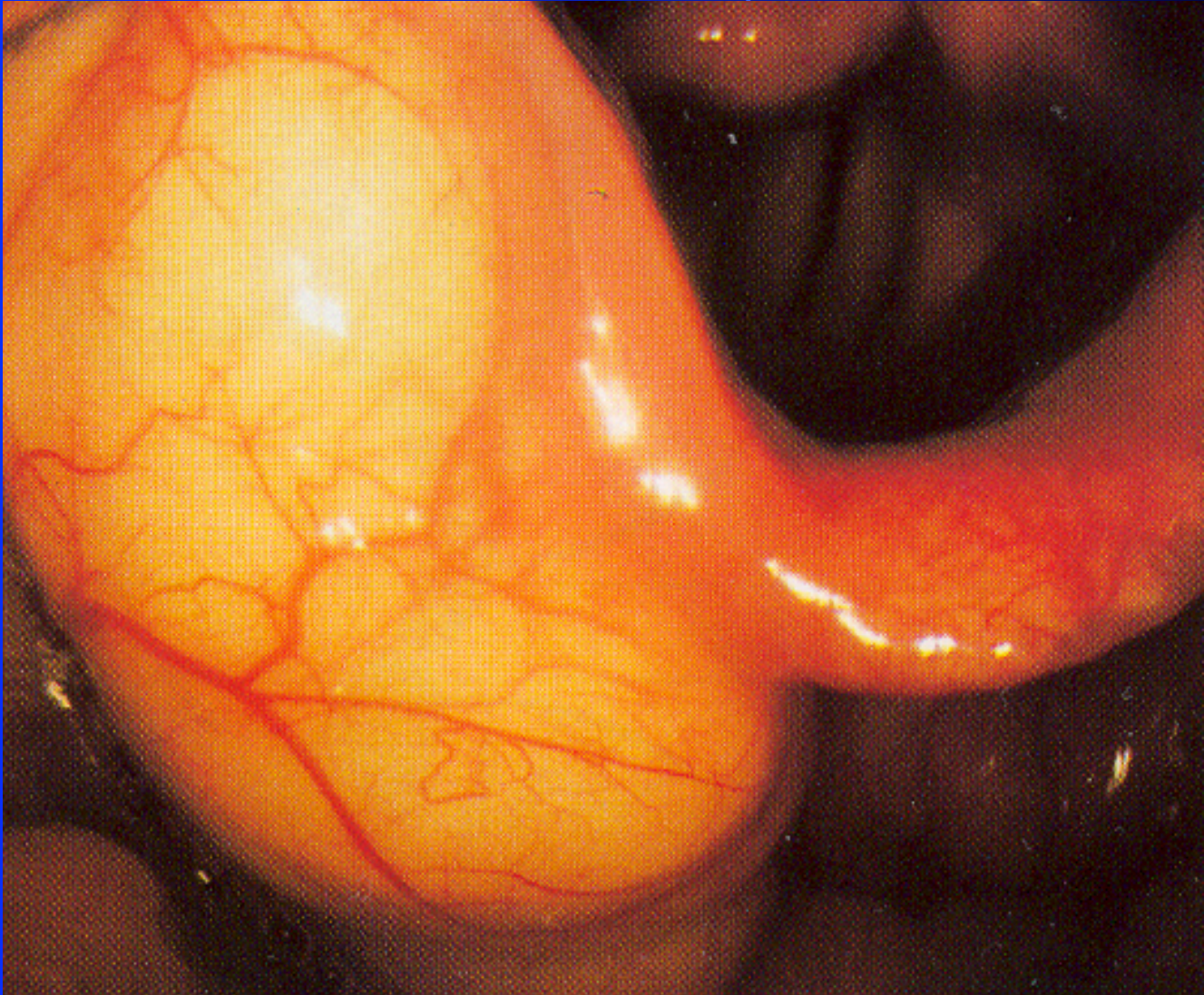
Noduli cantatorii

vocal abuse, dysphonia, pain on speaking

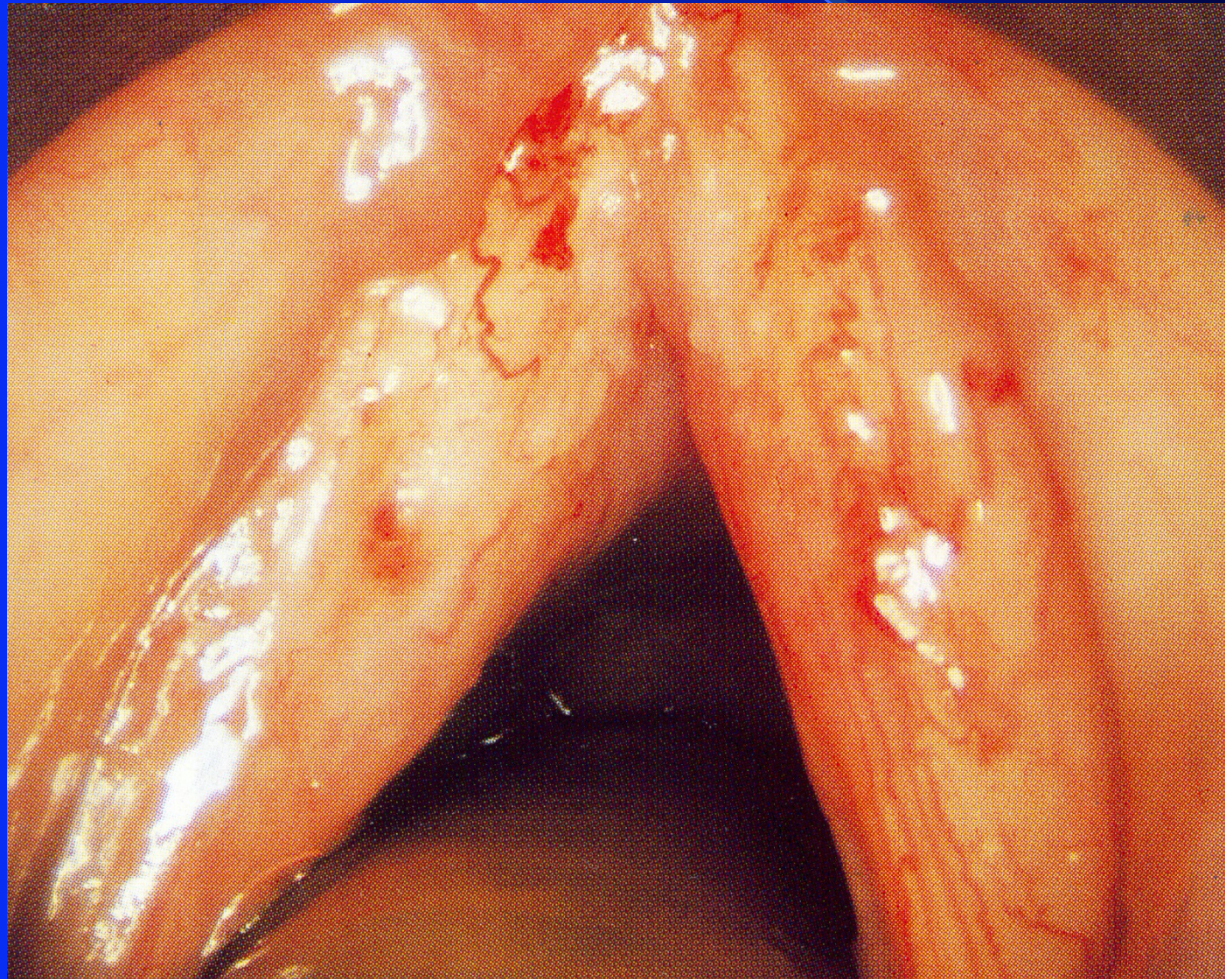


- in voice professionals
- microlaryngoscopy
- strict voice rest

