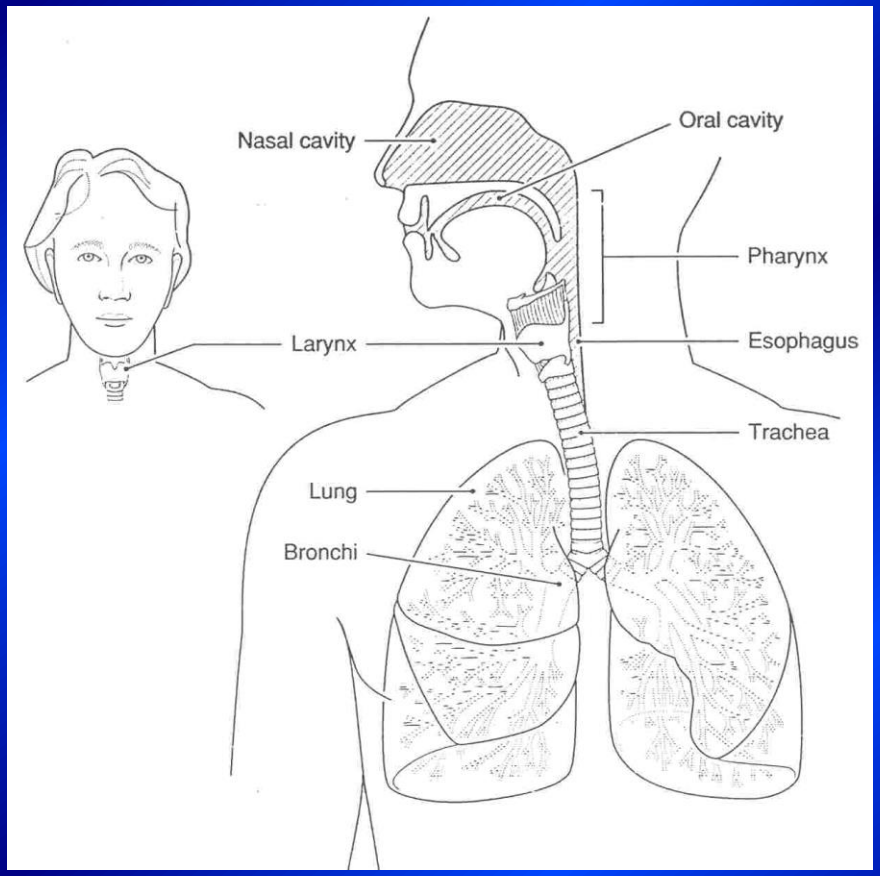
VOICE AND SPEECH DISORDERS

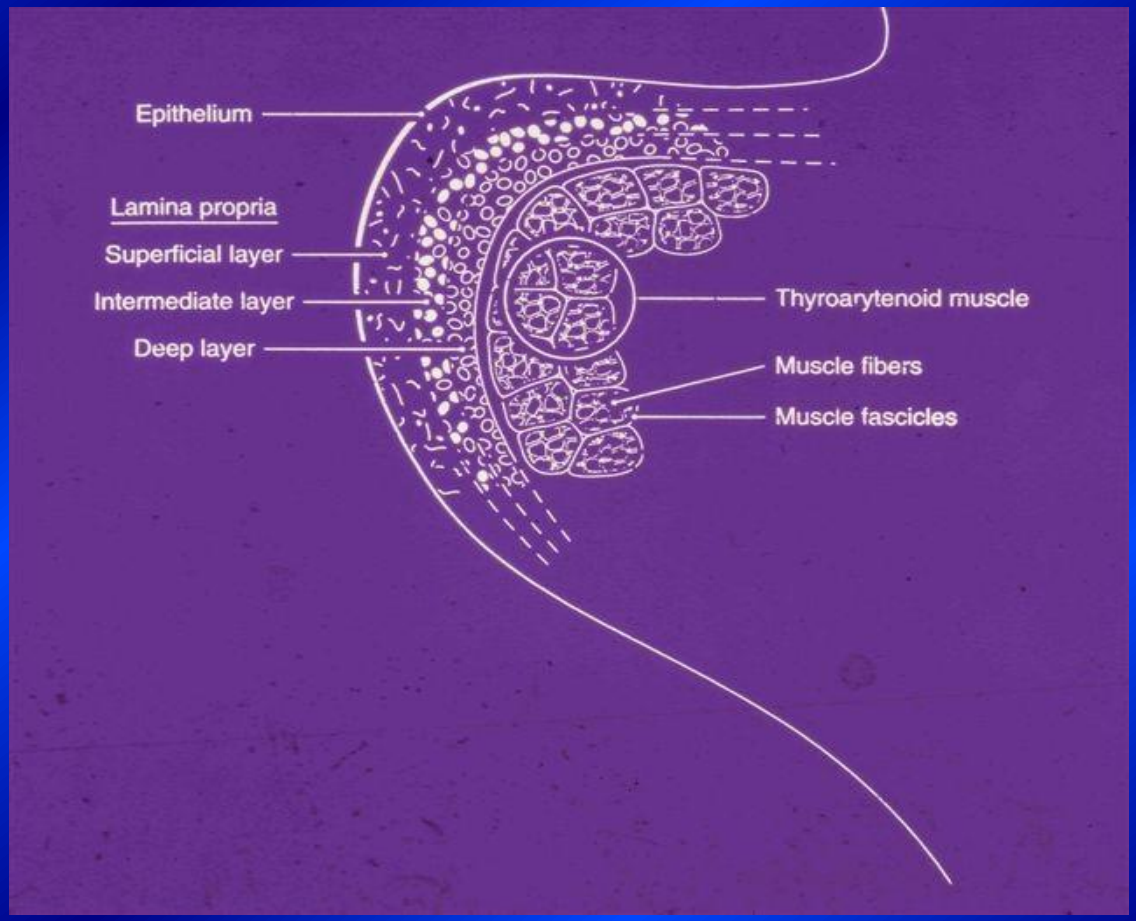
Centers and organs participating in speech

- centers in CNS (cerebrum, cerebellum, basal gangia reticular formation)
- peripheral nerves (cranial, spinal, phrenic nerve)
- respiratory tract
- larynx
- resonance tract and articulation organs
- control mechansms (hearing, superficial and deep sensibility)

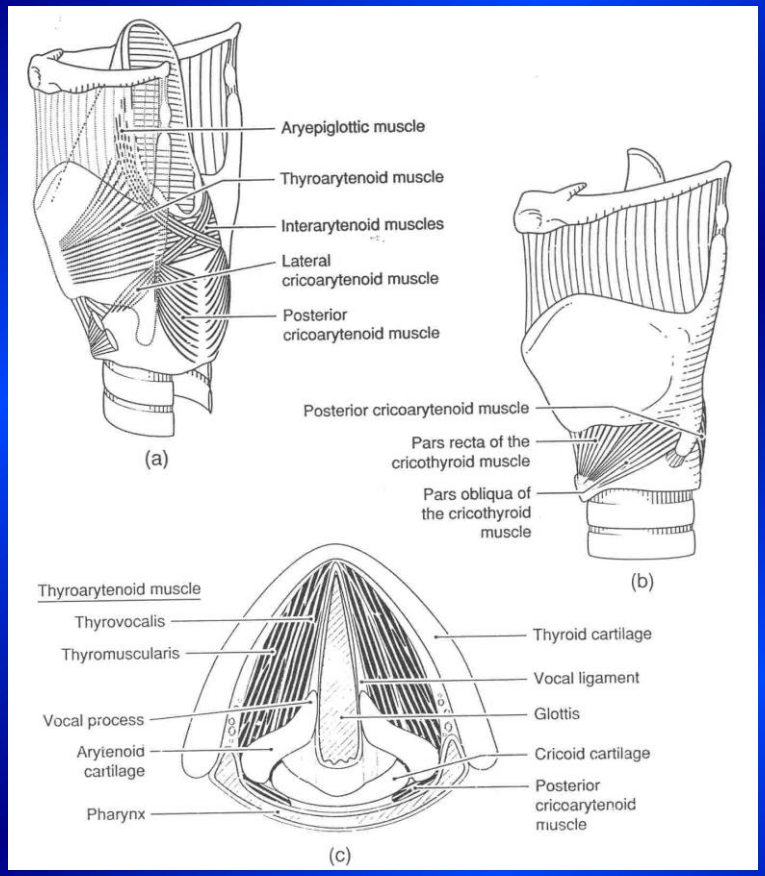
Vocal tract


Nasal cavity
Oral cavity
Pharynx
Larynx
Esophagus
Trachea
Lung
Bronchi

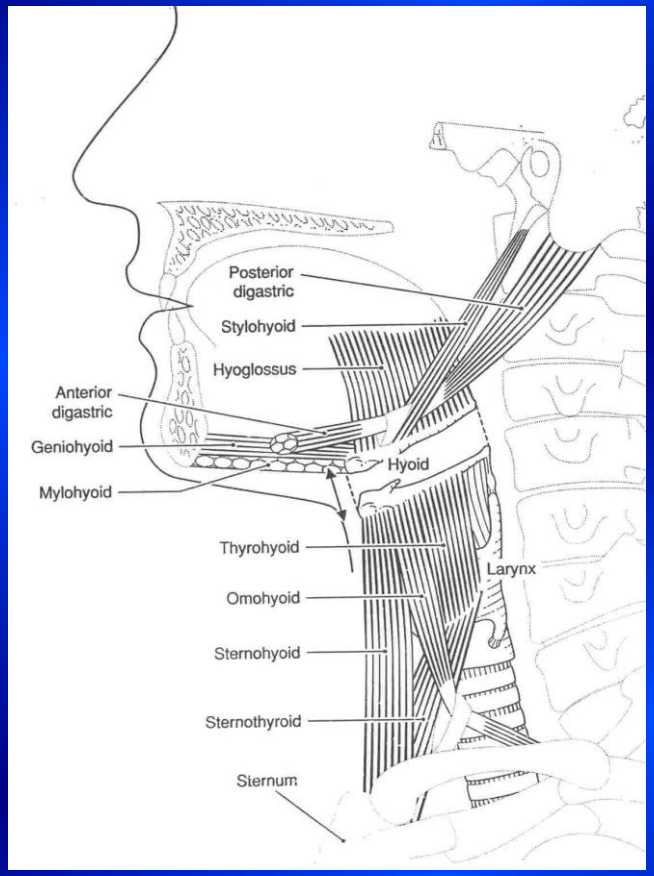
Structure of vocal fold



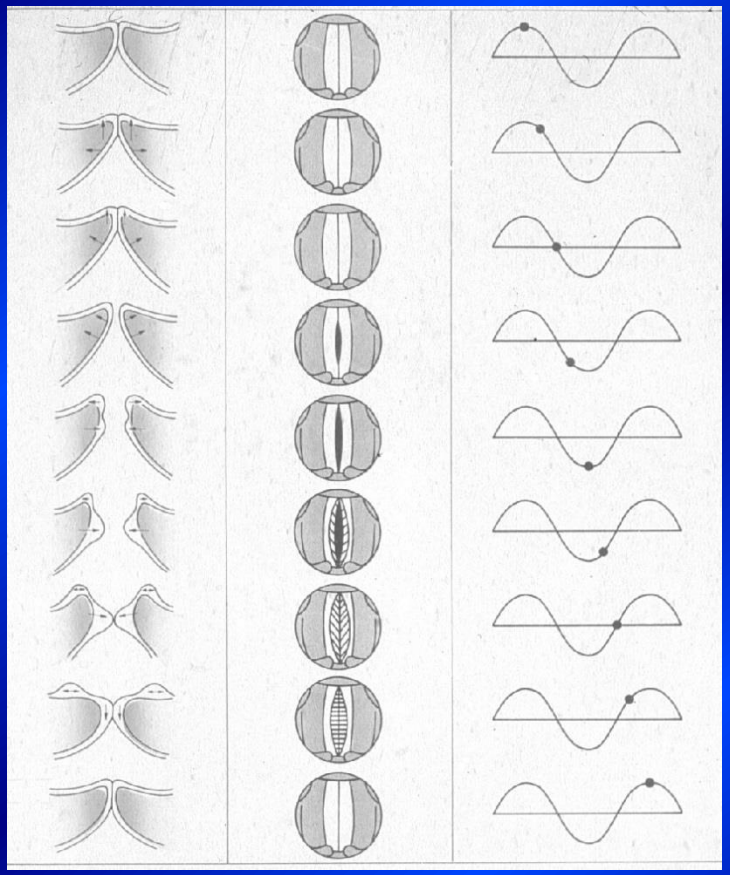
Inner laryngeal muscles



Outer laryngeal muscles



Vocal fold vibration during phonation - stroboscopy



Videoendostroboscopy

Phonation and modeling of the voice

- Phonation = vocal folds' vibration, fundamental laryngeal frequency F0

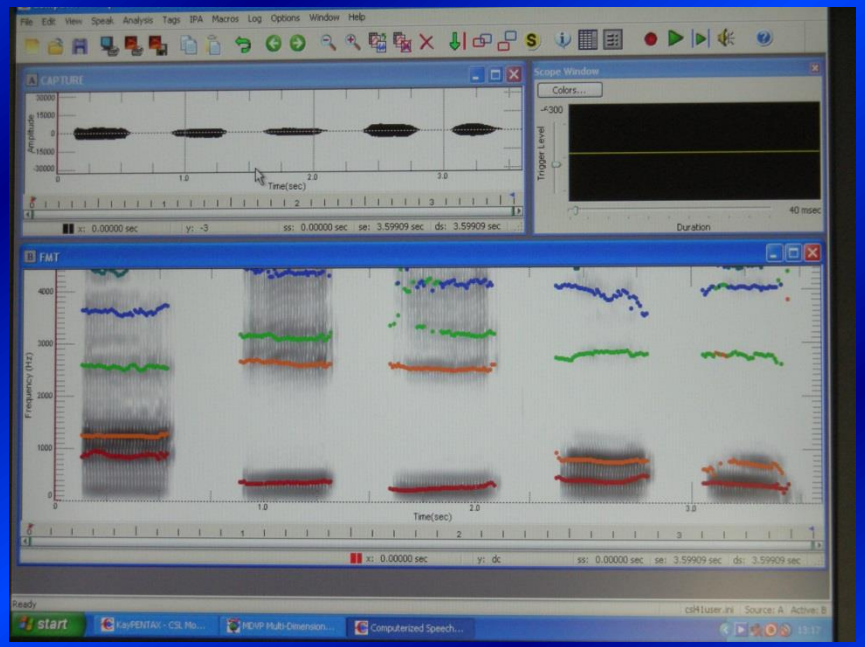
  men 100 – 160 Hz

  women 190 – 260 Hz

- Modeling of the voice:

  dependent of the resonance tract (length, shape)

  - spectral analysis



Voice characteristics

- pitch (length, width, thickness, tension of vocal folds)
- loudness –amplitude (tension of vocal folds, subglottic pressure)
- colour (spaciousness, shape of the resonance tract)
- voice range
- attack (soft, hard, breathy)

Conditions for healthy voice

- healthy vocal tract (healthy control mechanisms included)
- balance between the vocal load and vocal capacity
- Dysphonia: - incomplete vocal folds' closure
  - irregular vocal folds' vibration
  - irregularities in function of the supraglottic structures

Dysphonia classification

- Organic dysphonias

  (inflammations, benign hyperplastic epithelial vocal folds' lesions, trauma, neurologic disorders, cancer)

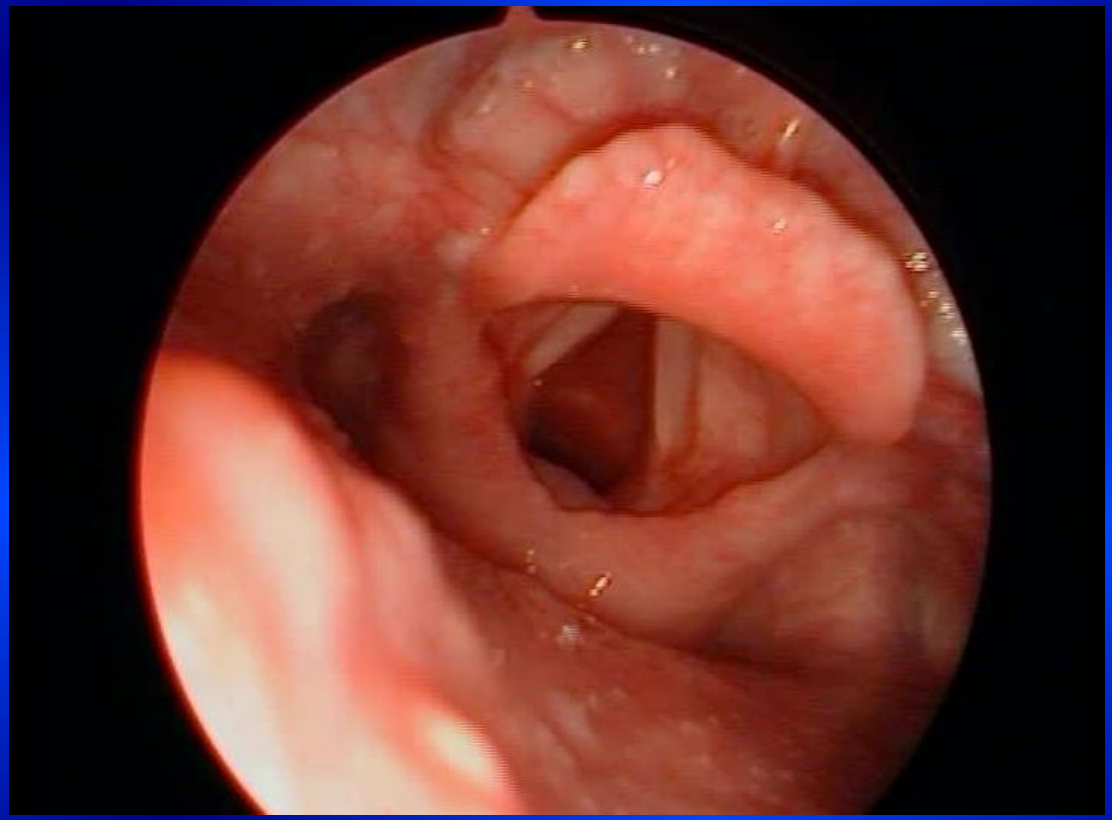
- Functional dysphonias

Organic voice disorders

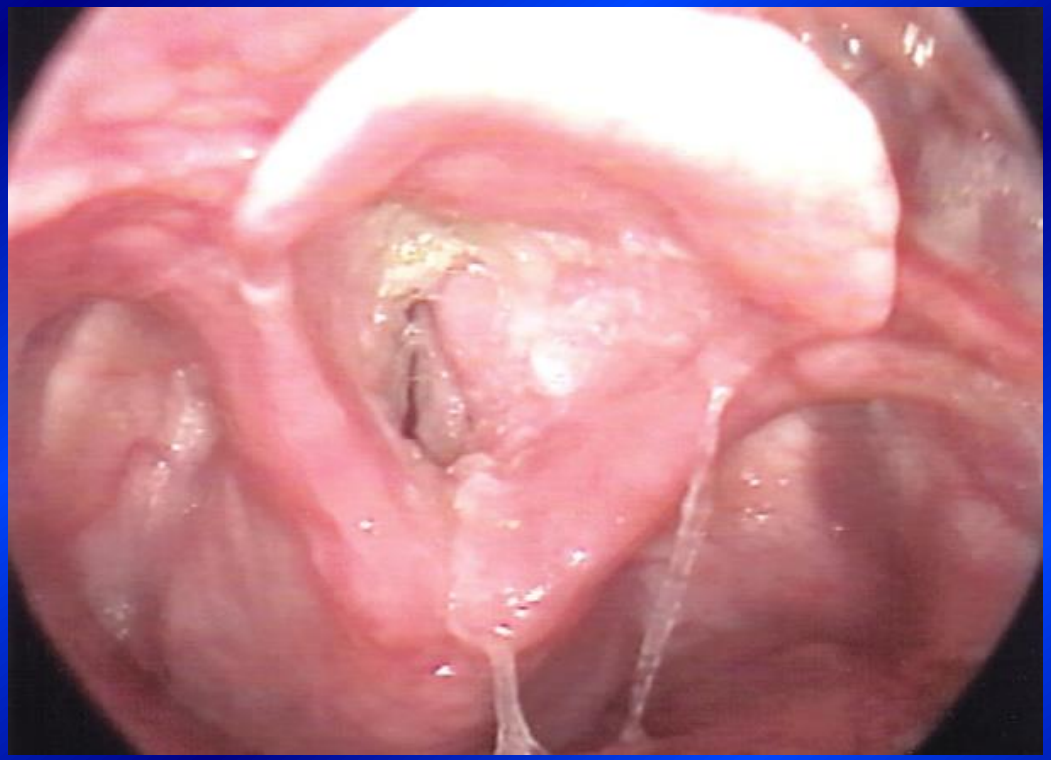
- laryngitis (acute, chronic)
- papillomas
- granuloma
- sulcus vocalis
- trauma
- lesions of laryngeal nerves
- cancer