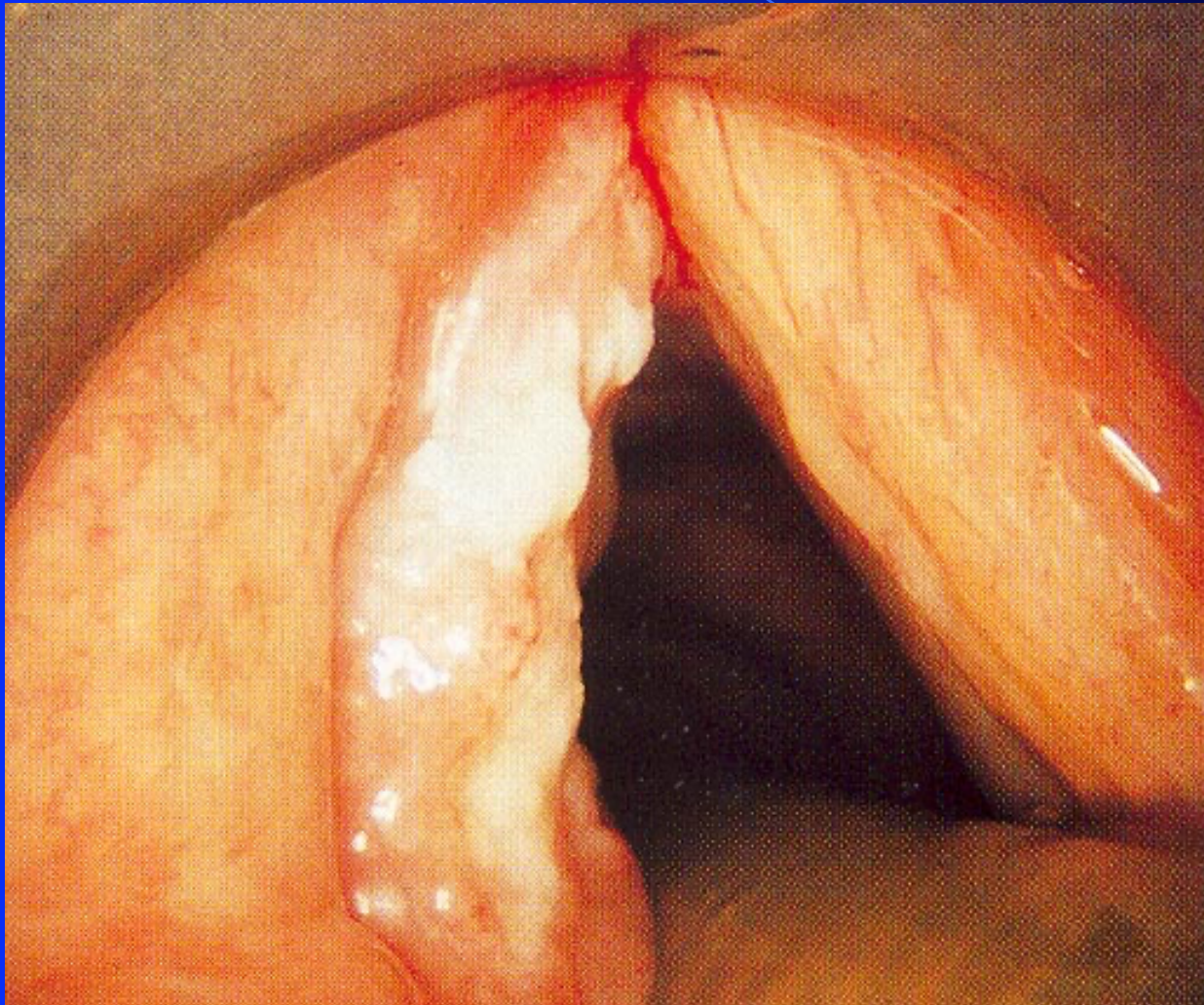
Cystis epiglottidis



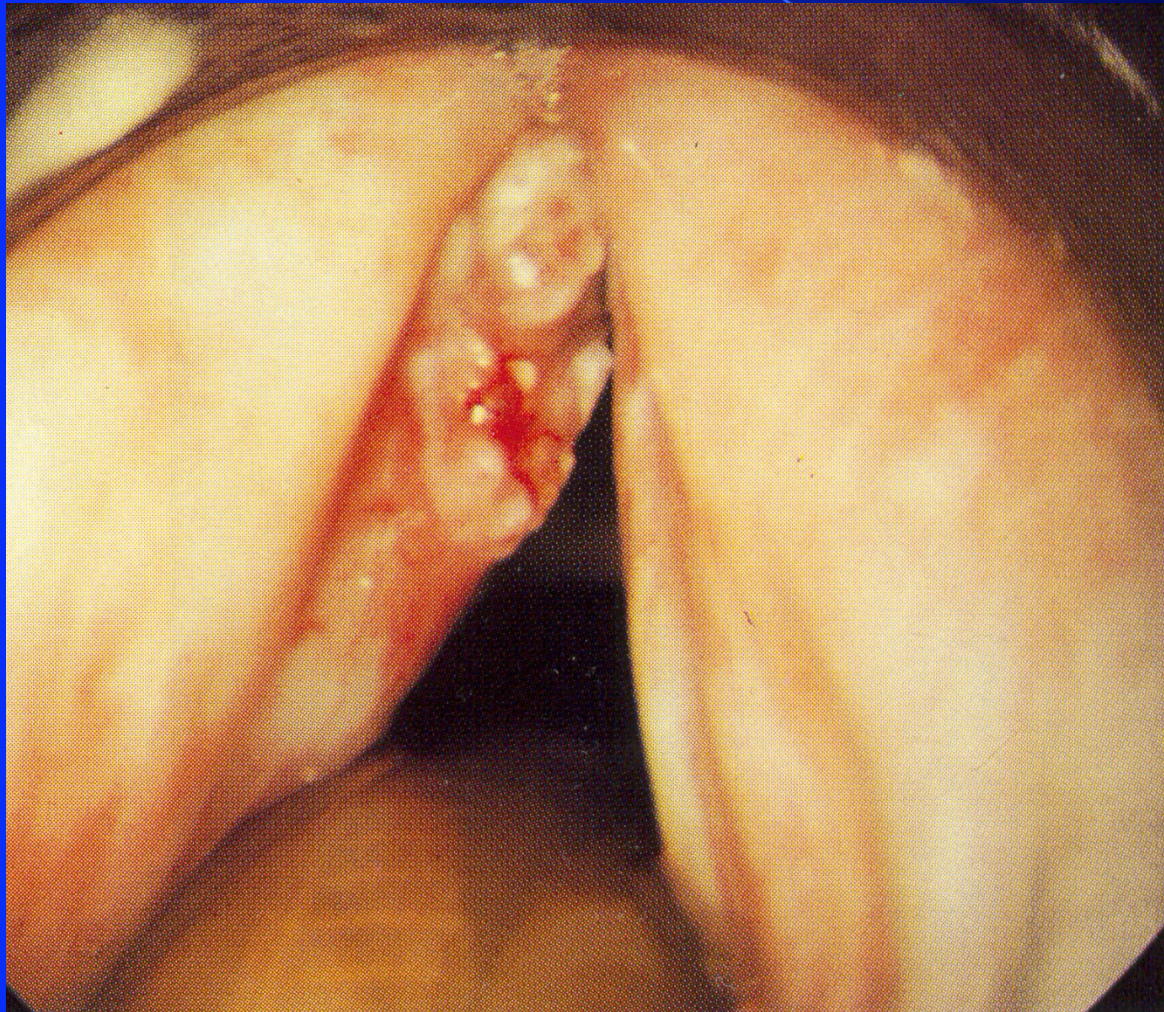
Ca in situ bilat



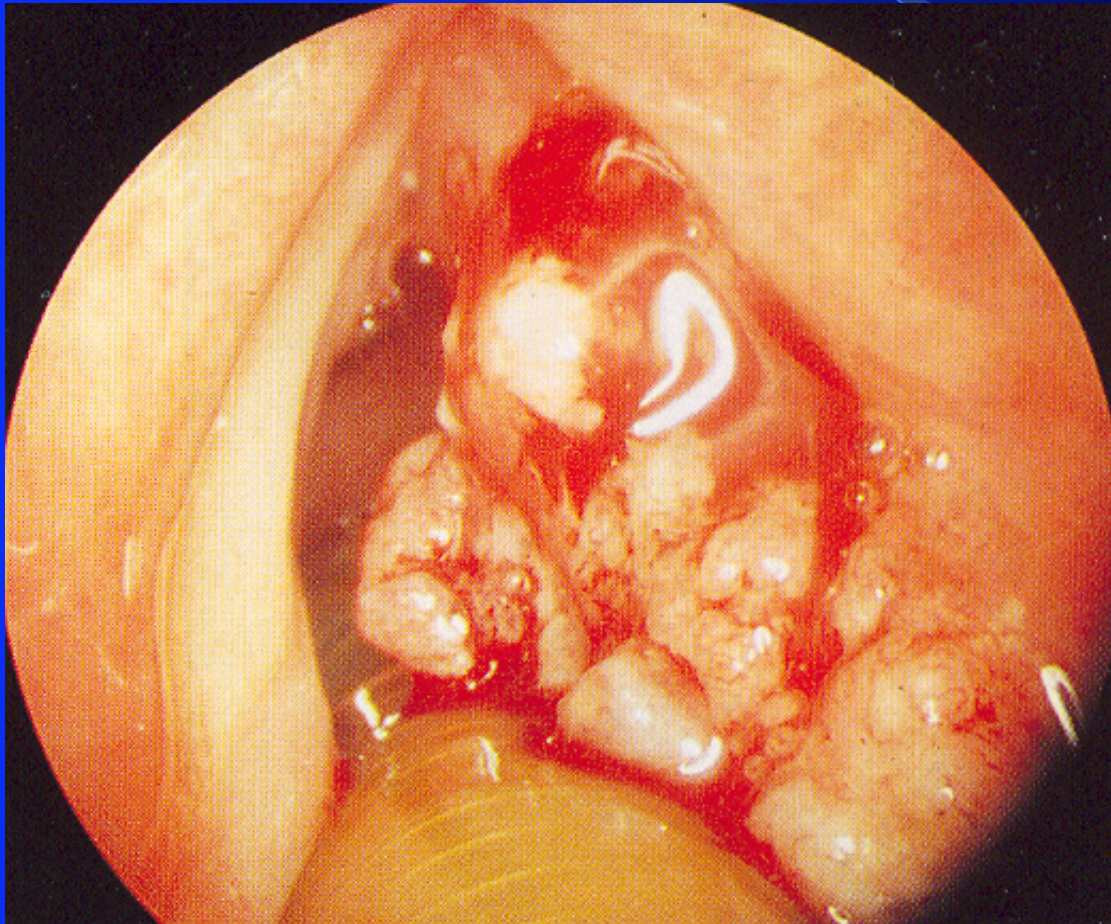
Ca spino plicae voc. l.sin. T1



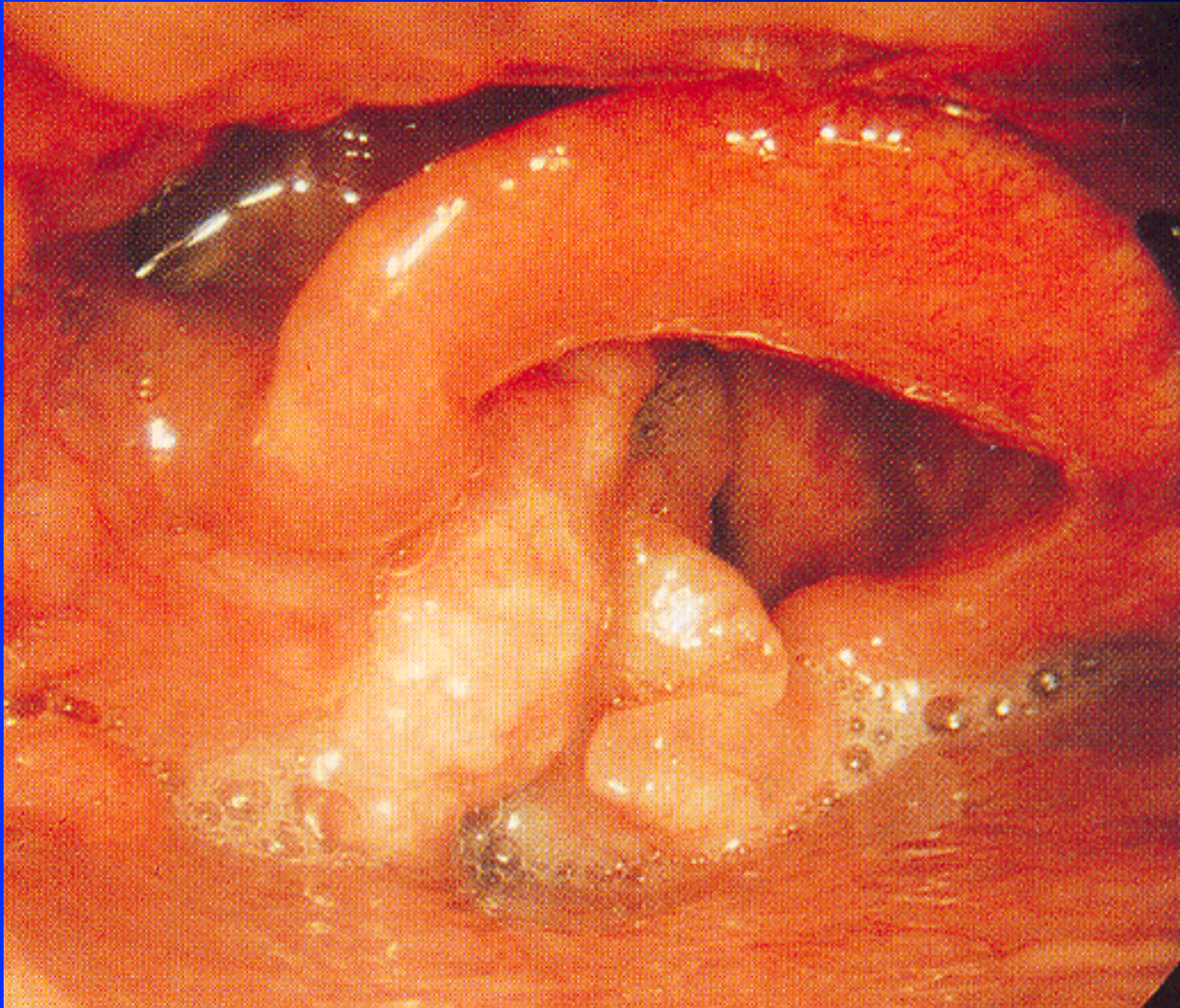
Ca spino plicae voc. l.sin. T2



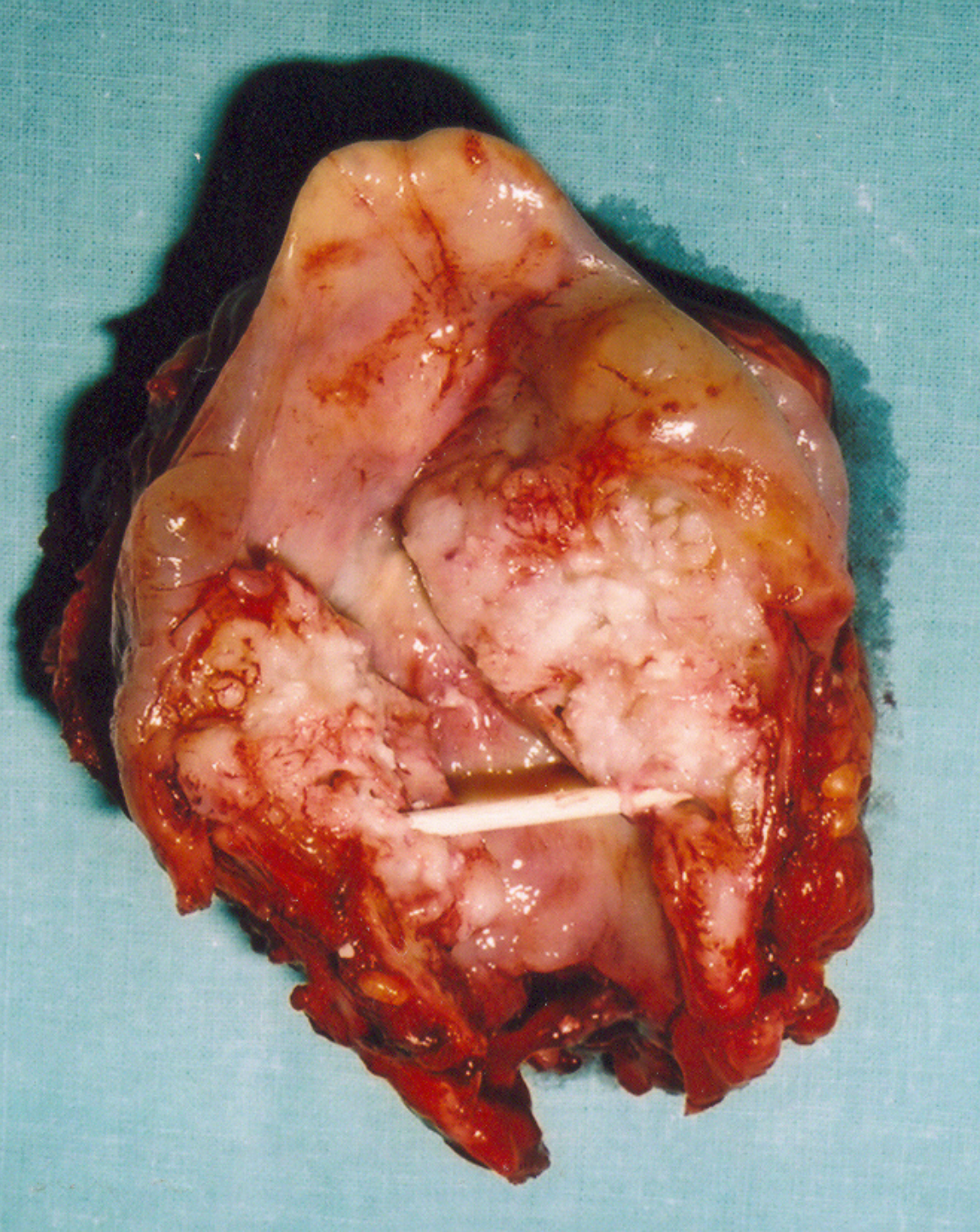
Ca spino plicae voc. l.sin. T3



Ca spino sinus piriformis

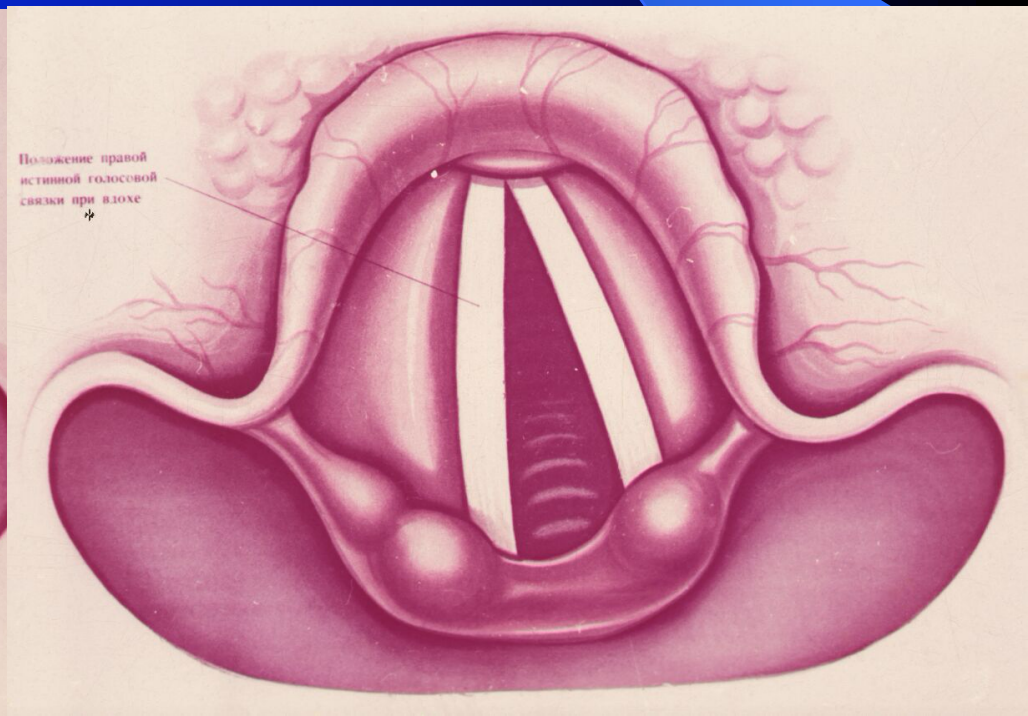
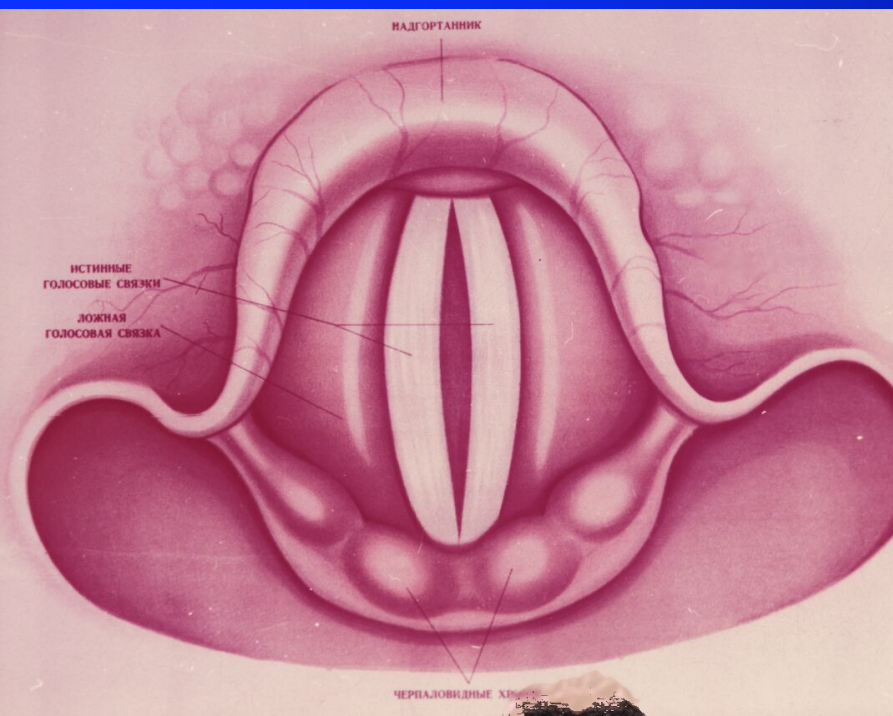