Organic lesion >>>functional disorder

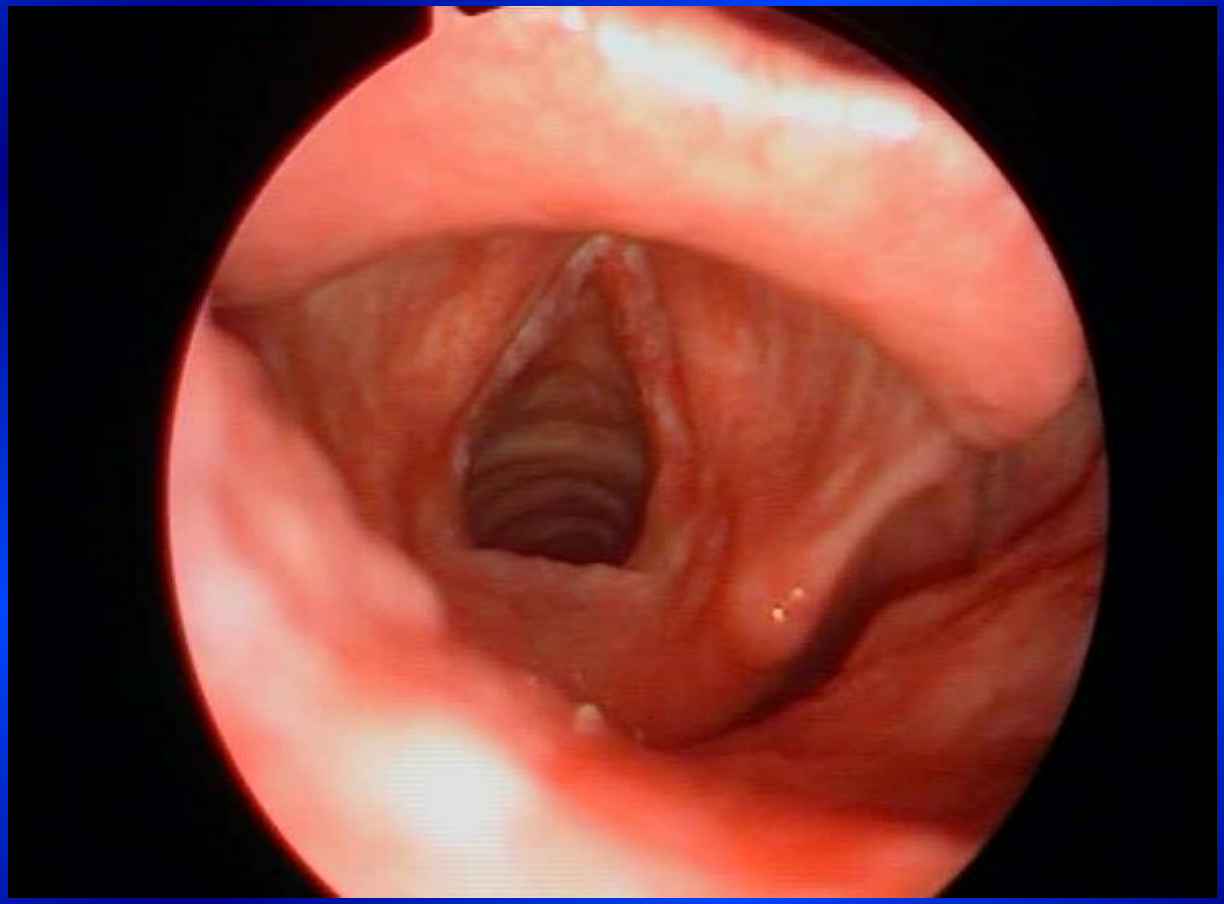
Acute viral laryngitis



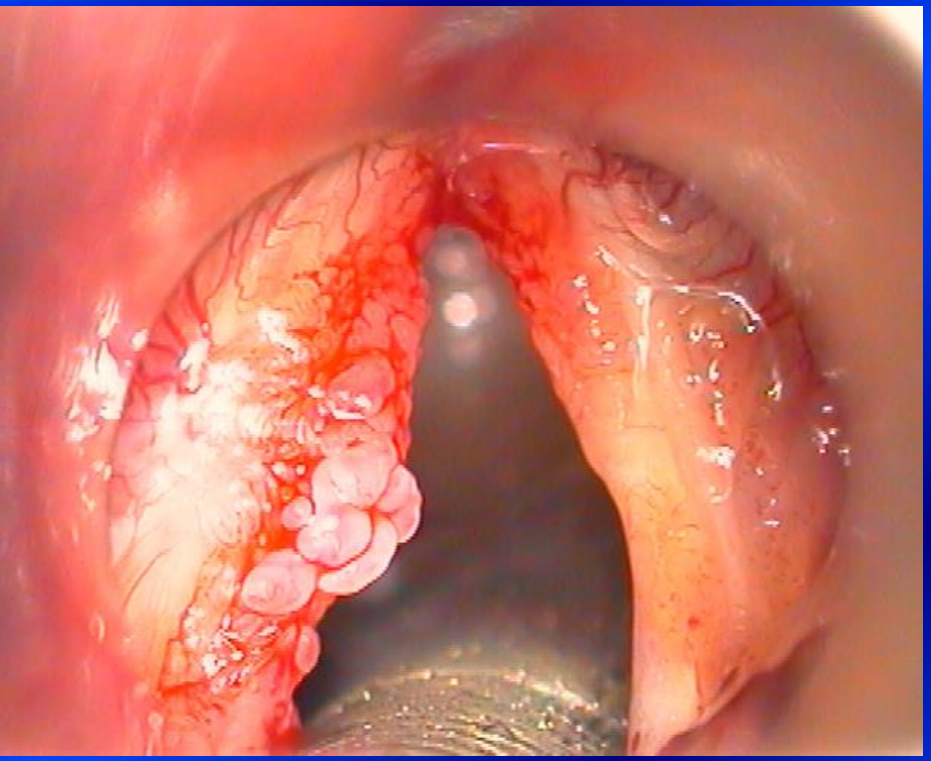
Acute bacterial larygitis

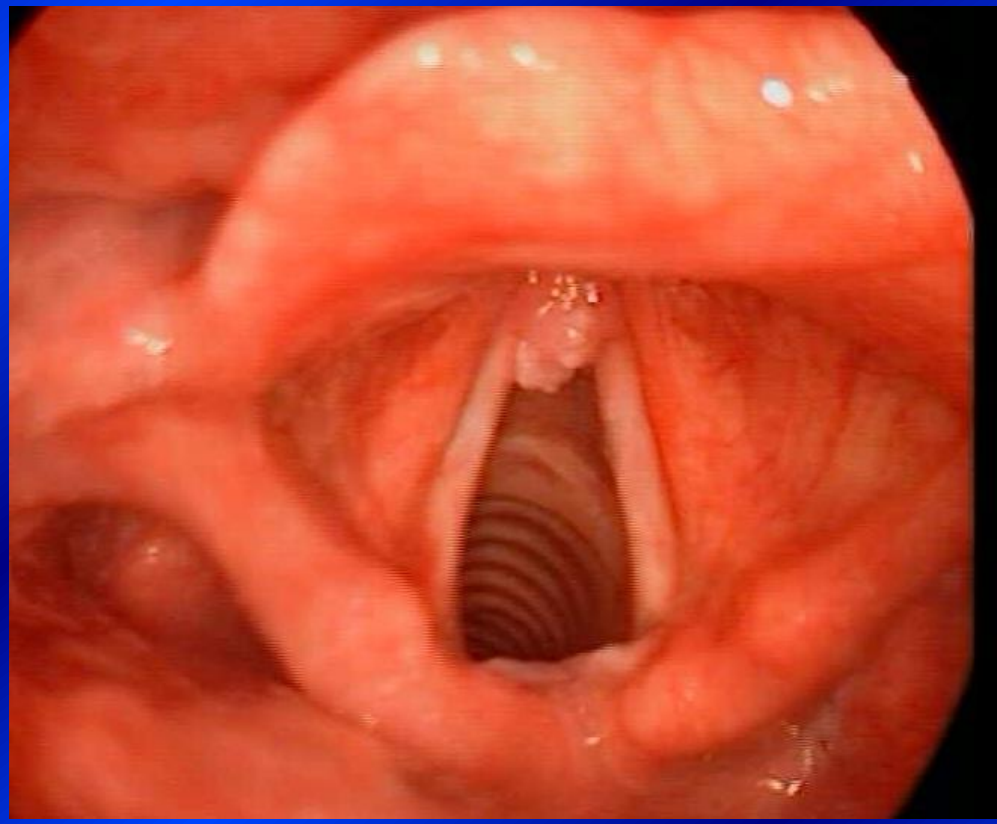


Chronic laryngitis (laryngeal keratosis)

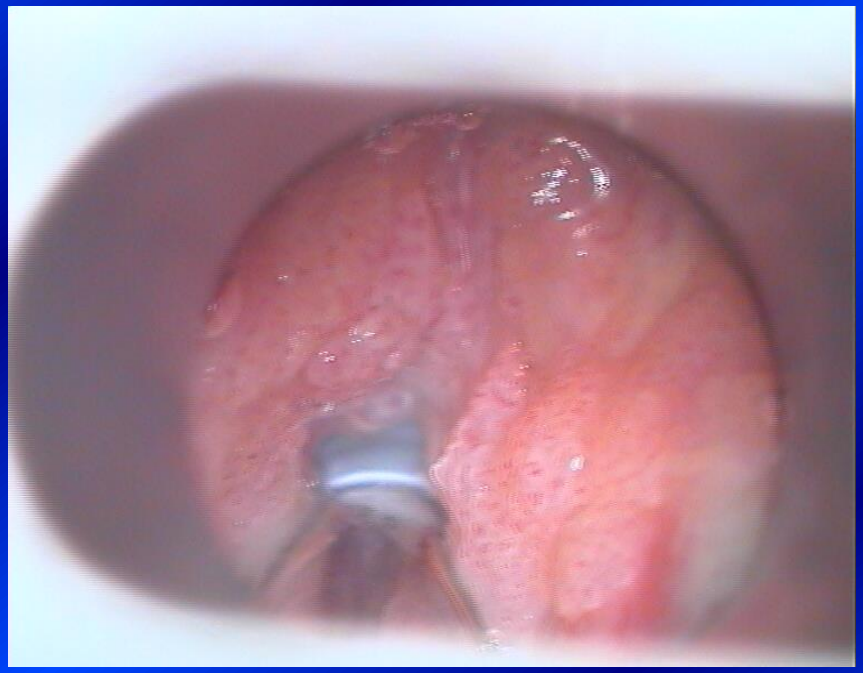


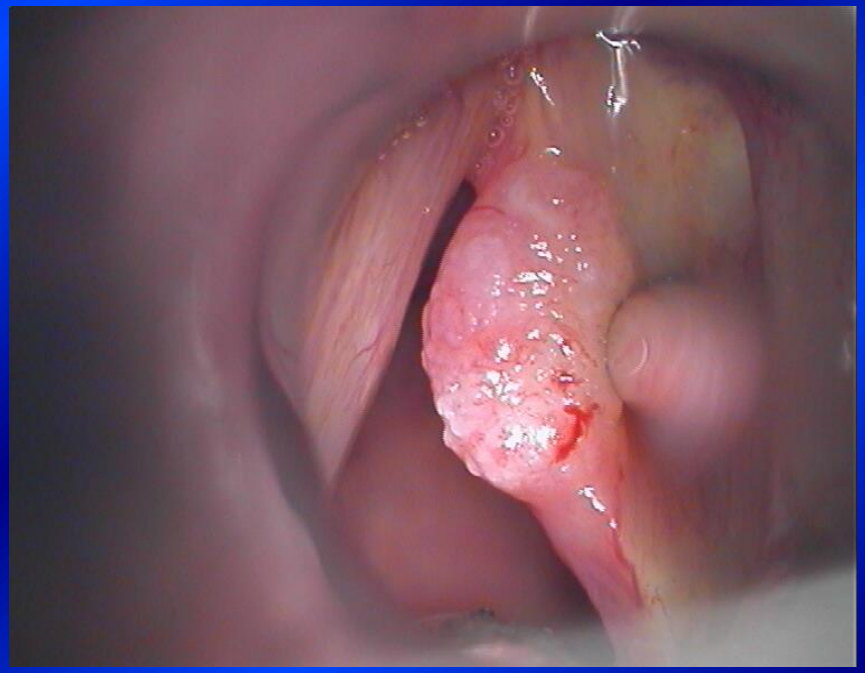
Laryngeal papillomatosis





Laryngeal papillomatosis





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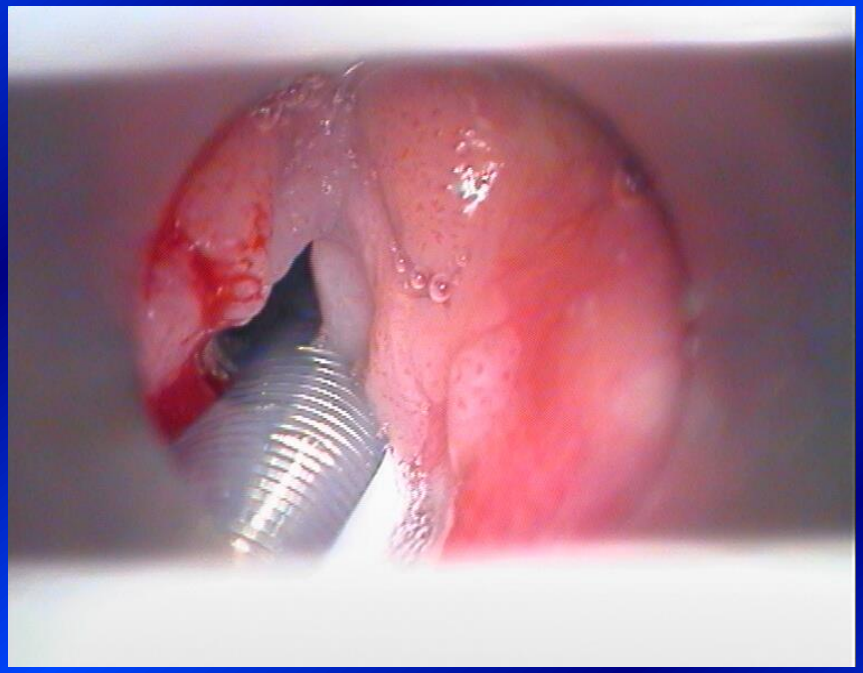
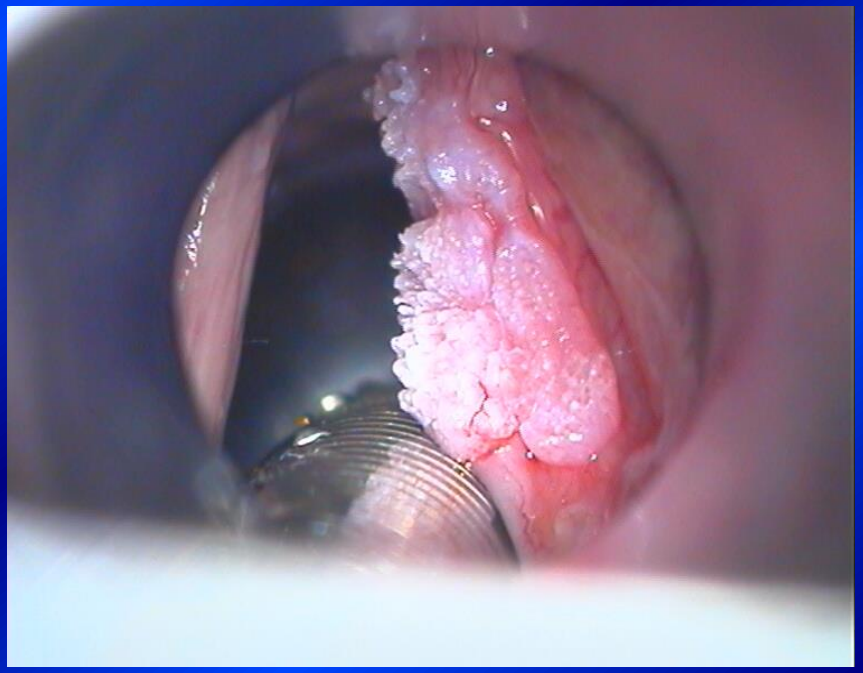
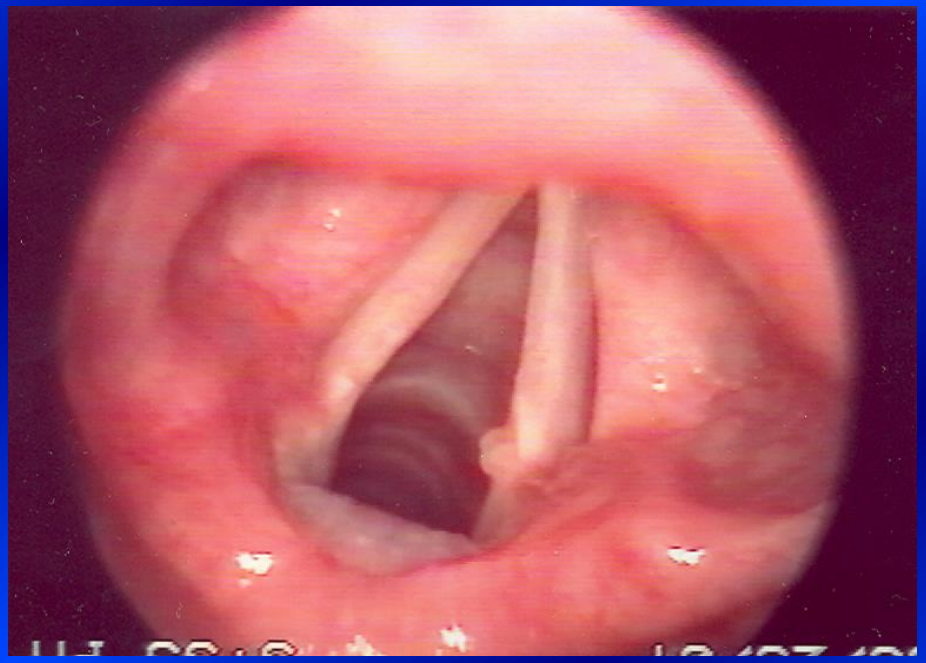
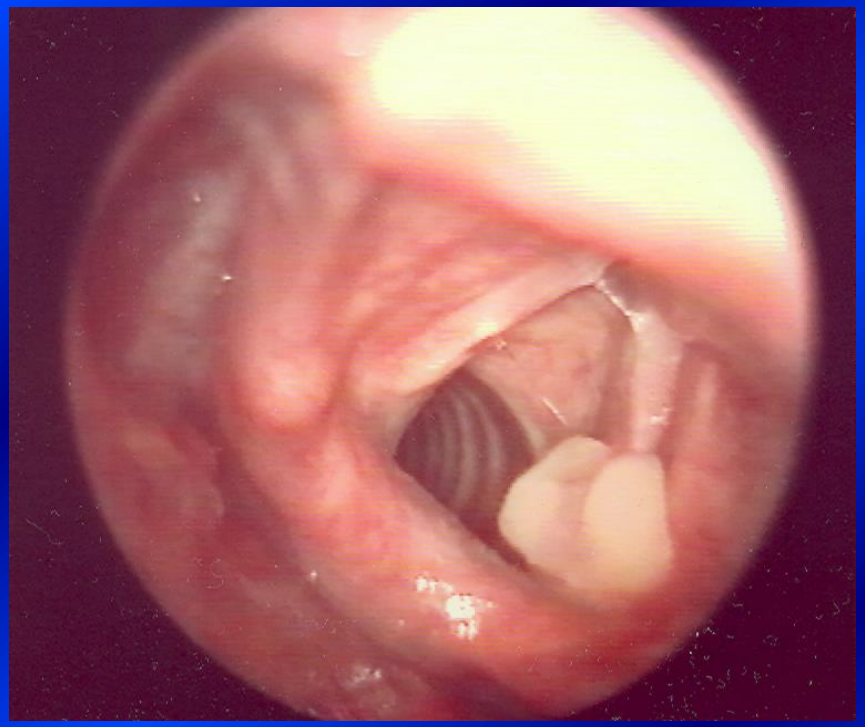