Ca glottis



Disorder of laryngeal motivity

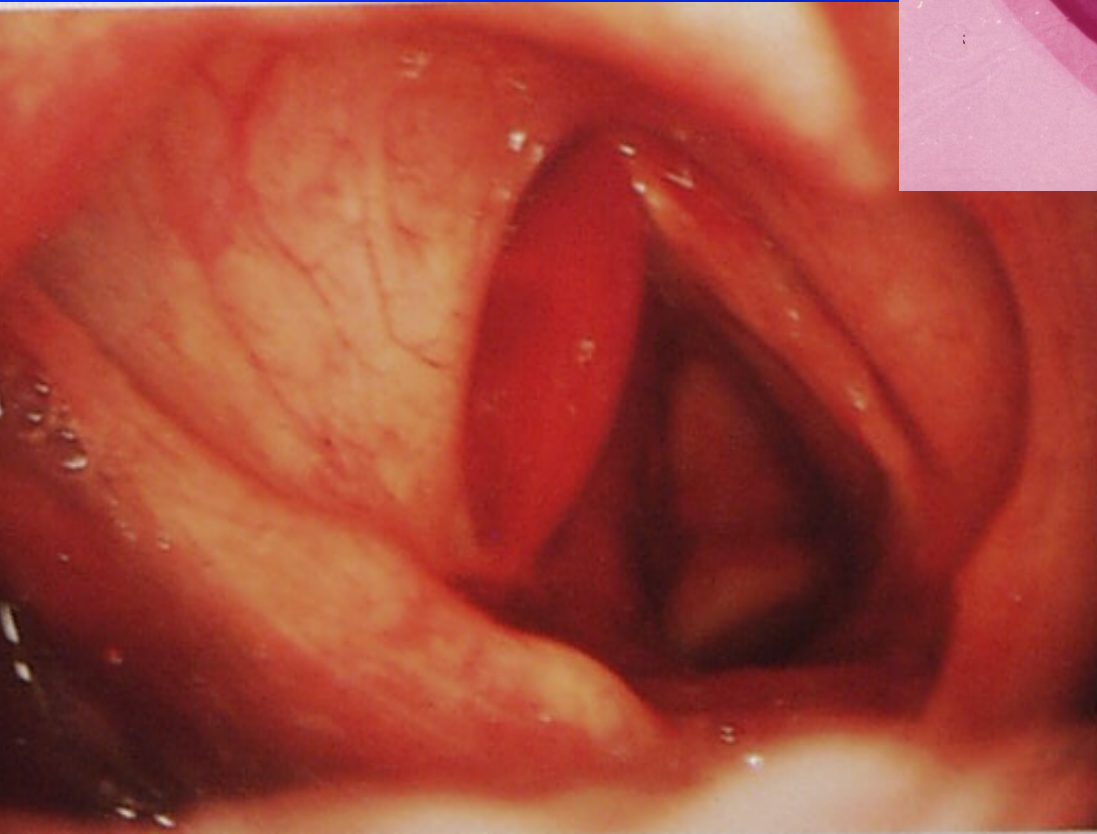
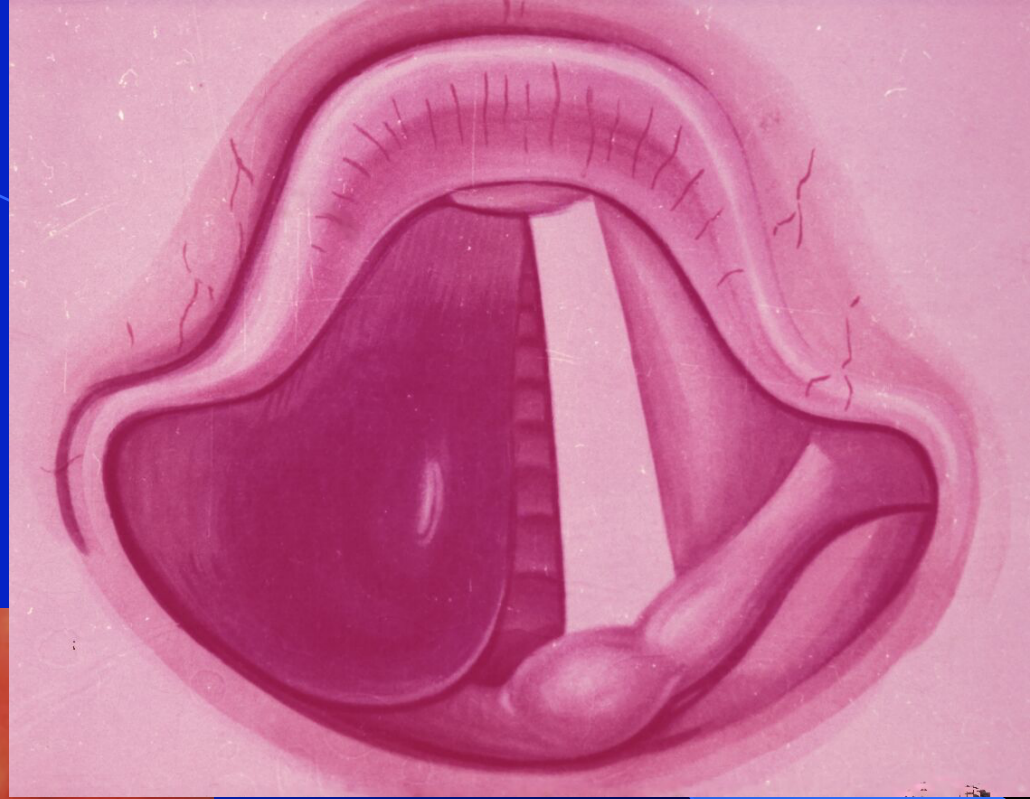
Seeman-Rosenbach rule – in insidious toxic influence on recurrent nerve - first damaged fibers phylogenetically younger (for m. posticus)



Laryngeal injury – symptoms, diagnosis

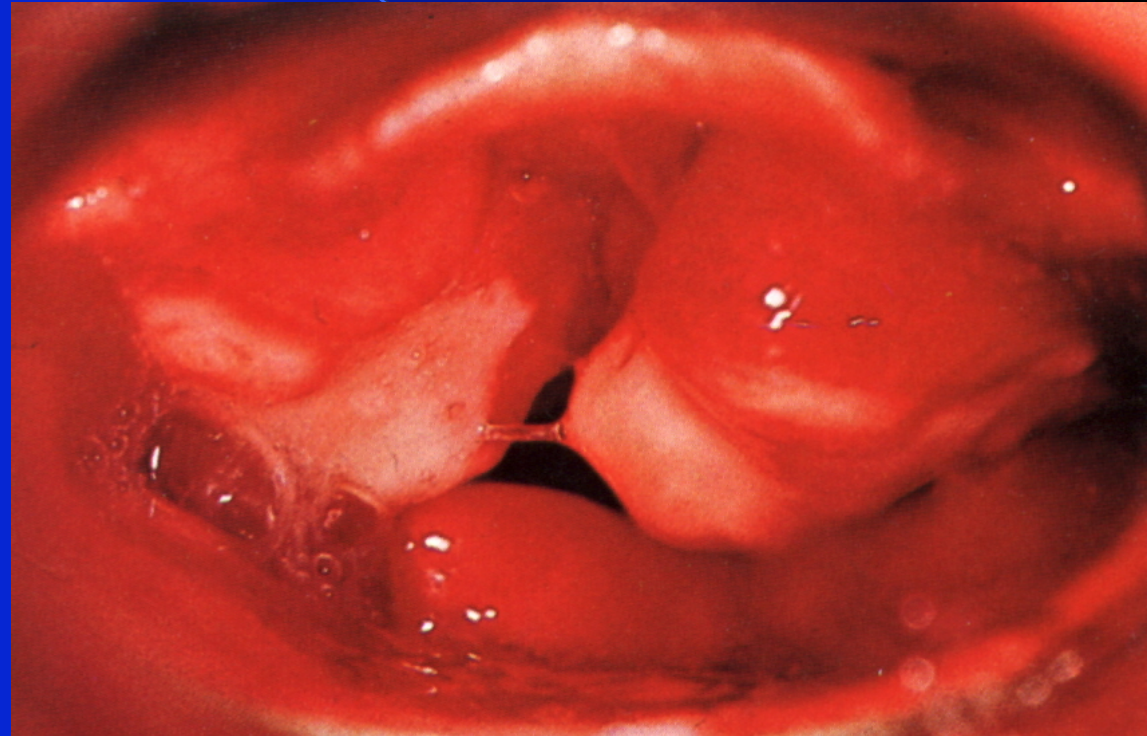
- **Dyspneu**
- **Dysphonia**
- **Bleeding** – not very extensive
- **Dysphagia** – in connection to injury of pharyngeal and esophageal muscles

Hematoma of right vocal cord

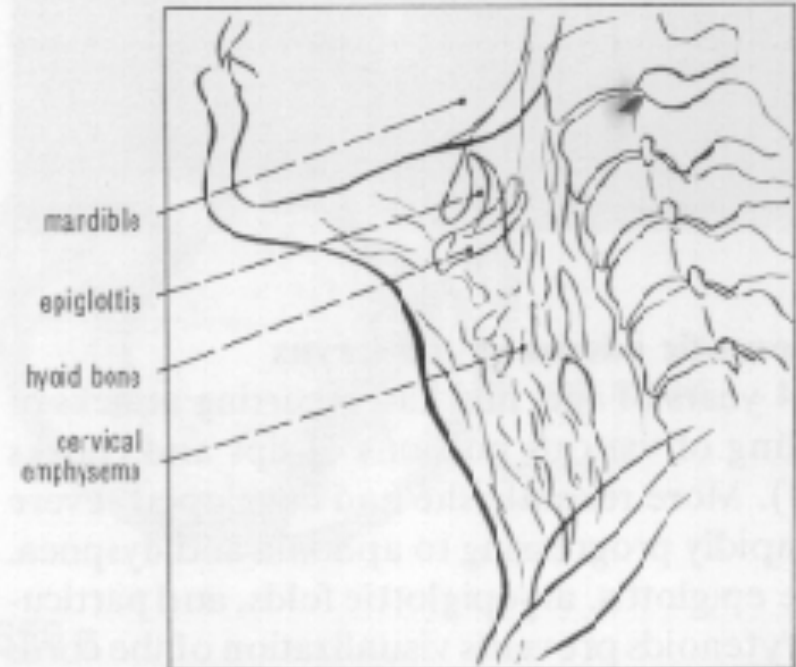
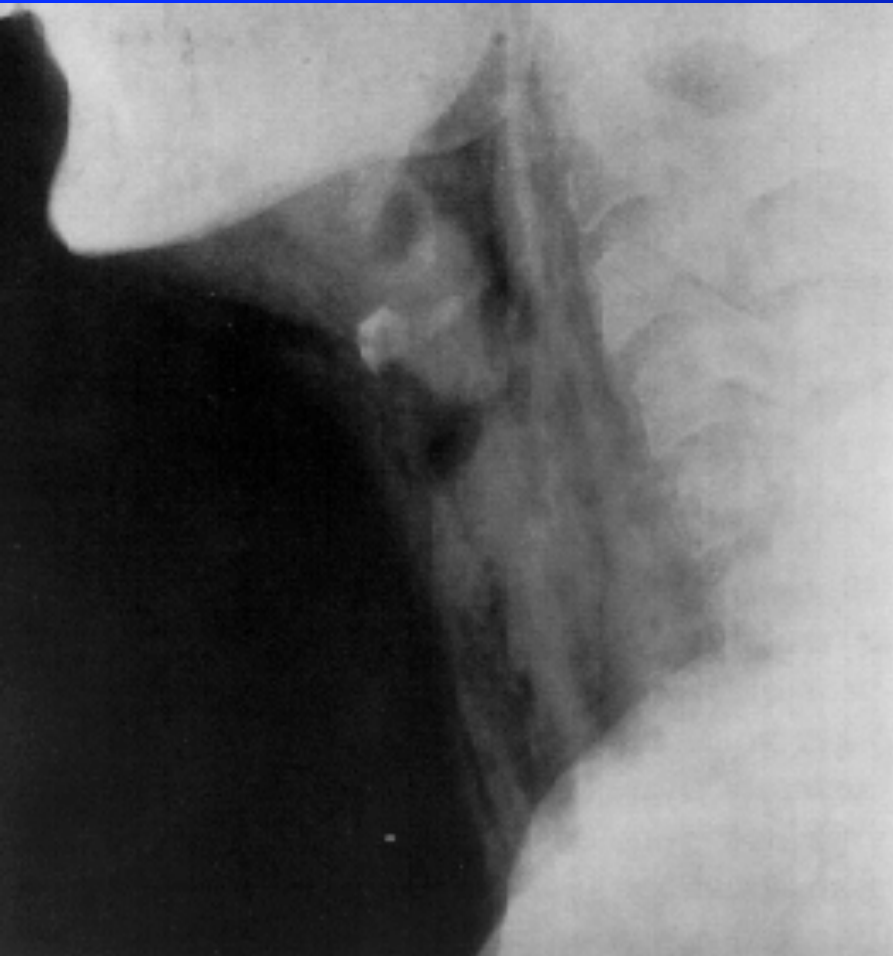


Fractura of laryngeal skeleton

Laryngeal fracture
with a mucosal
hematoma and
dislocation of
the arytenoid



Laryngeal fracture , neck emphysema



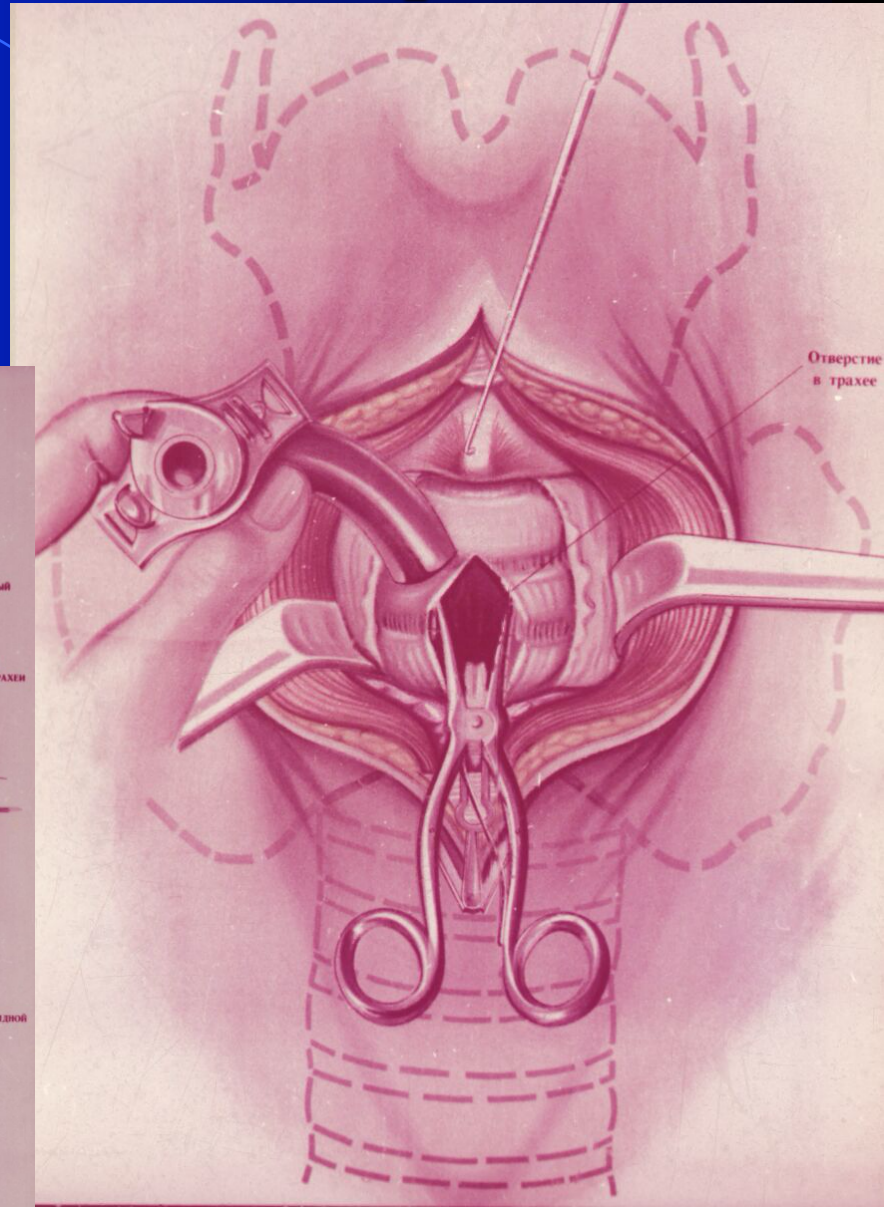
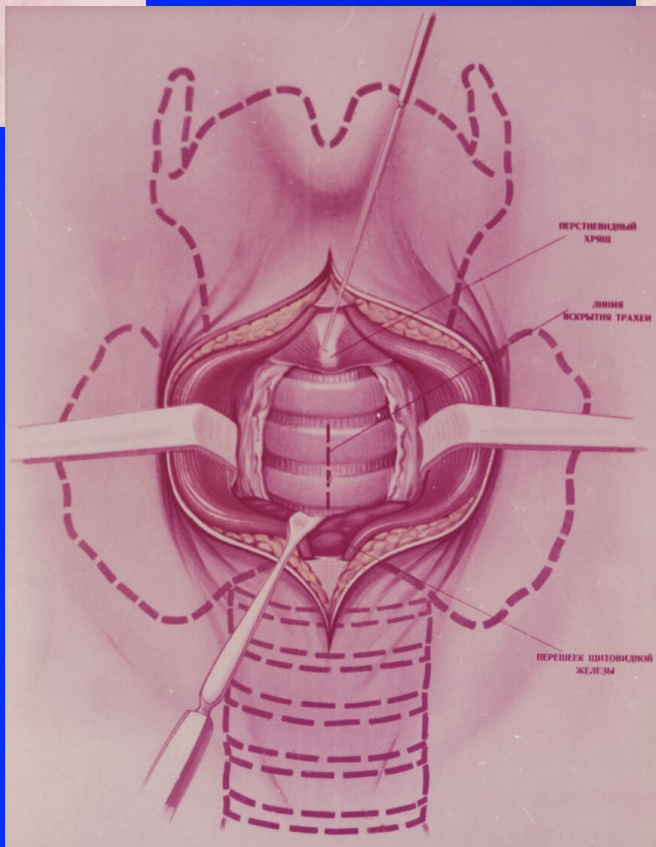
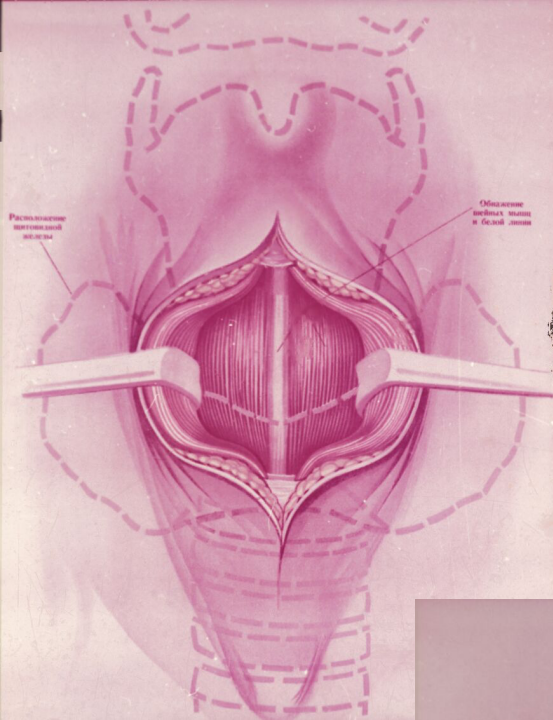
External laryngeal injury, first physician aid

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

Light injury (blunt trauma) conservative treatment-

- 1) antihistaminics, corticosteroids, antibiotics, analgetics, oxygen
- 2) cold compress on neck
- 3) in dyspnoe – cricothyrotomy, intubation