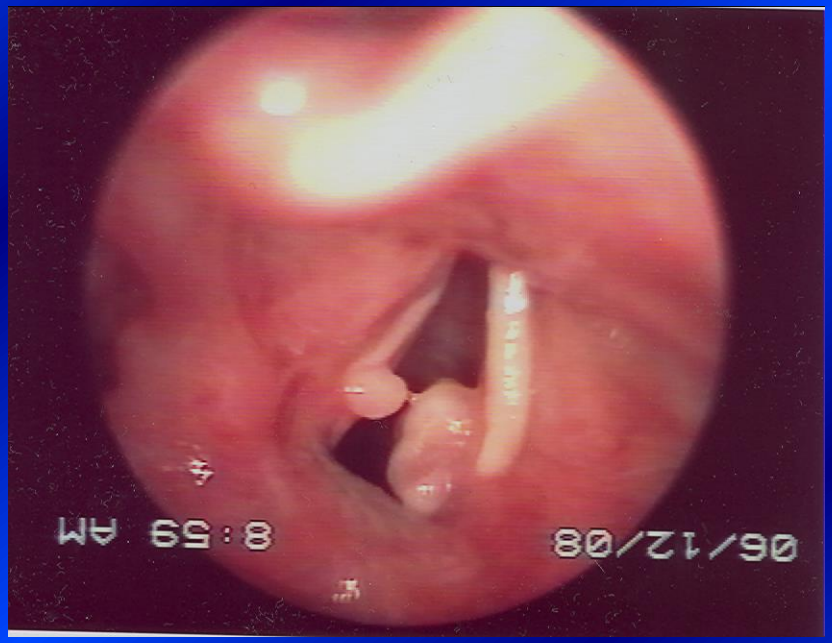


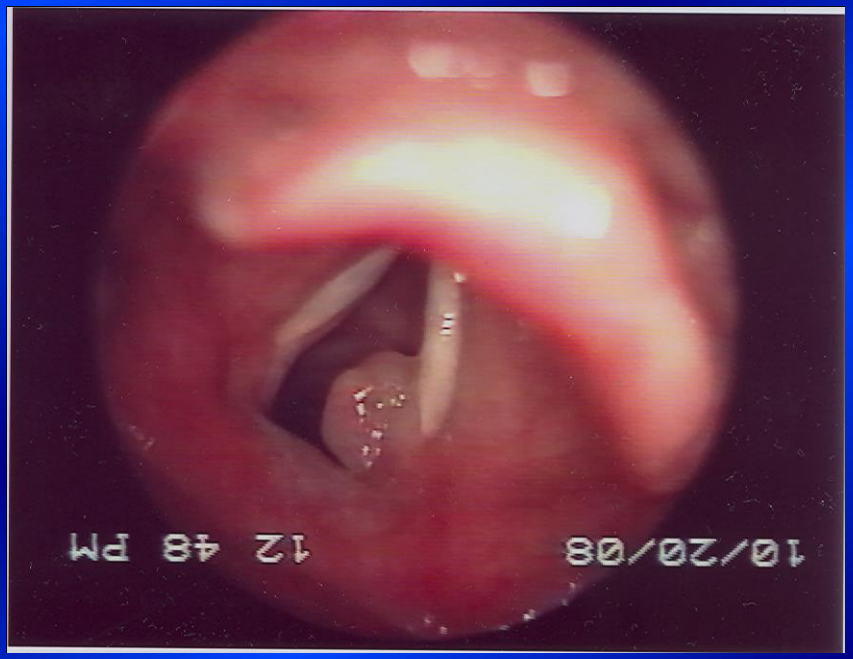
Granuloma



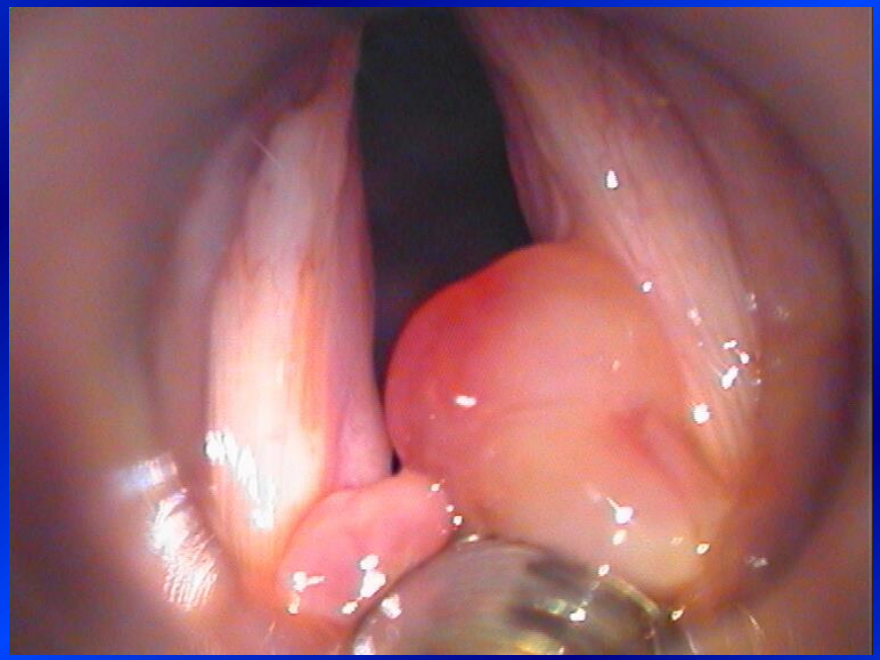


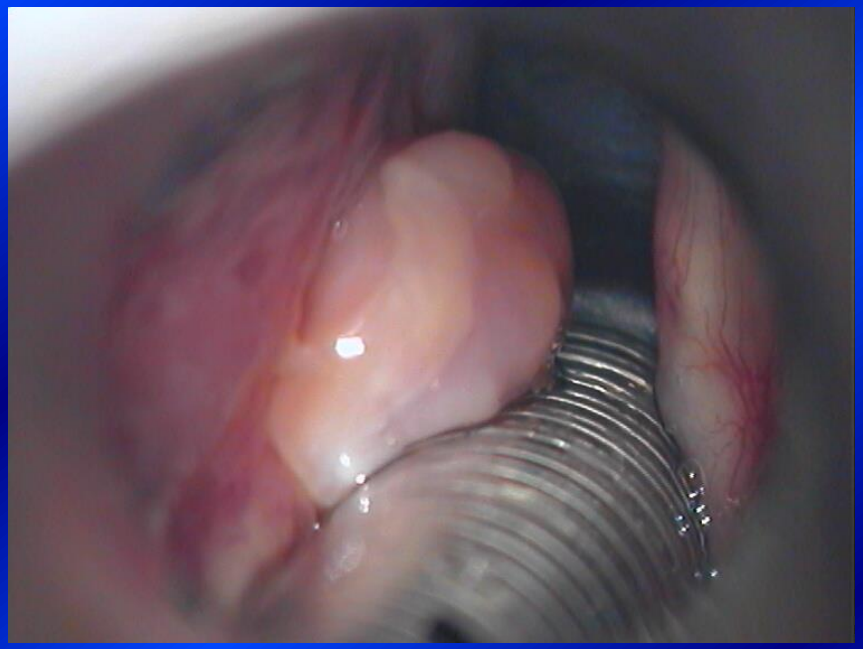
Granuloma



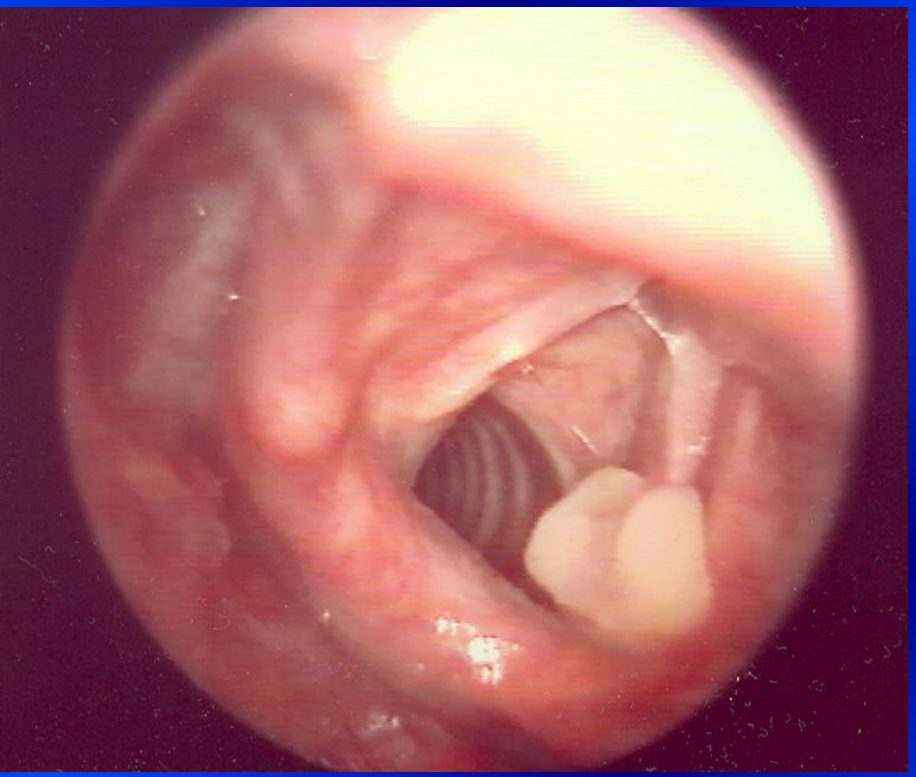


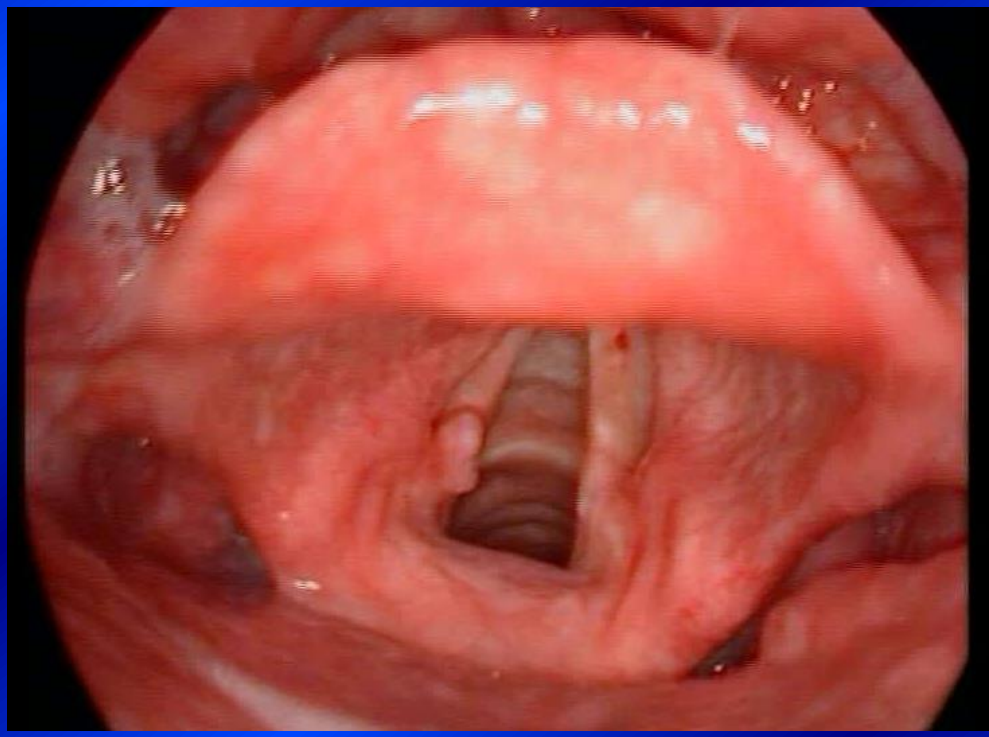
Granuloma



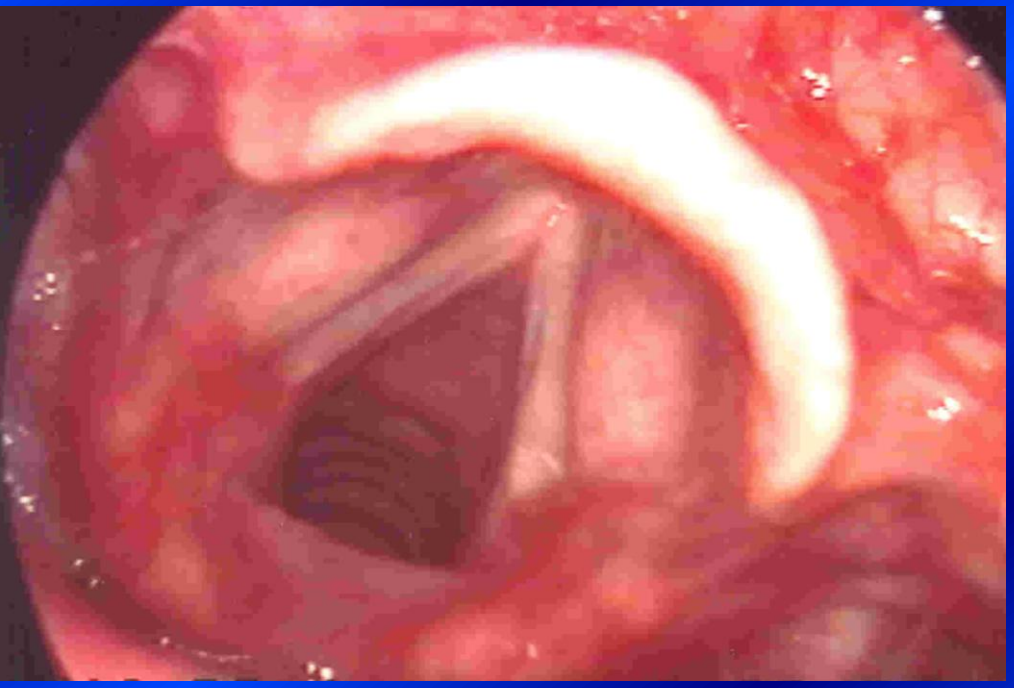


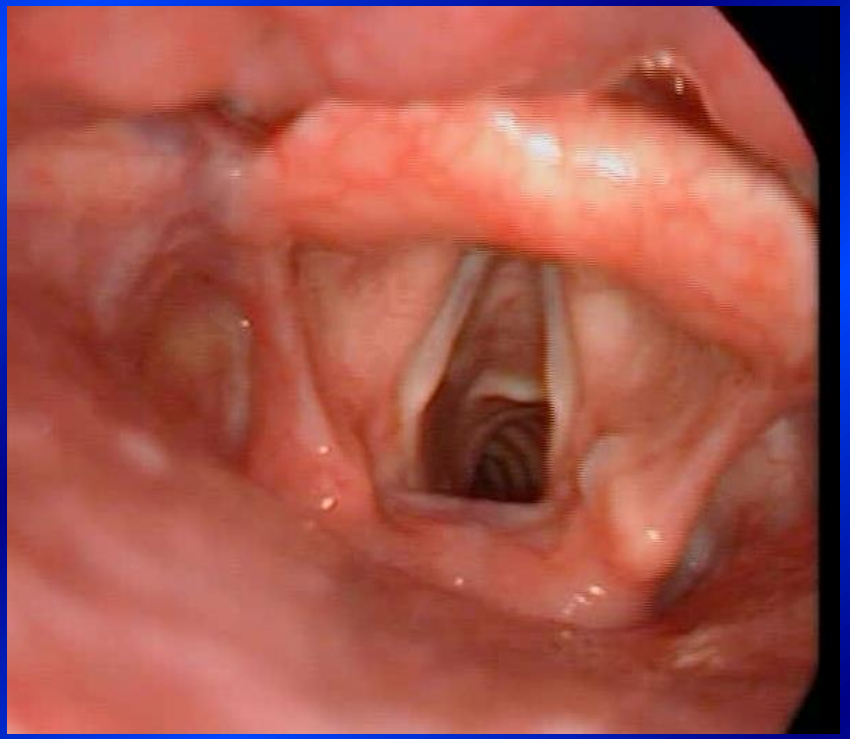
Granuloma



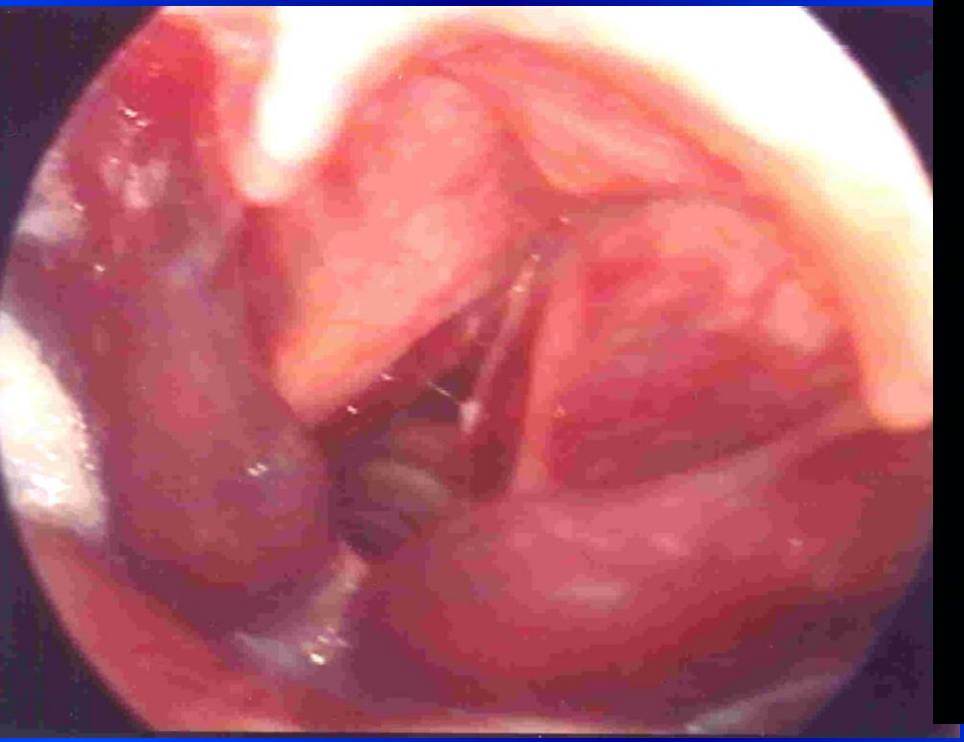


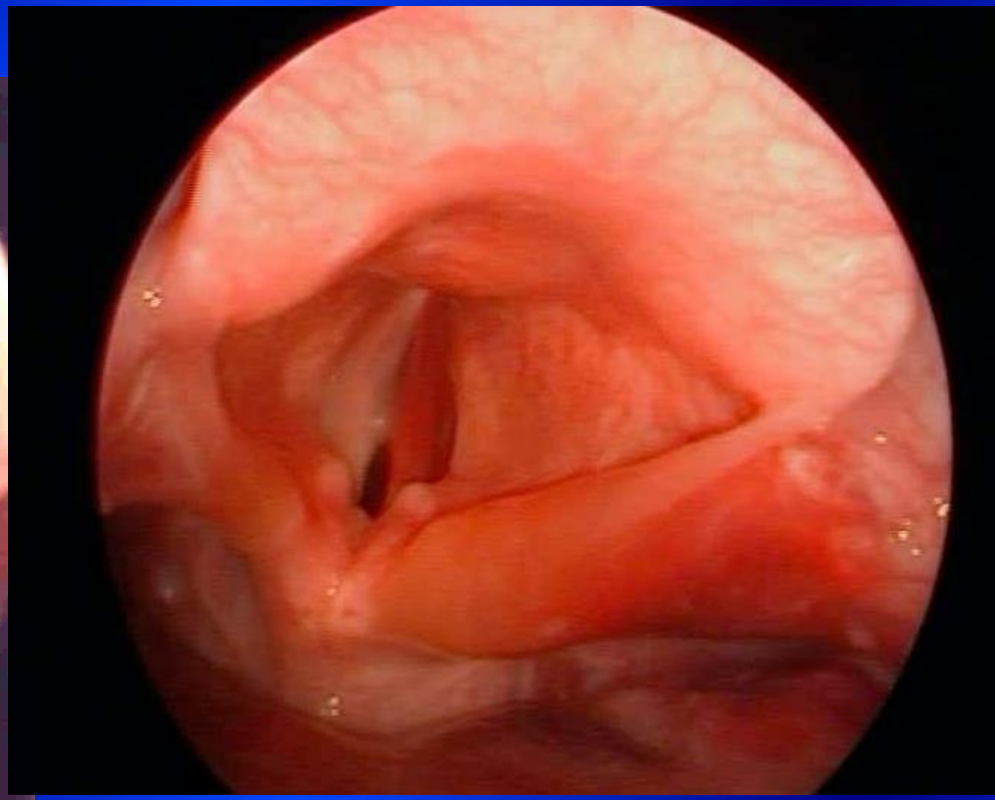
Sulcus vocalis



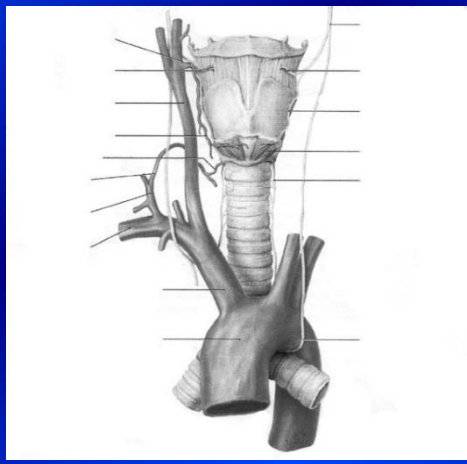


Laryngeal trauma





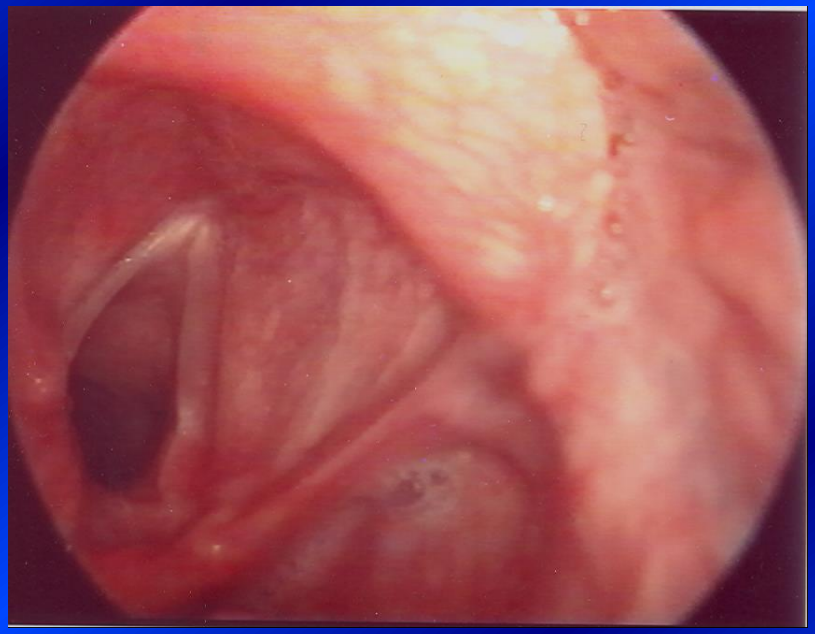
Lesion of laryngeal nerves

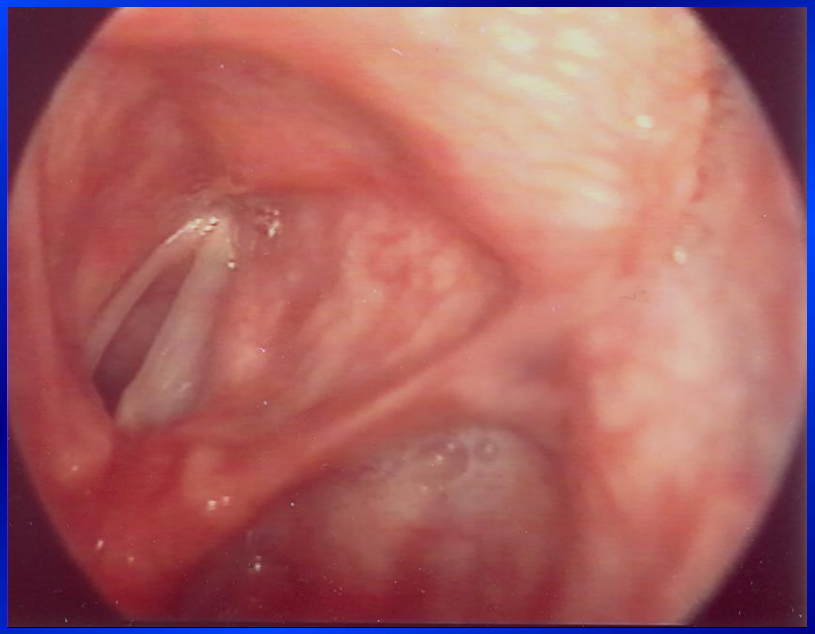


- N. vagus: upper laryngeal nerve
  lower laryngeal nerve (recurrent n.)

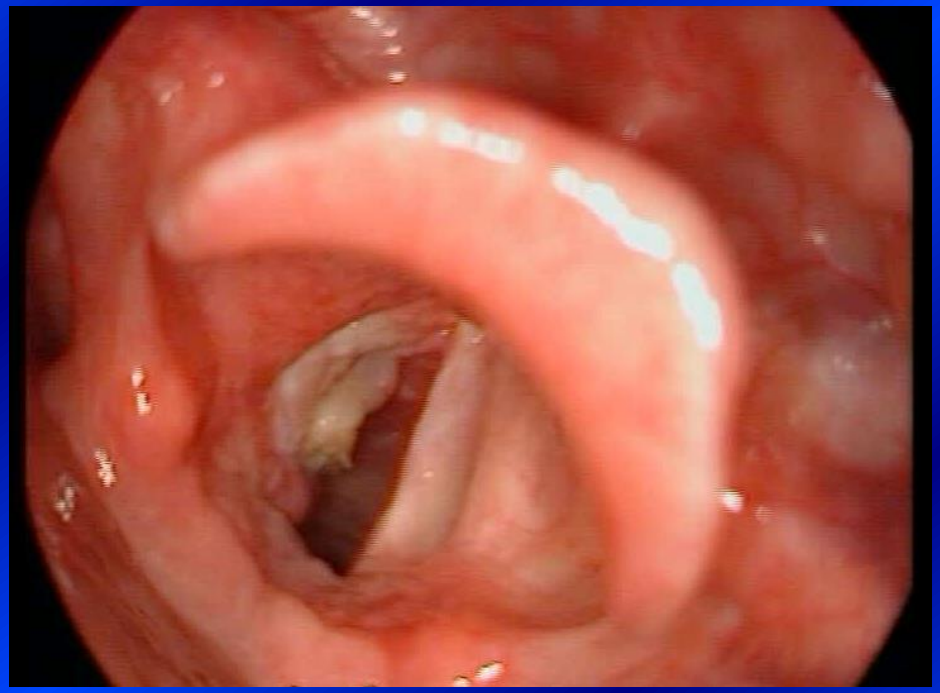
- Causes: - viral neuritis
  - injury during surgical procedures on thyroid gland, oesophagus, lungs
  - injury during diagnostic procedures close to the nerve
  - cancer or serious inflammation of the thyroid gland, lungs, oesophagus, larynx, hypopharynx

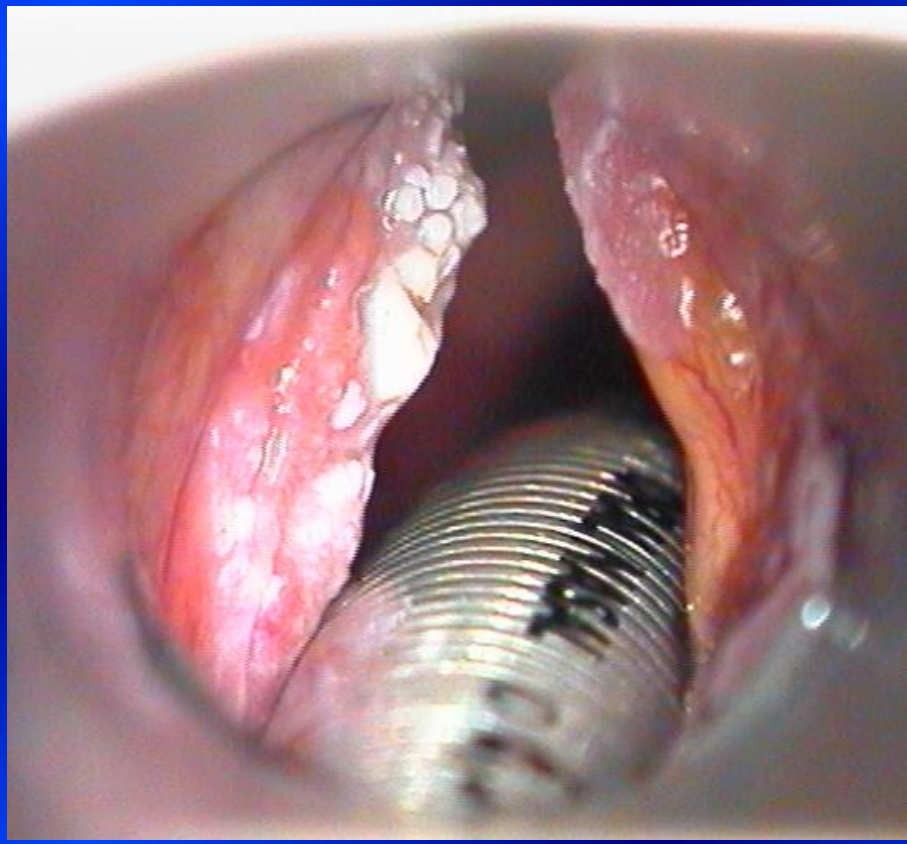
Unilateral paralysis of n. laryngeus recurrens





Laryngeal cancer

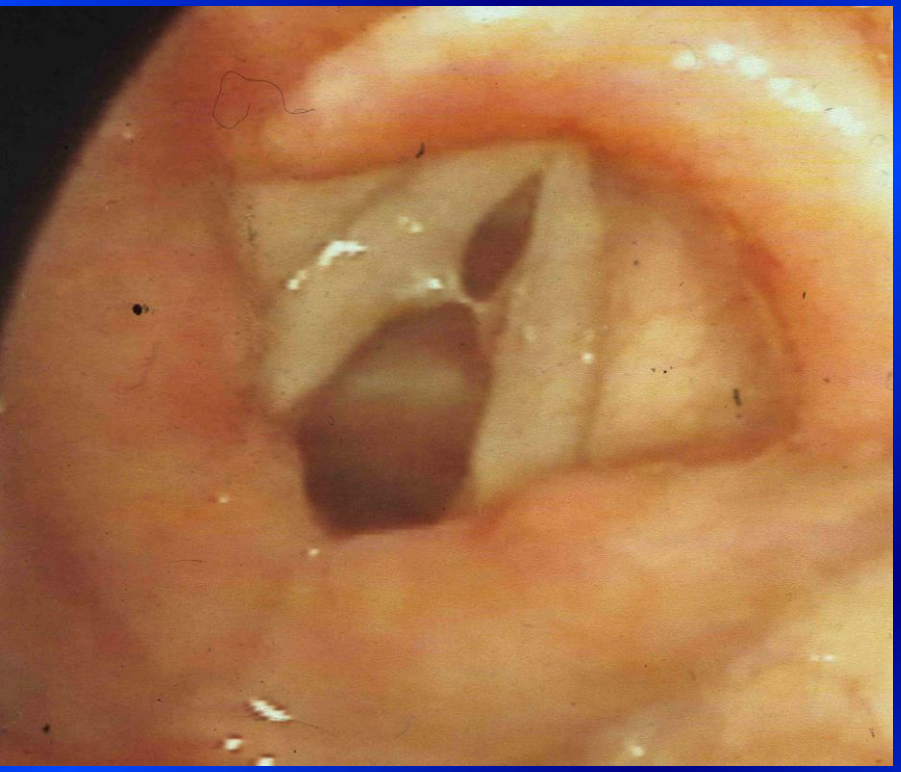


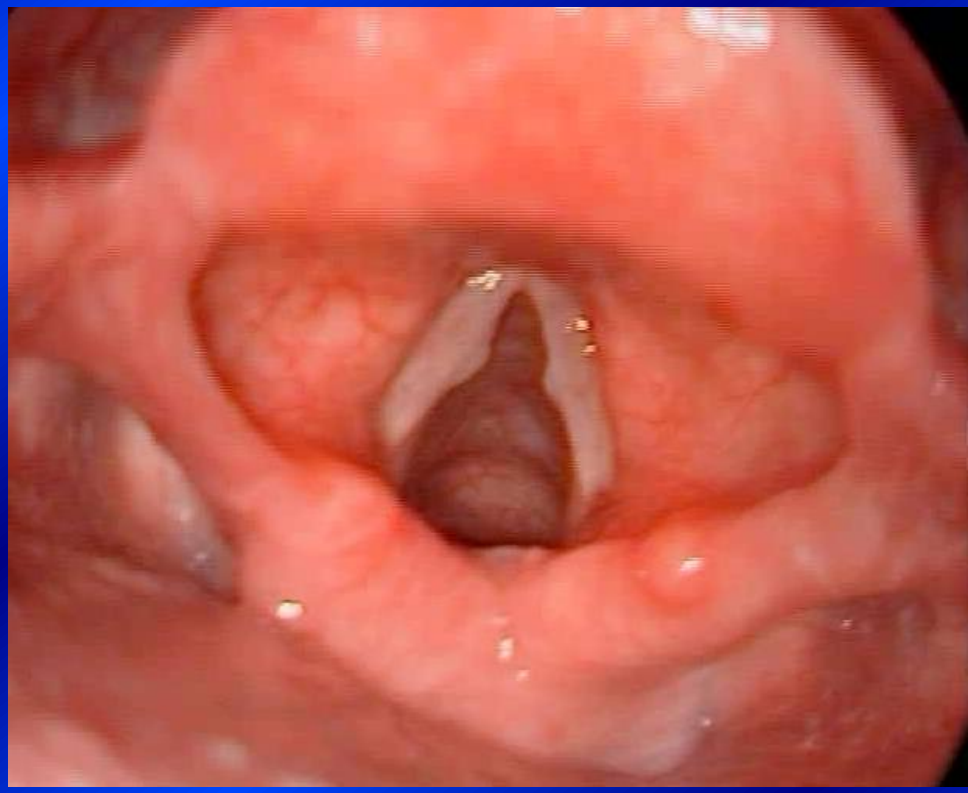


Functional >> organic voice disorder

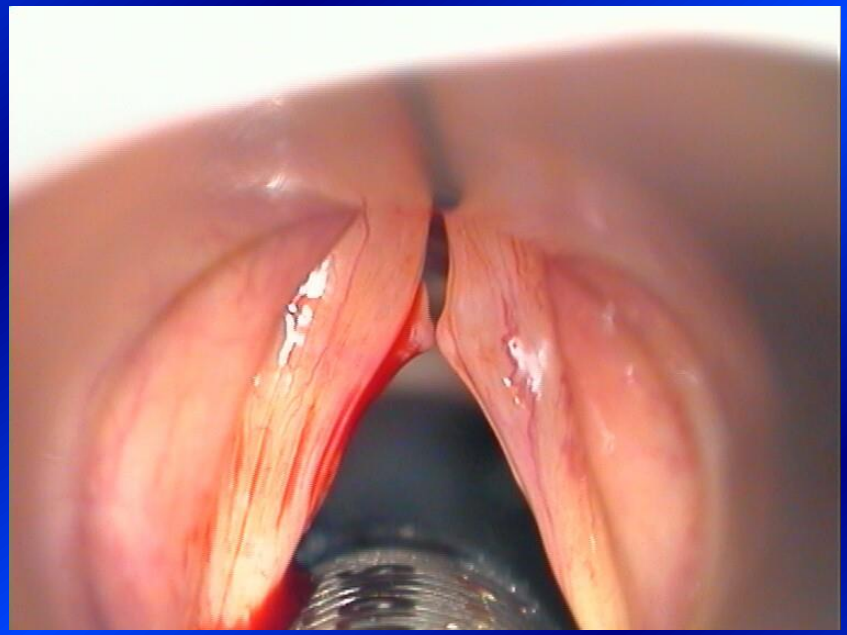
- nodules
- polyp
- cyst
- Reinke’s oedema
- contact ulcer
- hematoma