Tracheotomy



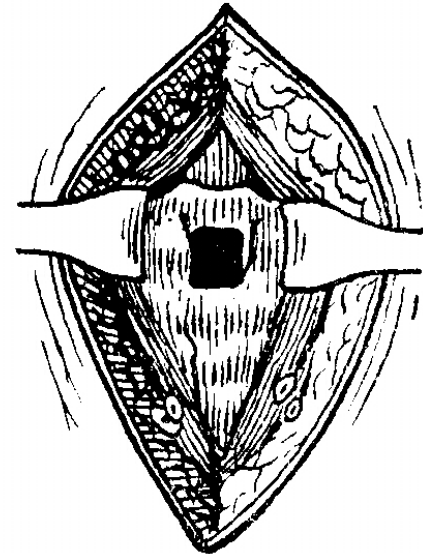
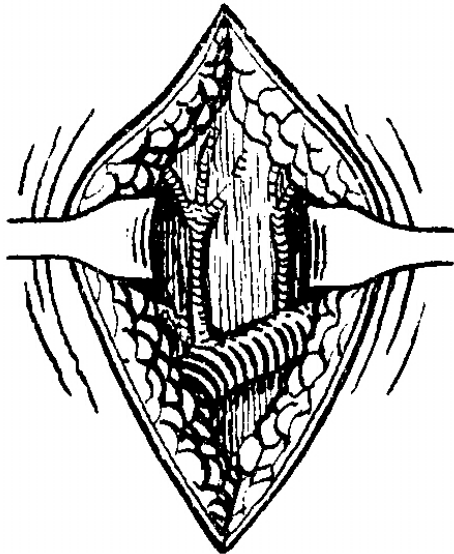
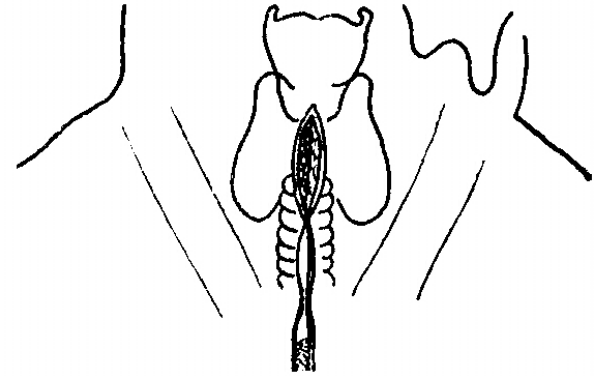
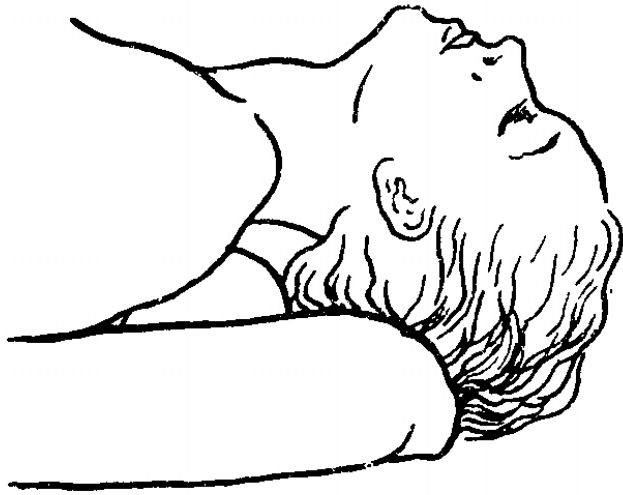
Indication for tracheotomy

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

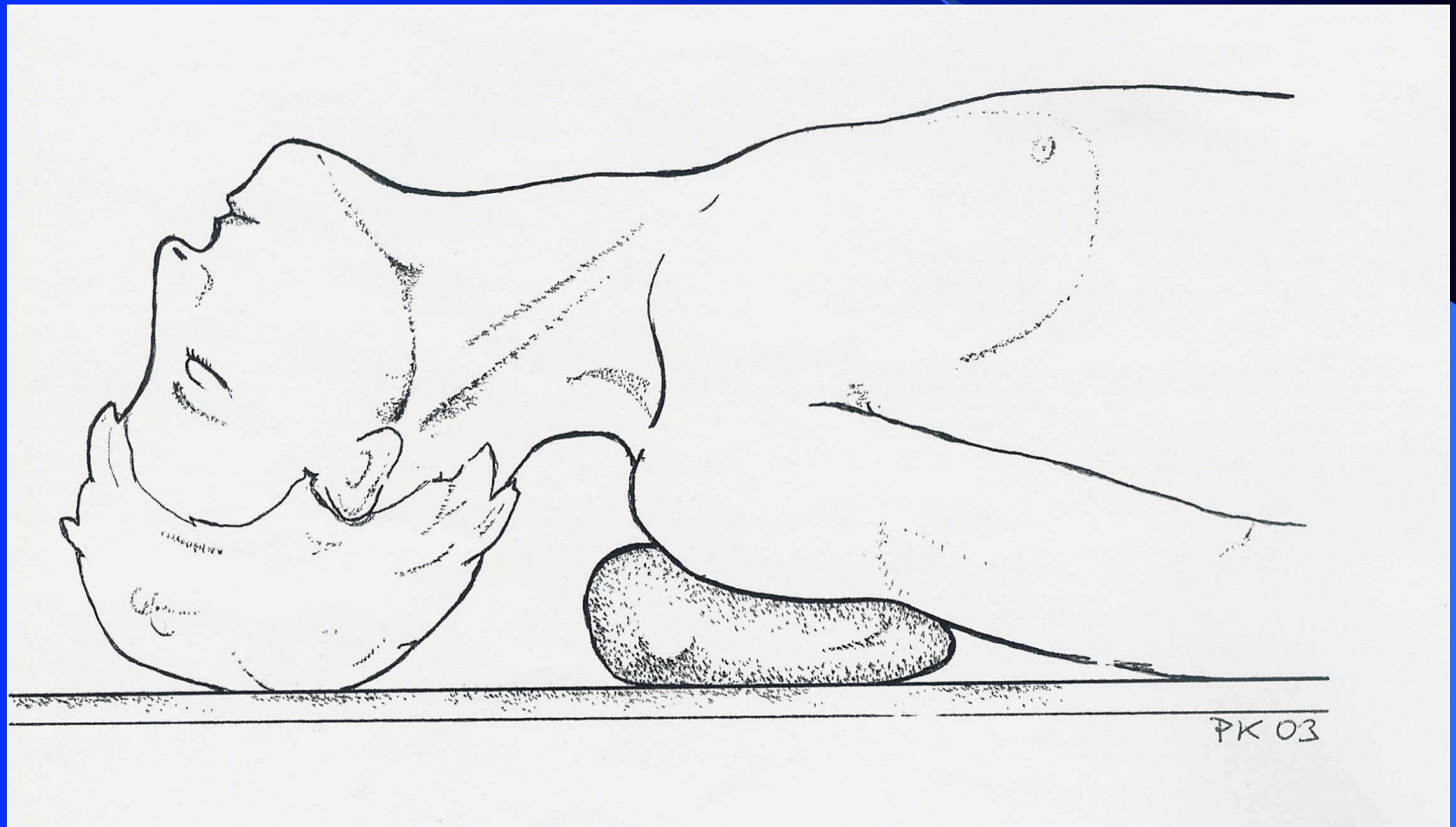
„Prophylactic“ – if we suppose possible stenosis (big surgery, swelling, bleeding, irradiation...)