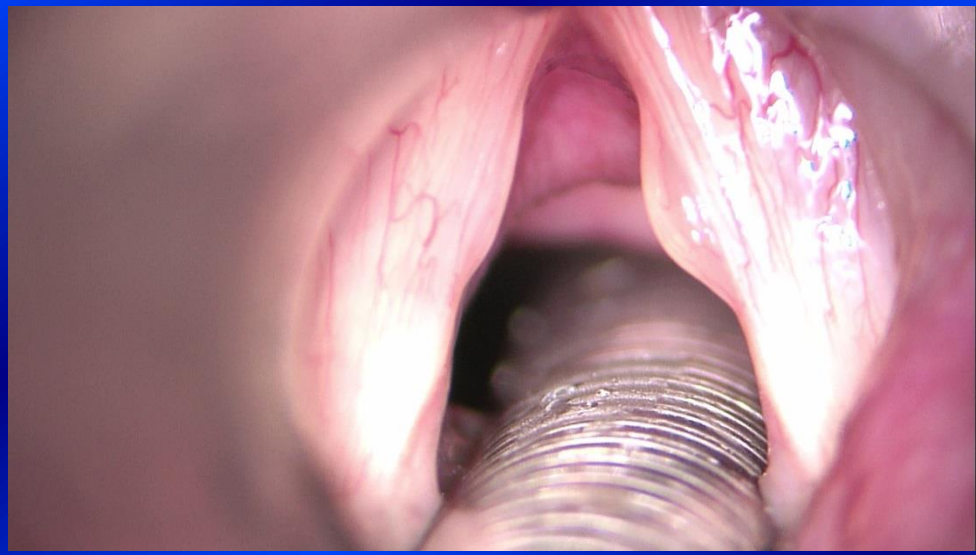
Vocal folds‘ nodules



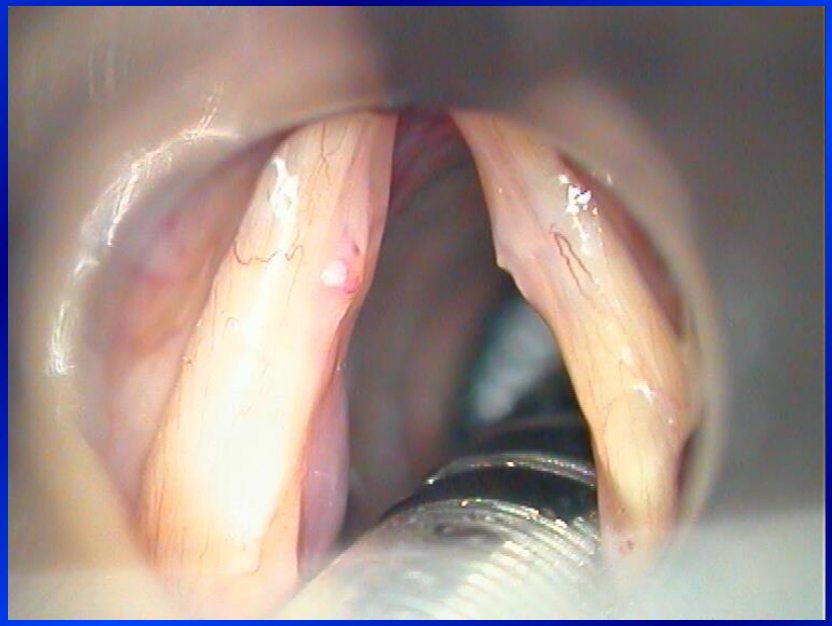


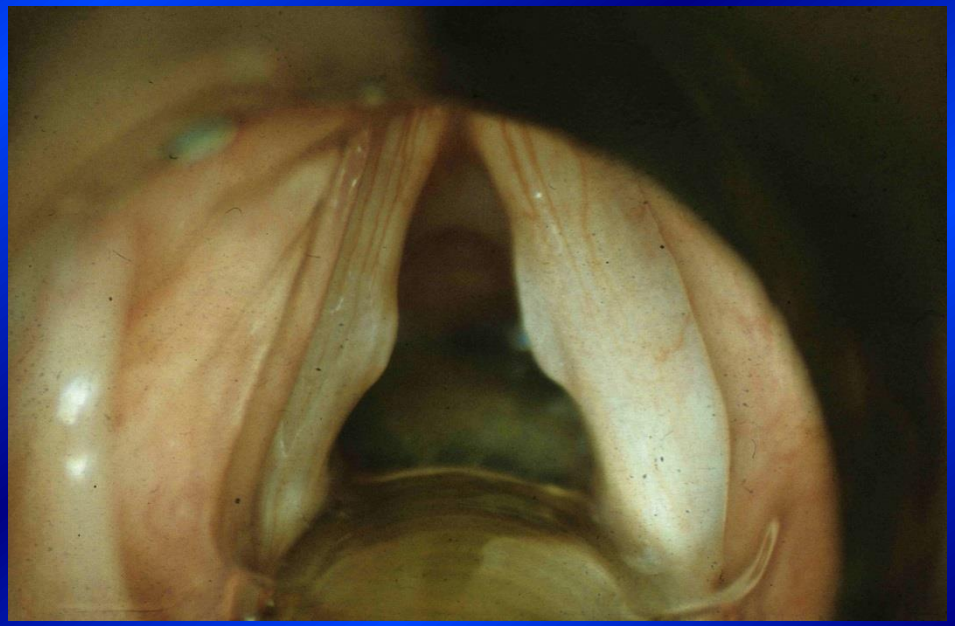
Vocal folds‘ nodules



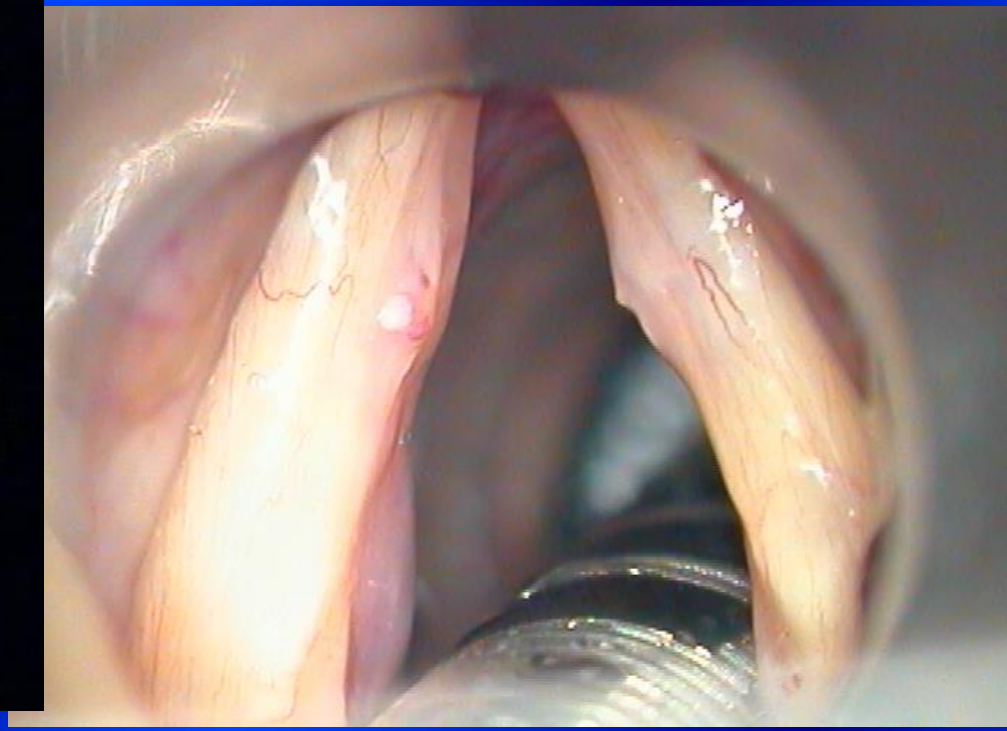


Vocal folds‘ nodules





Vocal folds‘ nodules

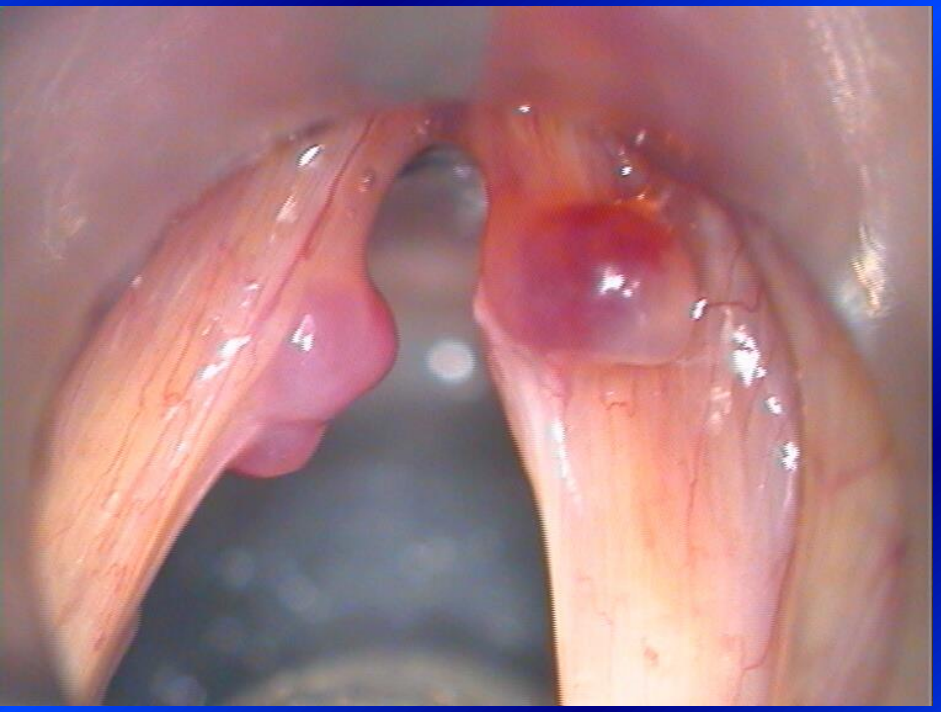


Etiological factors for vocal folds' nodules

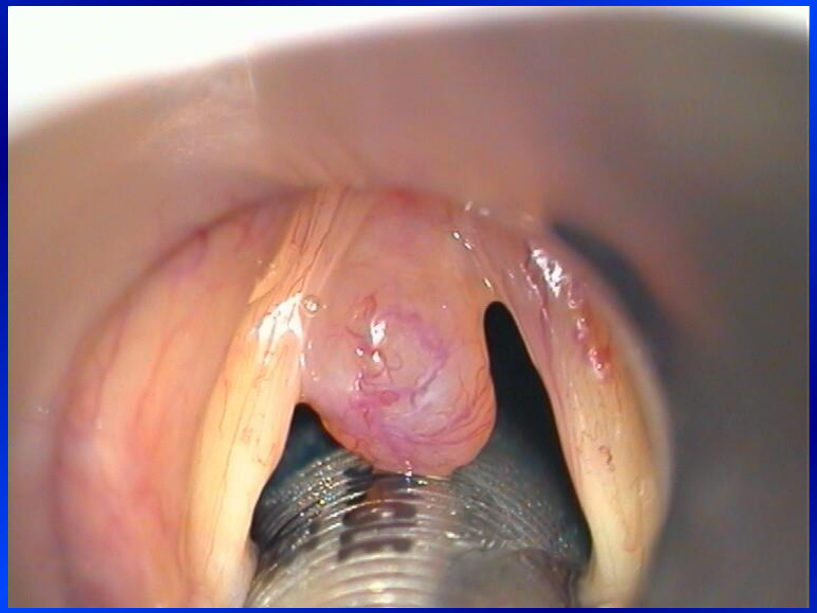
- gender (frequency of vocal folds' vibration)
- quantity of hialuronic acid in lamina propria of the vocal folds' mucosa
- genetic reasons – "anchoring colagen fibers" between the basal membrane and lamina propria

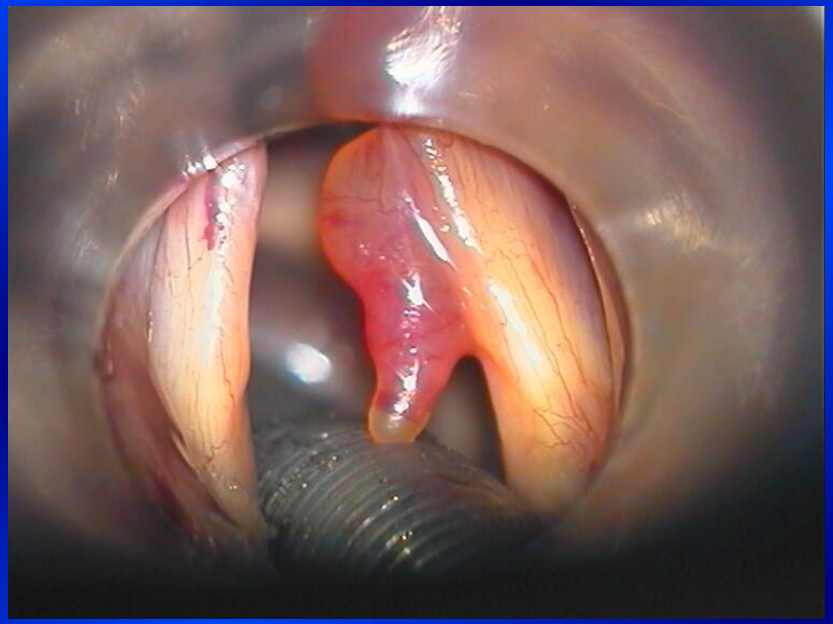
Polyp

Polyp

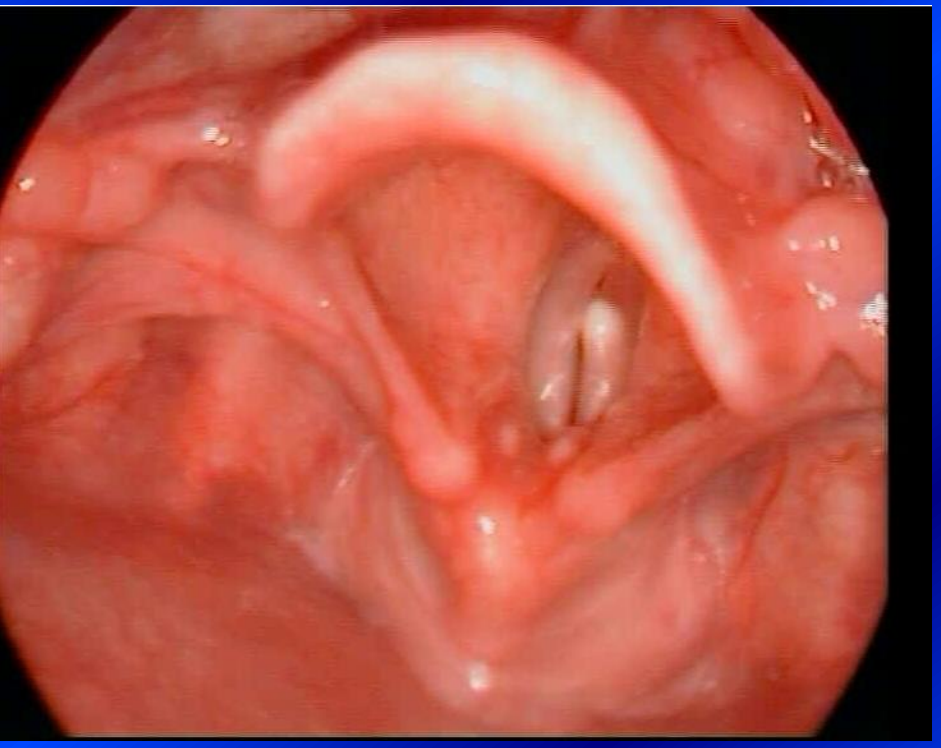


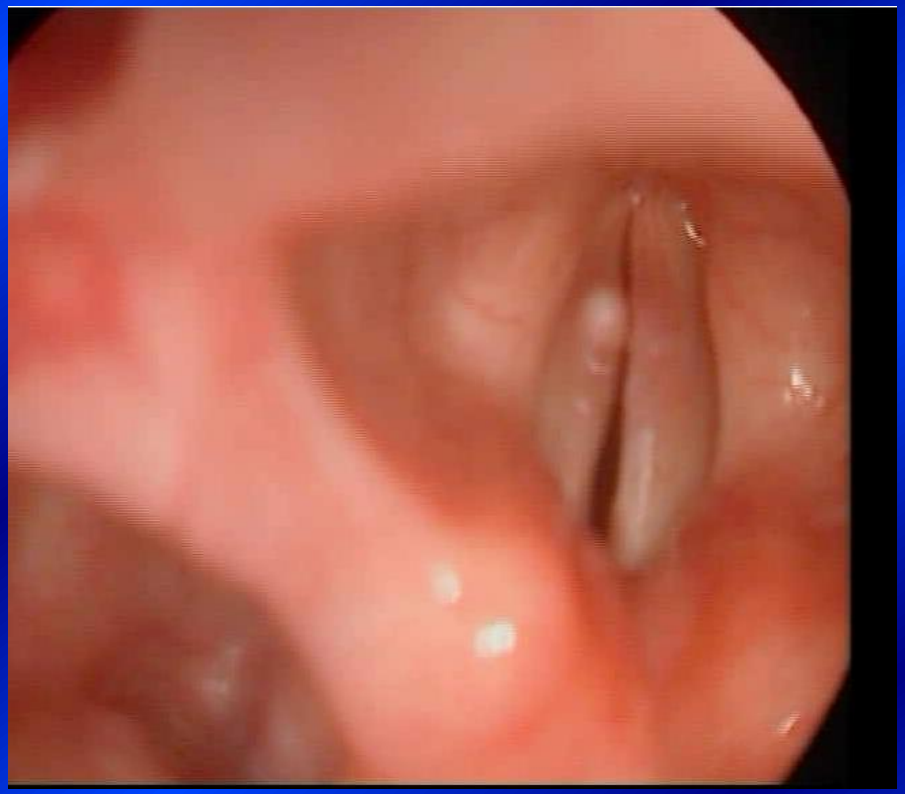
Polyp



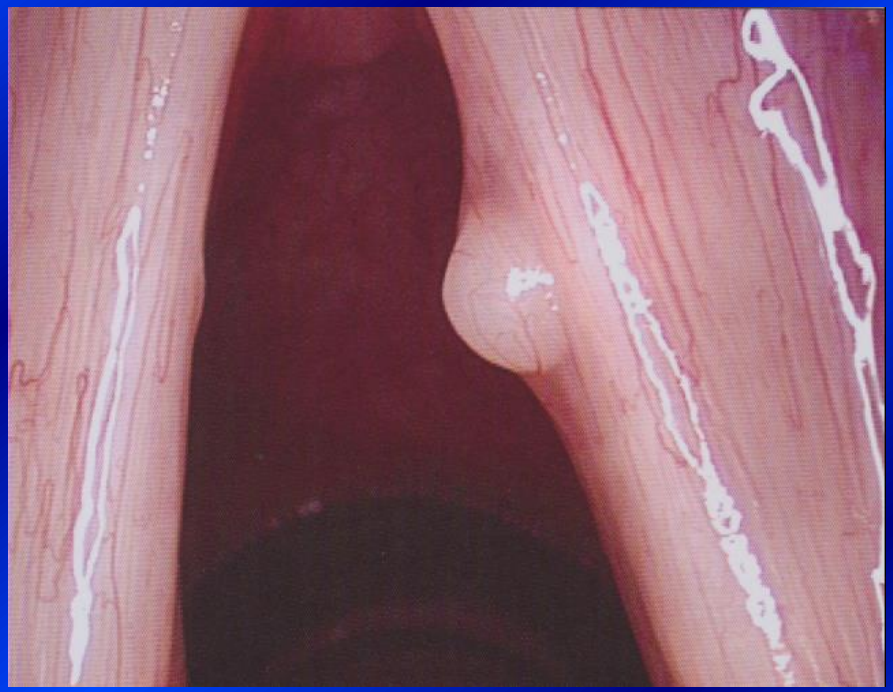


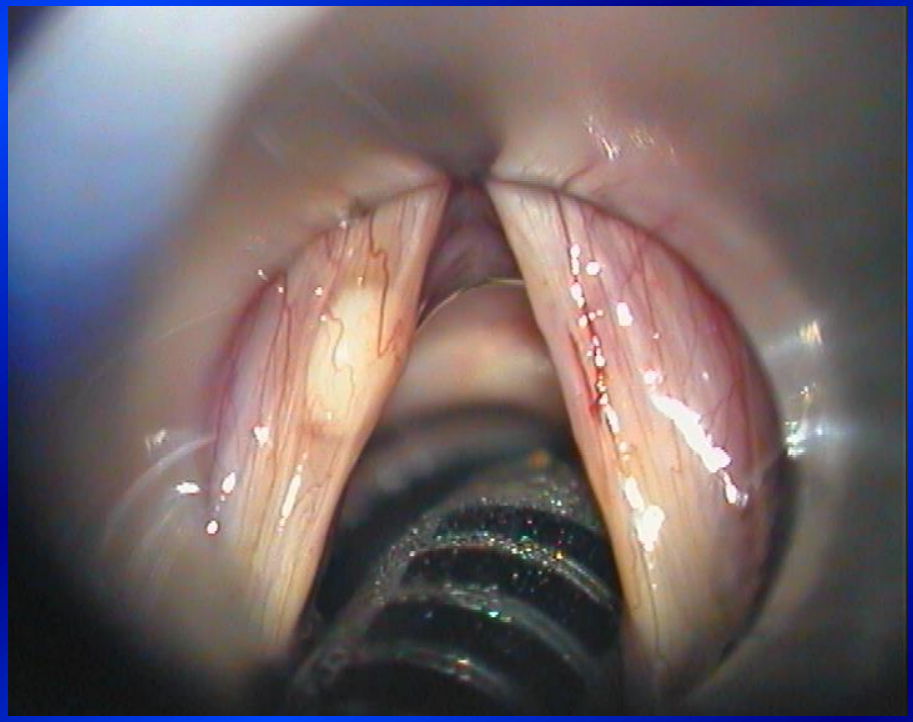
Cyst



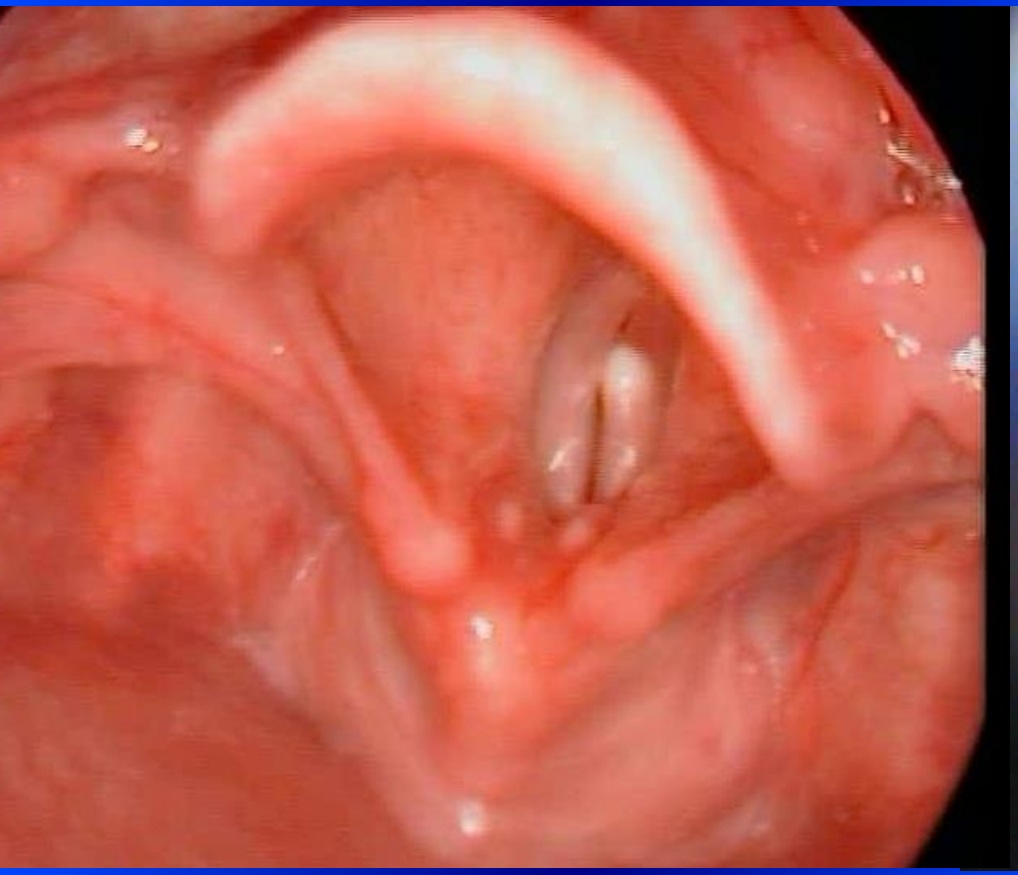


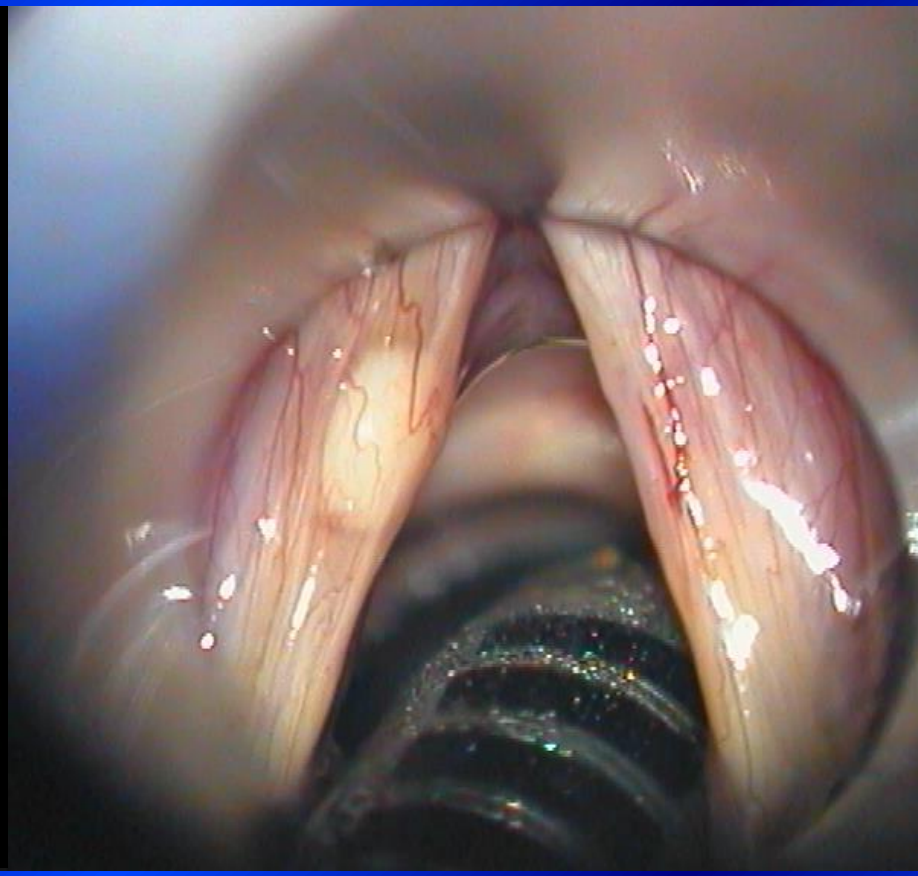
Cyst



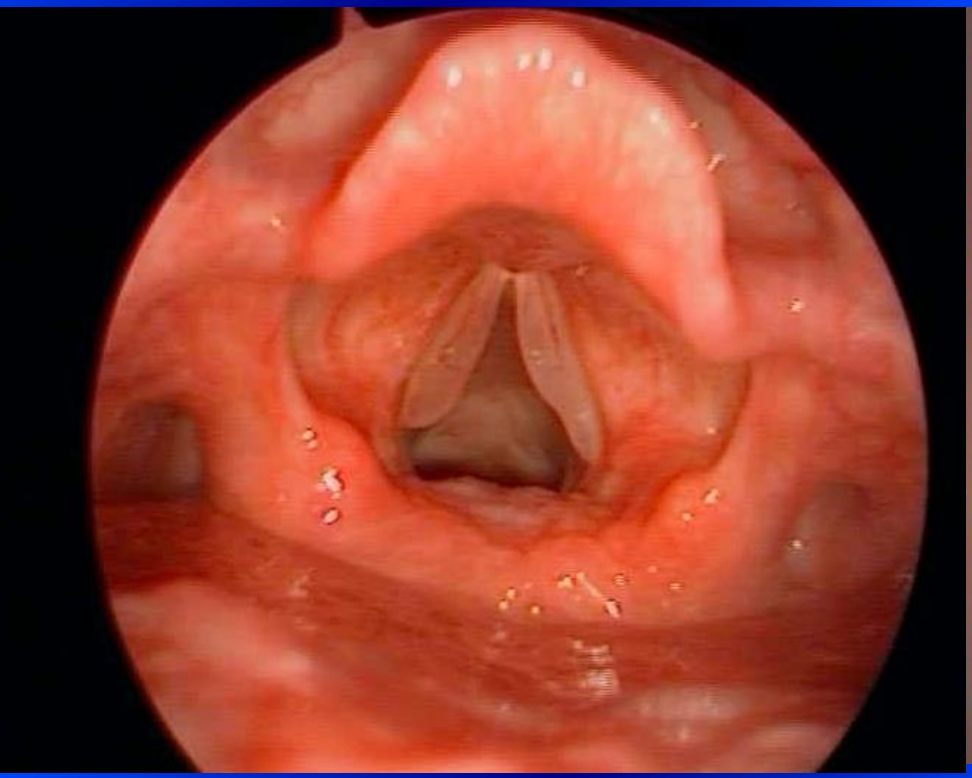


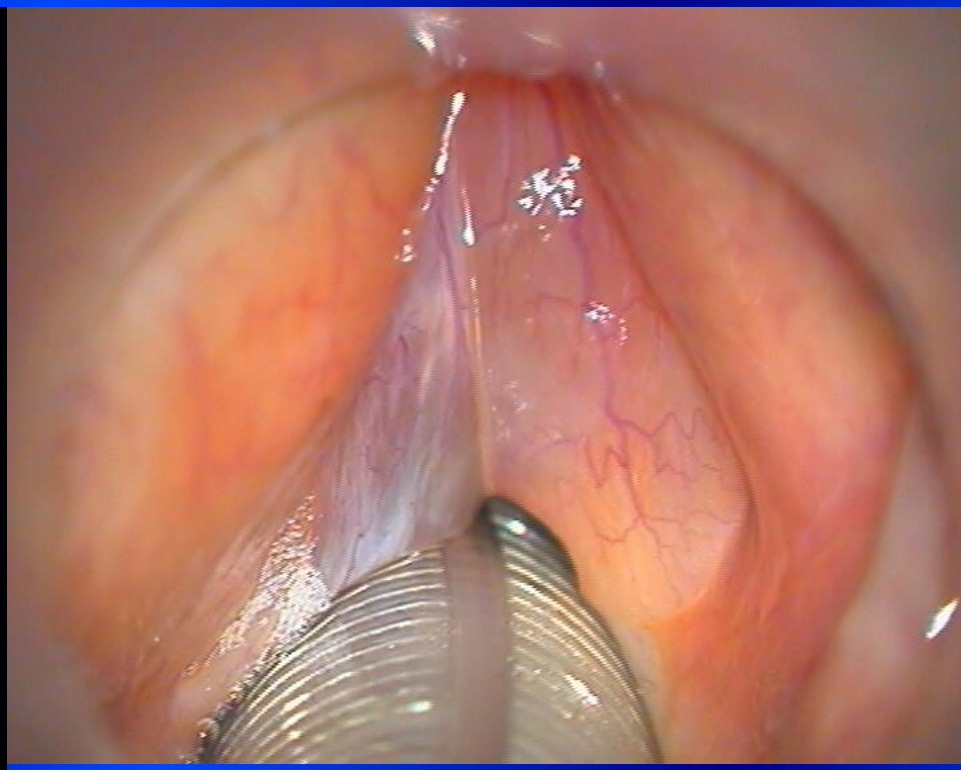
Cyst





Reinke's oedema





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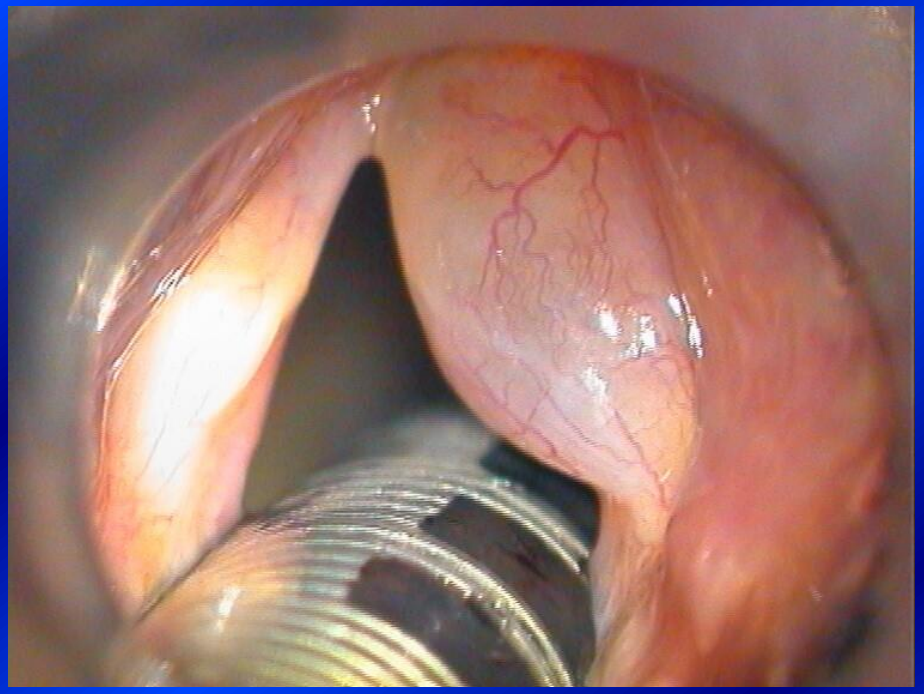
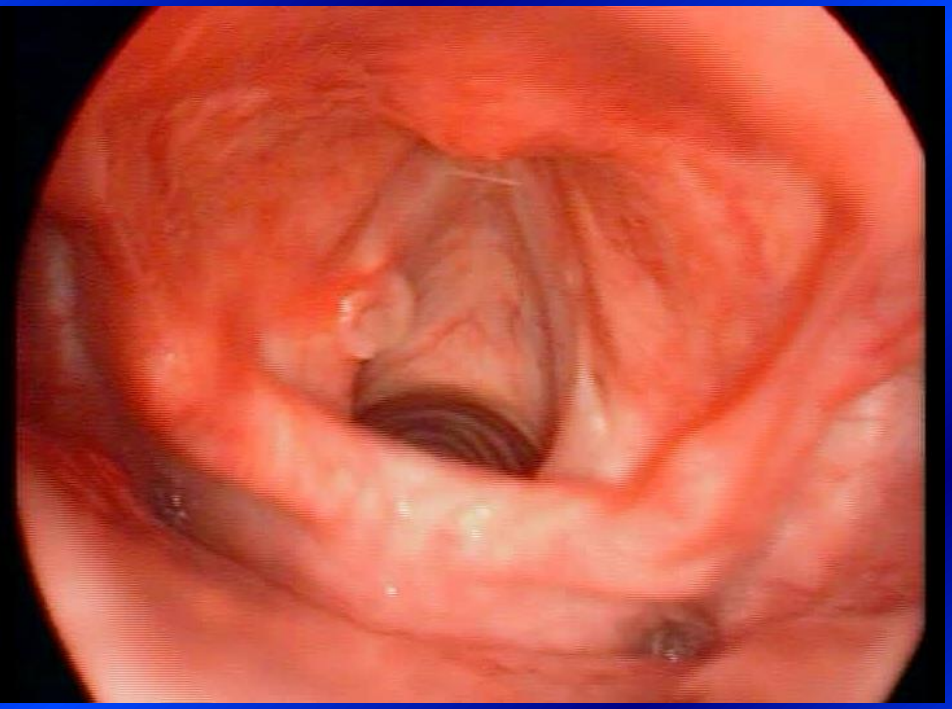
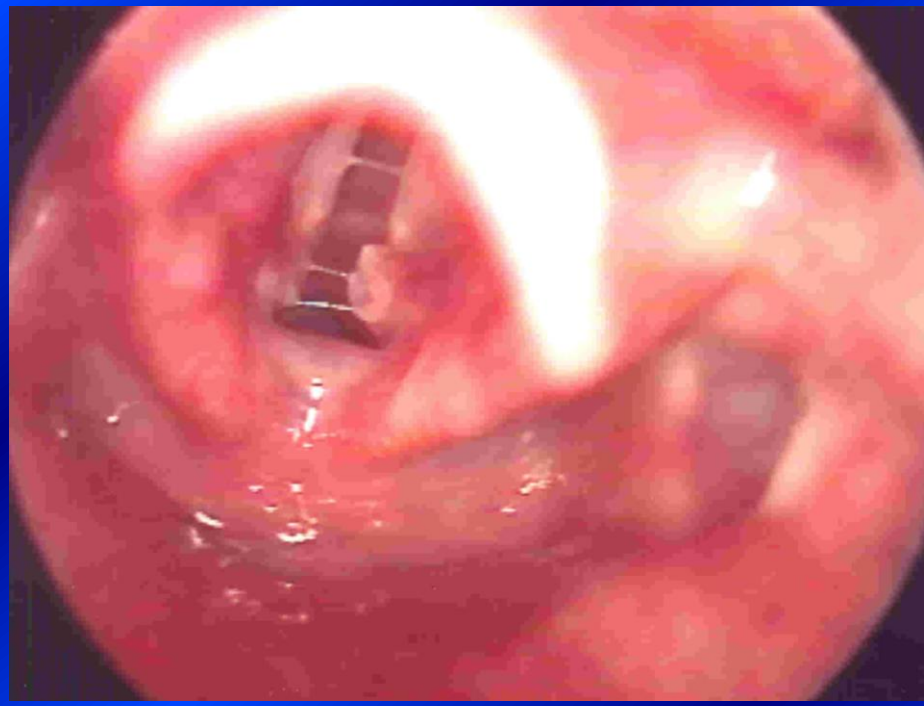
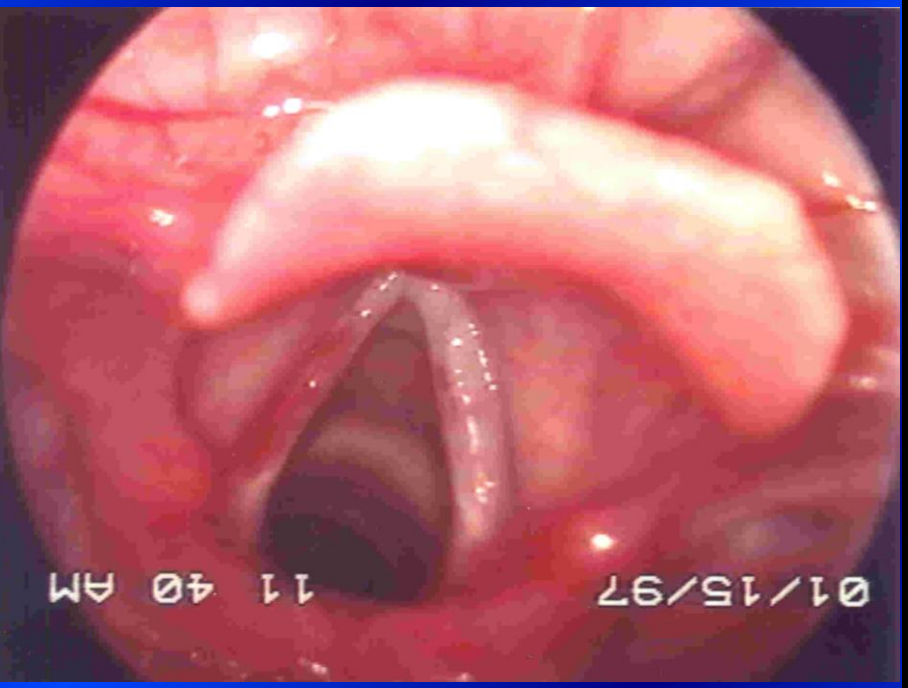


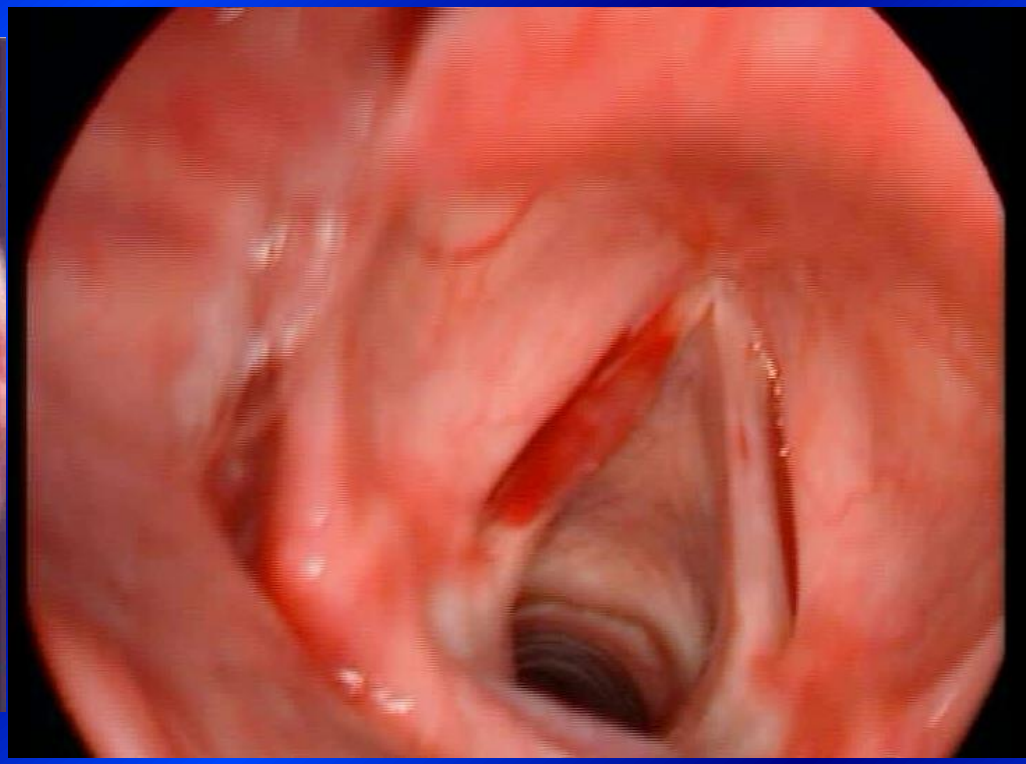
Contact ulcer





Hematoma





Classification of functional dysphonia

- Old classifications: hyperfunctional, hypofunctional
  hyperkinetic, hypokinetic
  phonoponosis, phononeurosis, mixed forms

- “muscle misuse voice disorders”
- muscle tension dysphonia

- primary, secundary

- abnormal activity of phonatory muscles

Muscle tension dysphonia

Phonation and modeling of voice - 100 different muscles:

- improper technique (“misuse”)
- proper technique but excessive vocal load (“overuse”)
- improper and excessive voice use (“abuse”)

Disordered coordination between breathing, phonation and articulation

Influencing factors

- increase tension of phonatory and articulation muscles
- cause sweling of respiratory tract mucosa
- increase vocal folds load

Diseases and factors influencing phonation

- infections (viral, bacterial, mycotic)