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

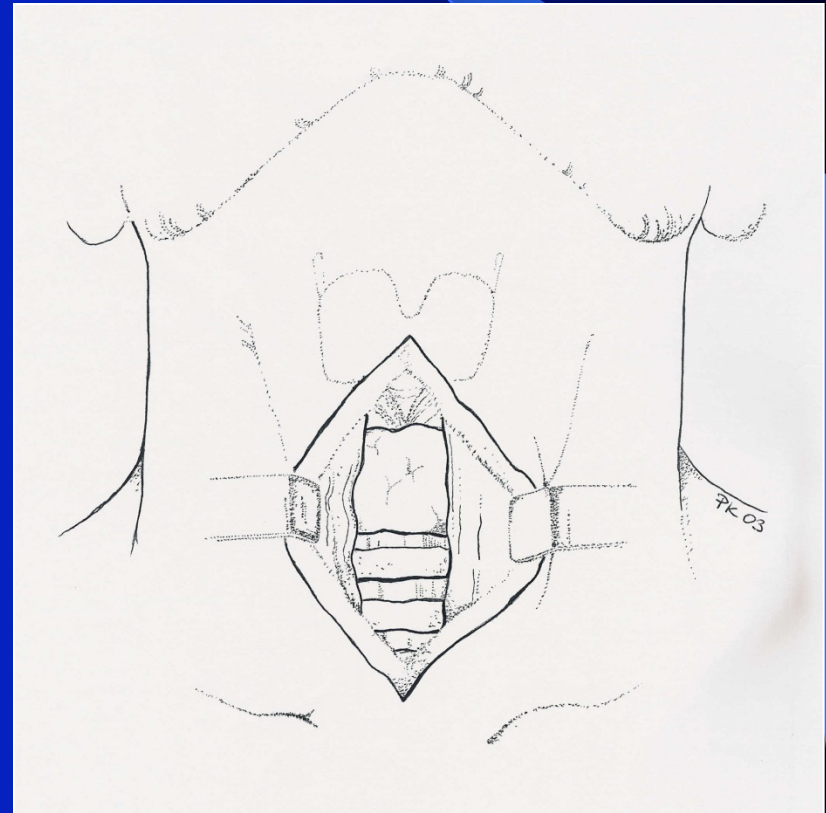
Tracheotomy



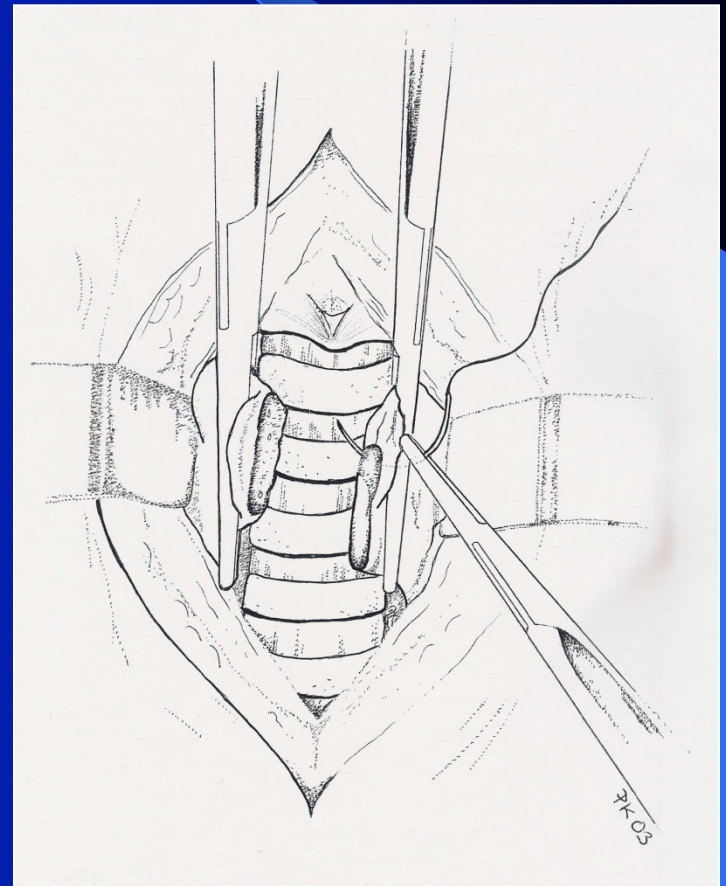
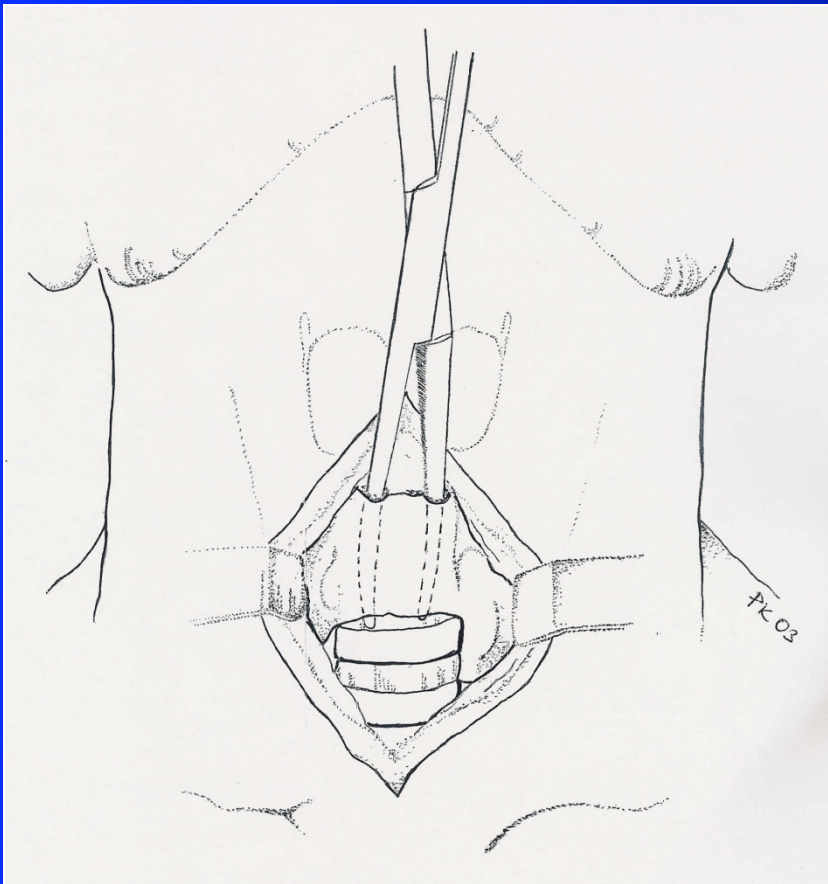
Position in tracheotomy



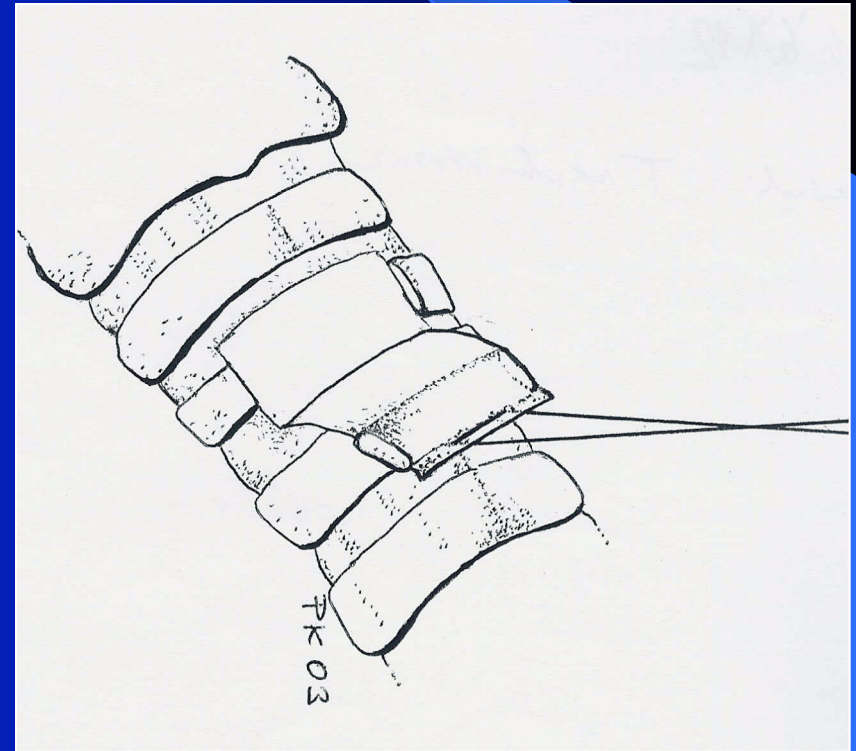
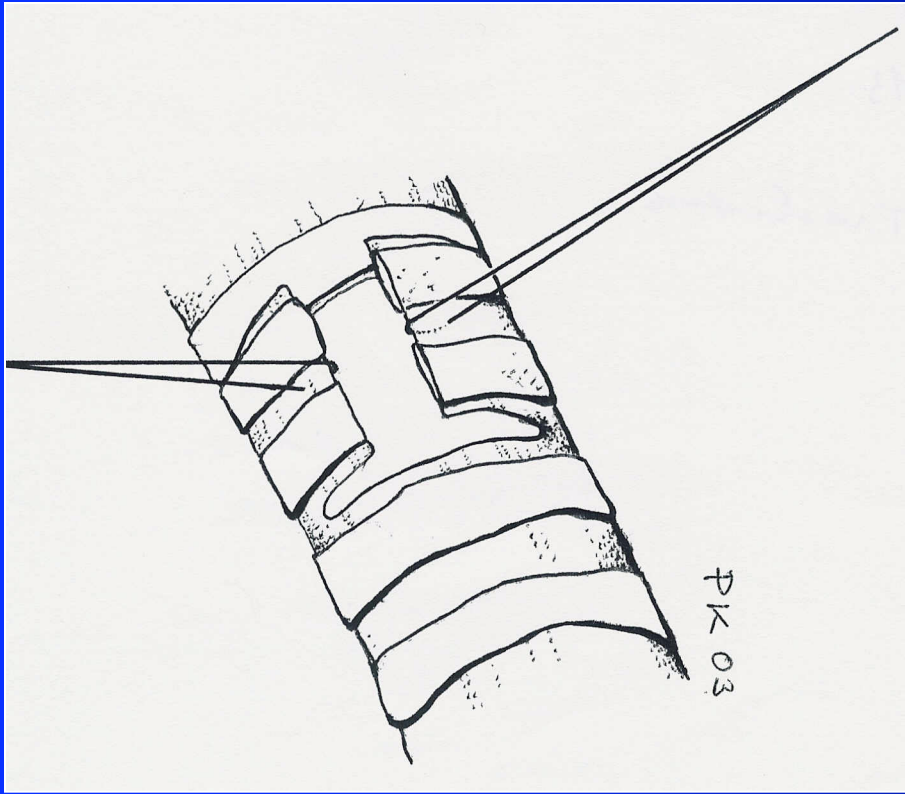
Skin section – horizontal or vertical