- unfavourable microclimate at workplace or at home (irritants, chalk, inappropriate humidity and temperature of air)
- inappropriate acoustic conditions at home or at working place
- harmful habits
- allergy (typ I. and III.)

Diseases and factors influencing phonation

- medicaments (antihypertensives, oral steroid sprays, antihistaminics, hormons, …)
- thyroid dysfunction and other hormonal disorders
- gastroesophageal reflux
- dysfunction of neck spine
- autoimmune salivary glands diseases

Diseases and factors influencing phonation

- stress – tension of phonatory muscles
- patient's environment
- patient's personal characteristics
  (intro – extroverted, neurotic patients)

Symptoms and signs

- hoarseness
- too high or too low pitch
- voice breaks
- vocal fatigue
- tension and pain in the neck
- lump in the throat
- weak voice
- aphonia

Diagnostic procedures

Team approach: phoniatrician, speech pathologist, psychologist, singing teacher,…

- history, phoniatric examination, hearing test
- videoendostroboscopy, fiberoptic endoscopy
- (electroglottography)

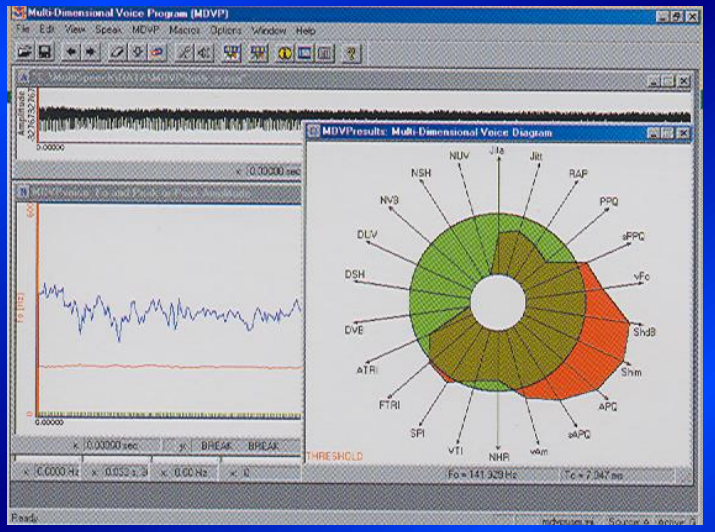
Diagnostic procedures

- aerodynamic examinations

- EMG of phonatory muscles
- subjective voice assessment (GRB)

Diagnostic procedures

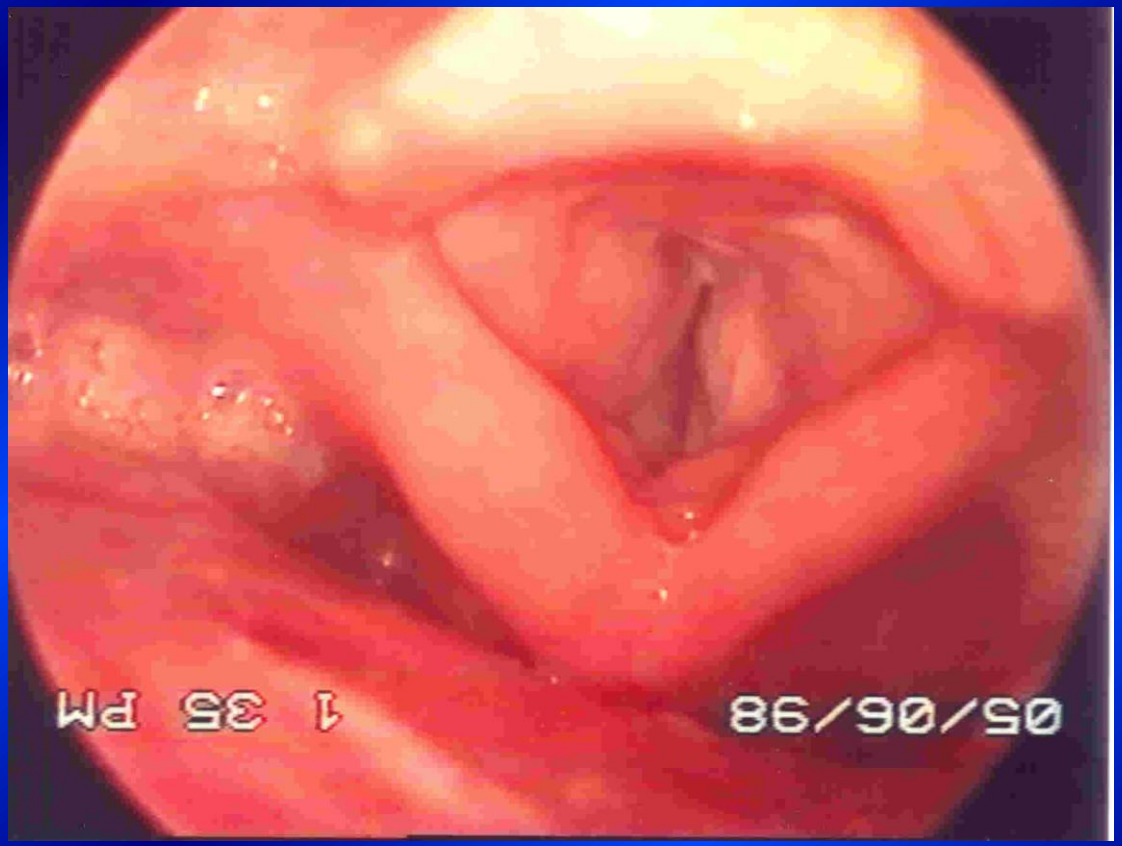
- objective voice assessment
  (F0, jitter, shimmer, NHR)



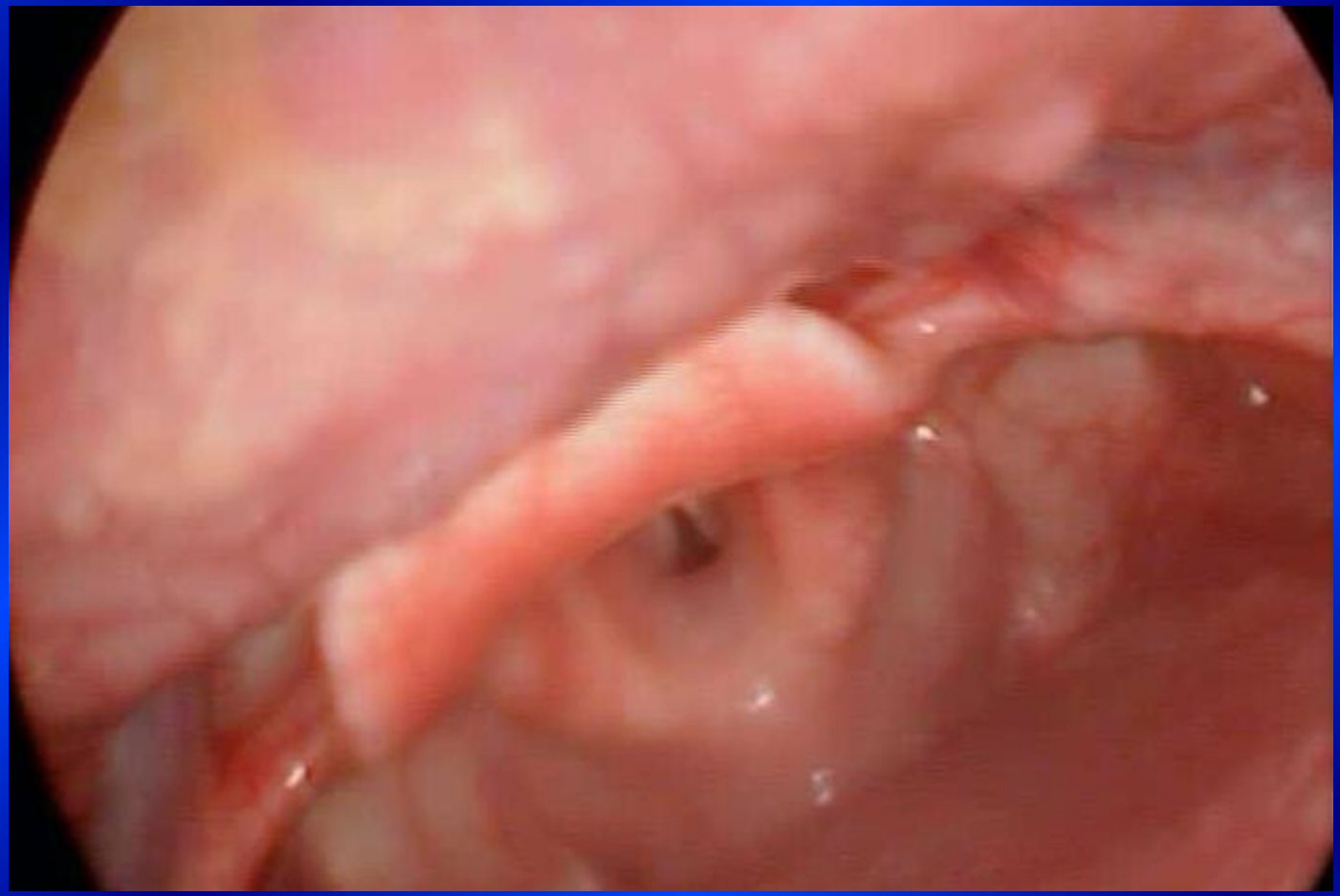
- assessment of speech breathing, attack, voice pitch
- assessment of speech tempo, nasal resonance
- articulation assessment
- assessment of psychogenic factors