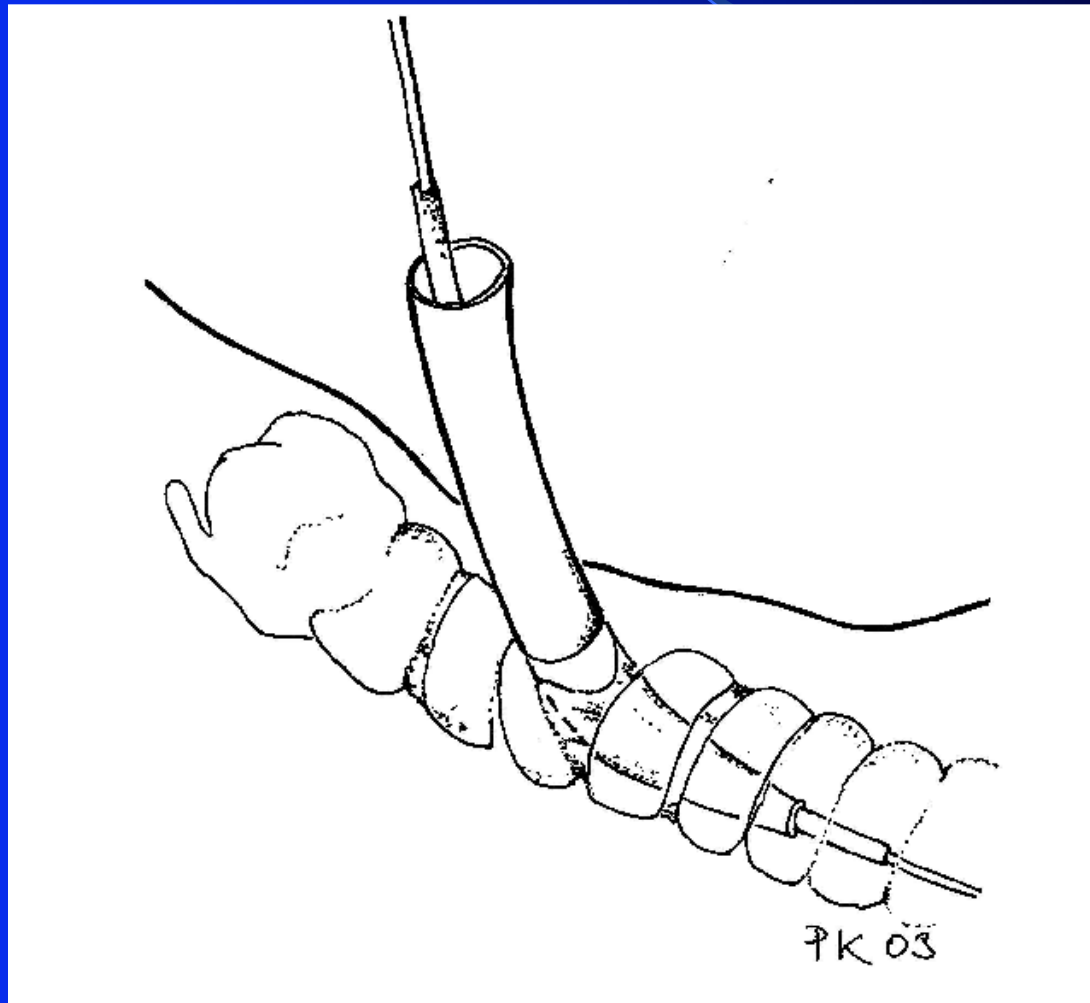
Thyroid gland isthm resection



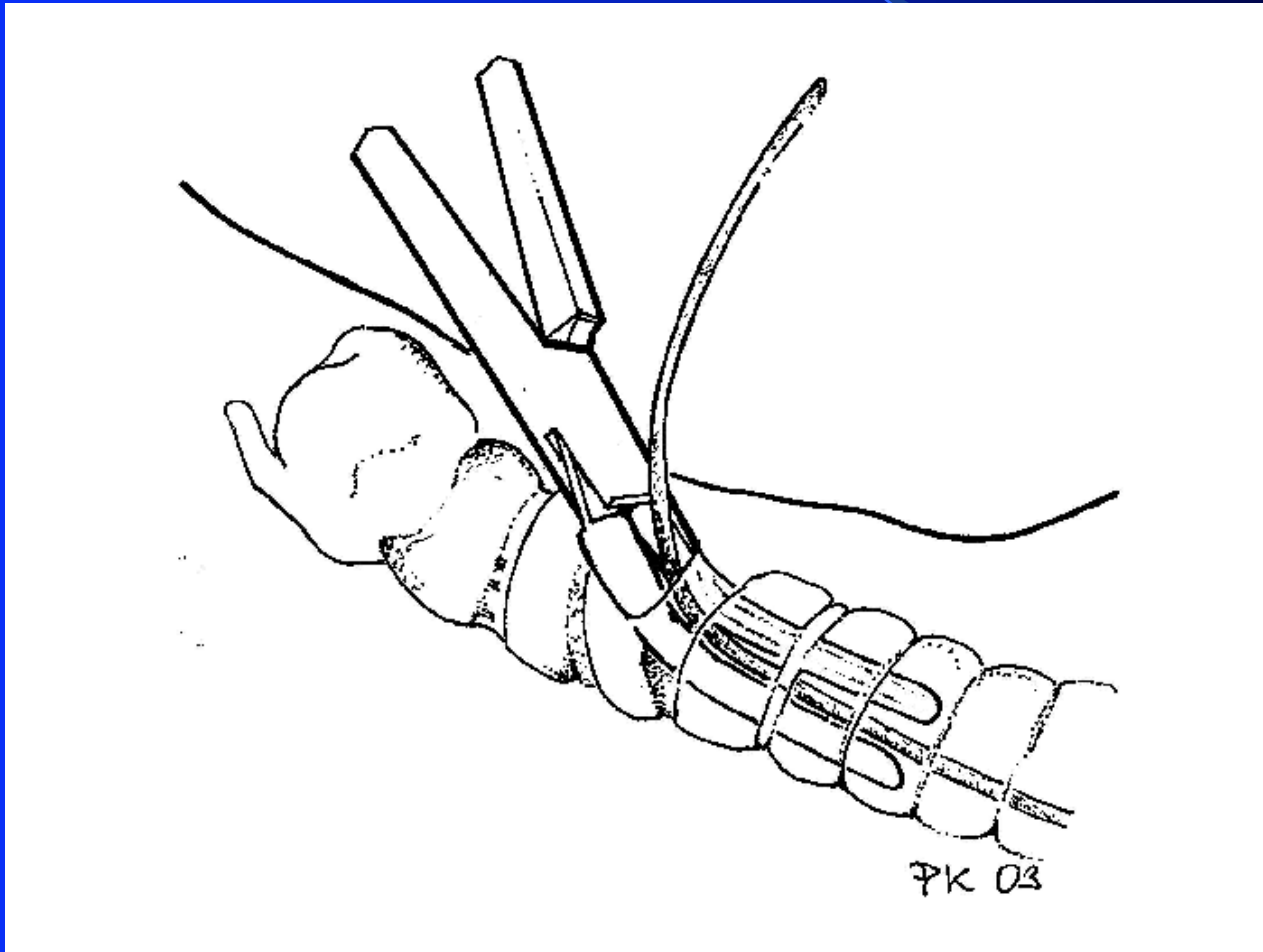
Trachea opening



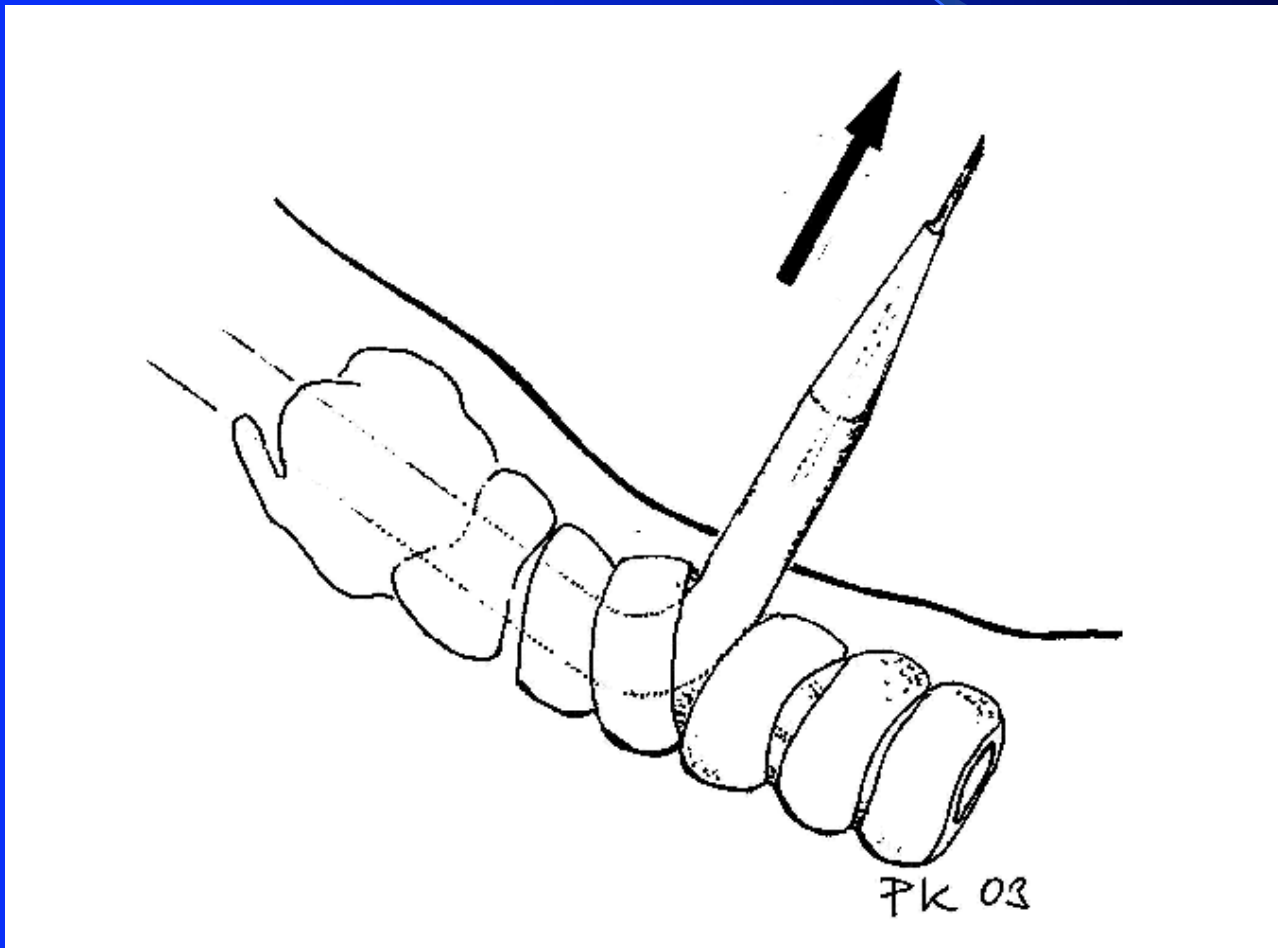
Puncture, dilatation tracheotomy - Ciaglia (1985)



PDT – Griggs (1990)



Translaryngeal tracheotomy Fantoni (1993)



Complication in tracheotomy

During surgery bleeding, dyspnoe, lost of orientation,

Early post surgery

emphysema, embolism,

mediastinální emfyzém,

pneumothorax, inflammation

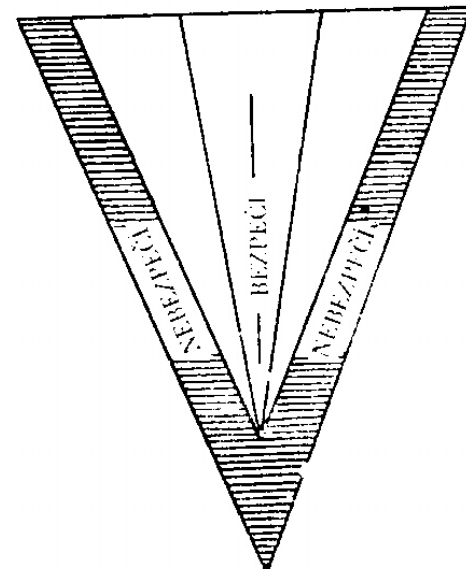
bleeding, nekoresponduje otvor

v průdušnici a na kůži-

problémy s výměnou kanyly .

Late post surgery stenosis

(C. CRICOID)



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 sblíží