Muscle tension dysphonia – I. degree

Muscle tension dysphonia – II. degree



Muscle tension dysphonia – III. degree



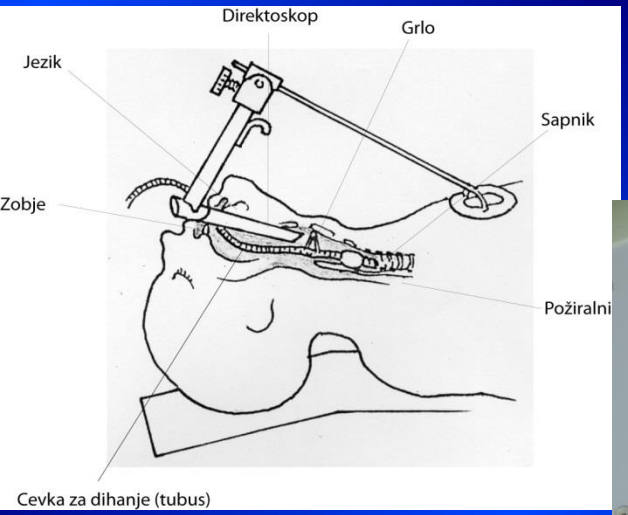
Treatment

Etiological team approach, adapted to the pateint's needs

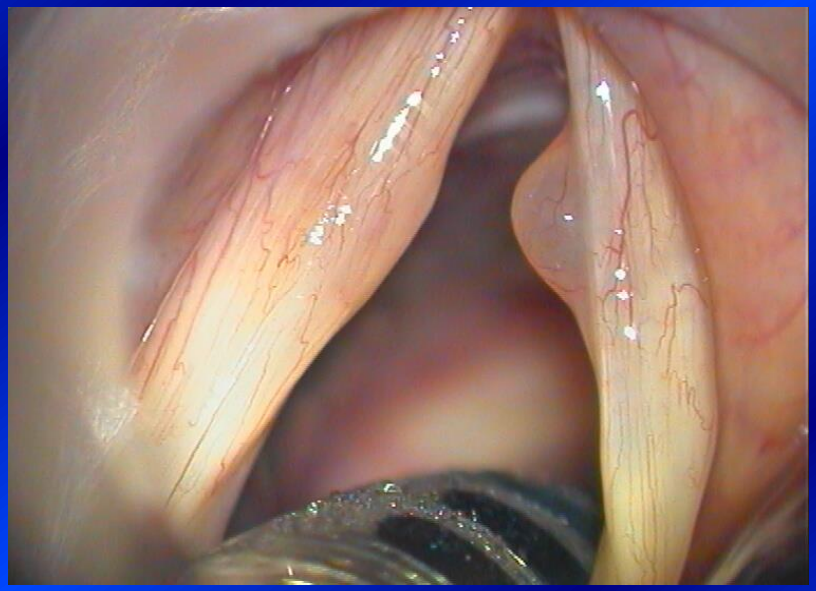
- various technoques of voice therapy
- medicament treatment
- relaxation methods
- surgical procedures
- botulinum toxin

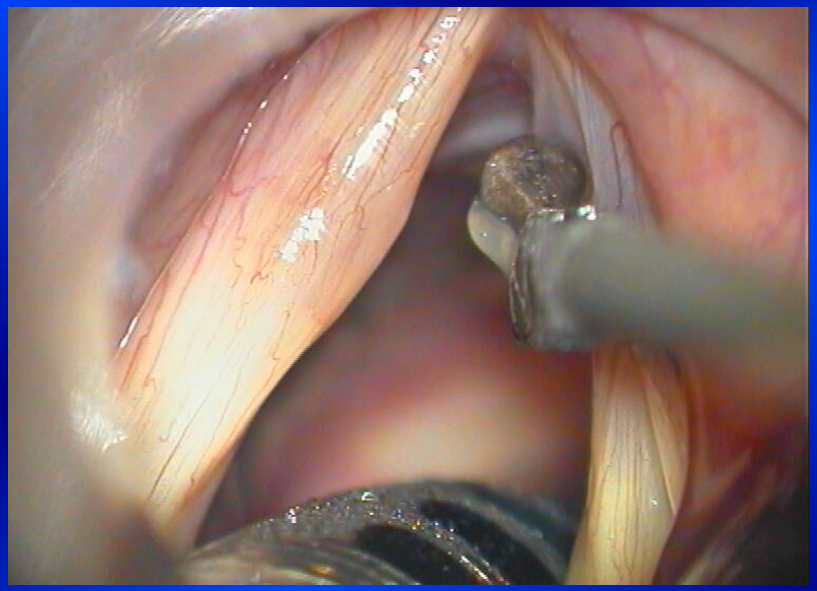
Endurance and activity of the patient !

Microlaryngoscopy



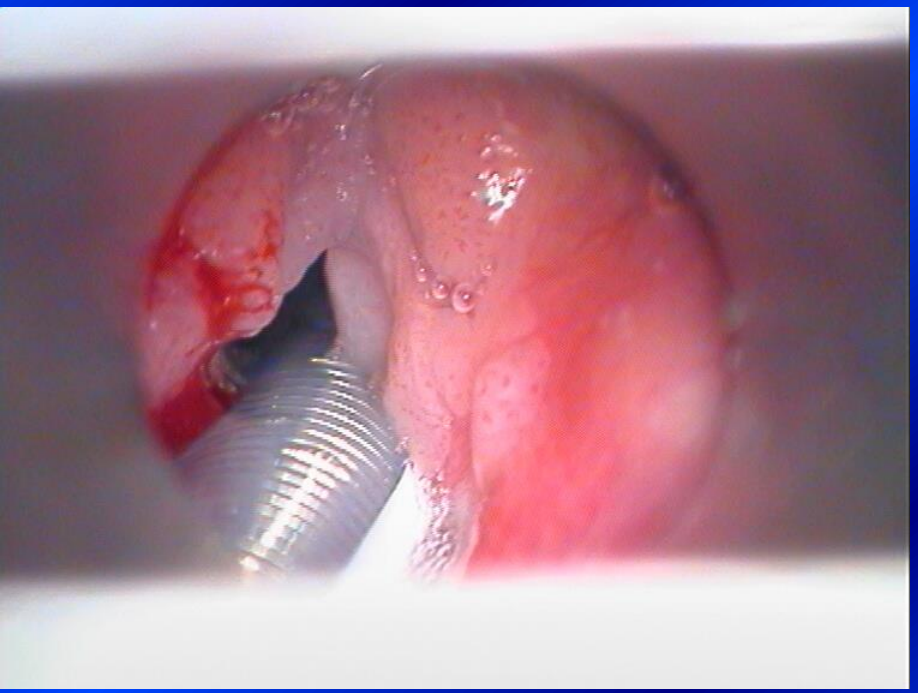
Microlaryngoscopy

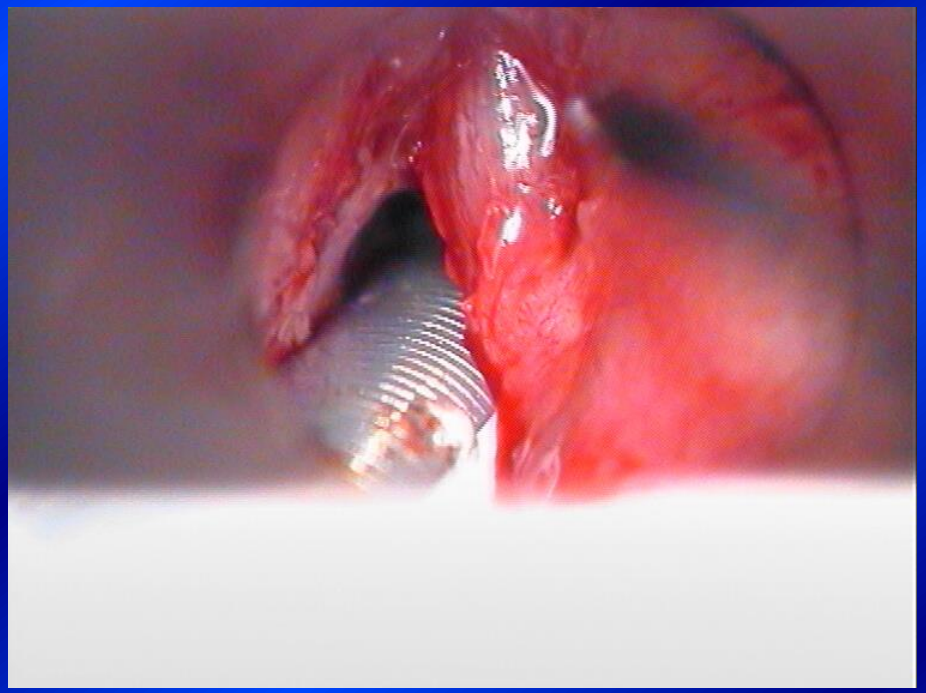




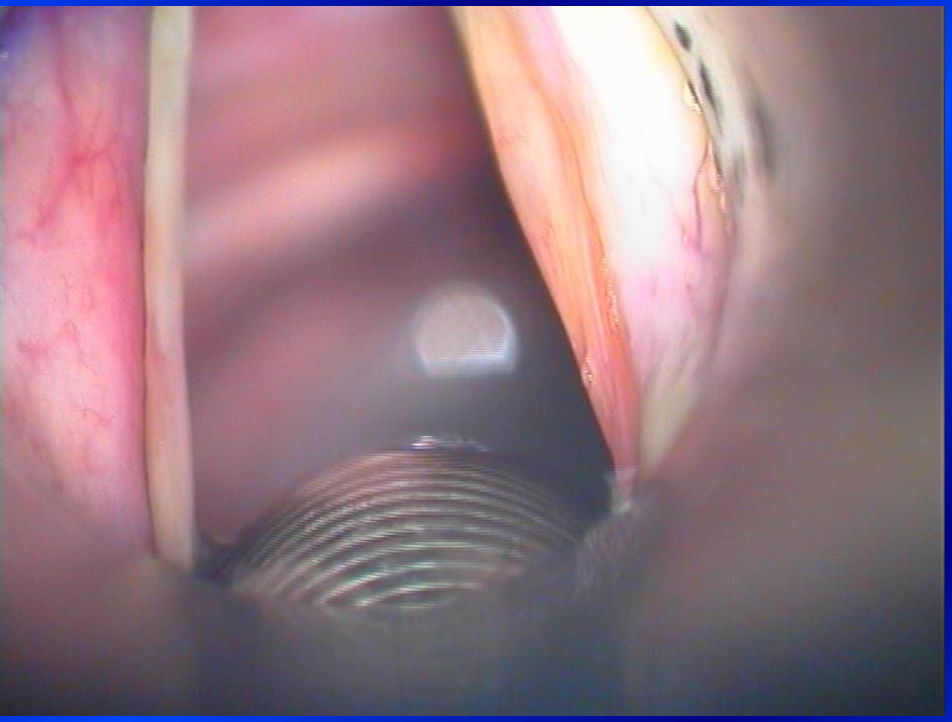
Laser ablation of papillomas

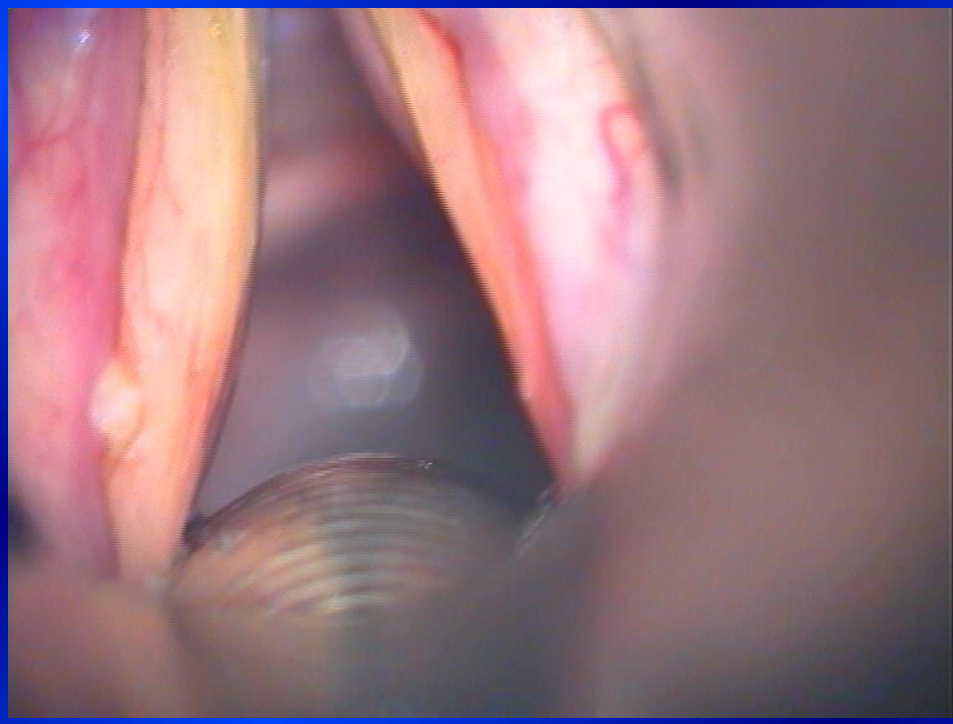
Laser ablation of papillomas



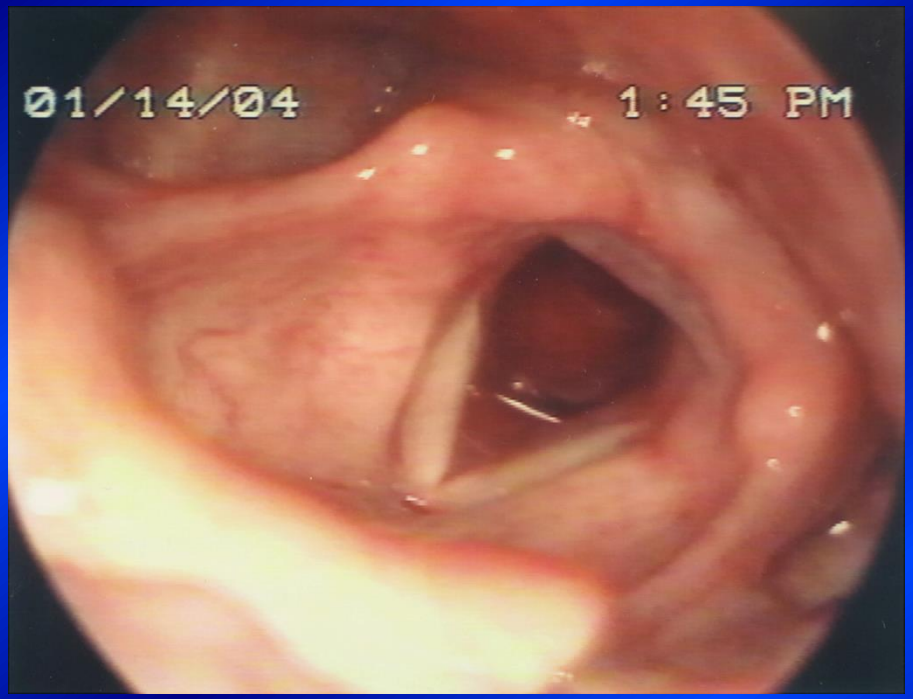


Vocal fold augmentation with autologous fat



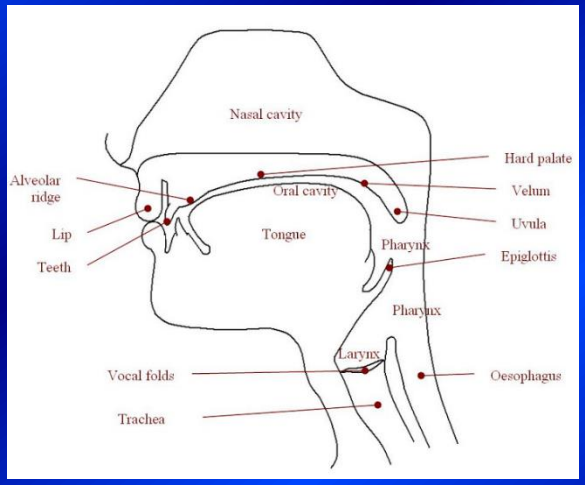


Injection of botulinum toxin in vocal folds



Articulation disorders (dyslalia)

- articulators: lips, alveolar ridge, teeth, tongue, hard and soft palate, pharynx



- normal between age 2-4 years
- classification: omission, substitution, distortion
  isolated, multiple, universal
  constant, sporadical

Articulation disorders - etiology

- central (CNS lesions: trauma, inflammation, tumour, demielinisation, vascular reasons)
- peripheral: malformation
  trauma, results of surgical procedures
  innnervation disorders
  hearing loss
- functional

Articulation disorders - peripheral

Maloclusion:

- frontal open bite (thumb, bottle, inherited)
- incisal overhang (inherited, oral breathing, improper maxilla growth

- cross bite
- diasthema anterior, missing teeth

Articulation disorders - peripheral

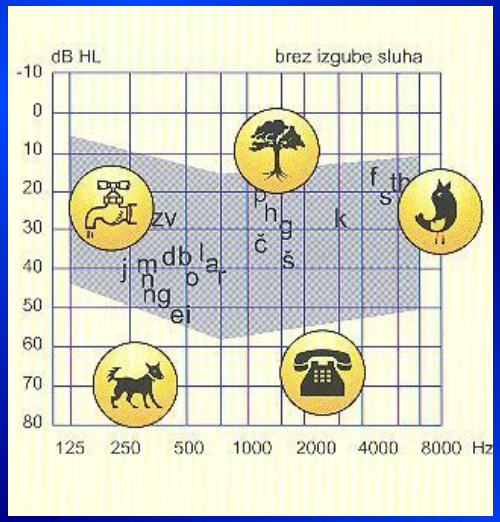
Awkwardness of articulation organs

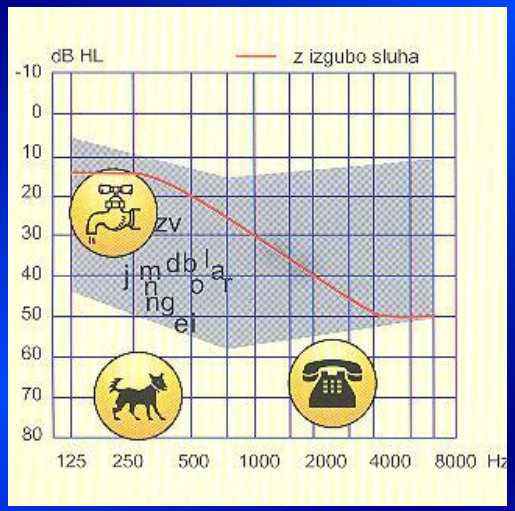
- inherited
- anatomic particularities (frenulum linguae brevis)
- innervation lesions (n. V, VII, IX, X, XI, XII)
- miopathies, maisthenia gravis
- scars after previous surgeries, irradiation

Articulation disorders - peripheral

Hearing loss:

- conductive hearing loss (secretory otitis media)
- sensorineural hearing loss (higher frequencies – sigmatism, formants frequencies – understanding)

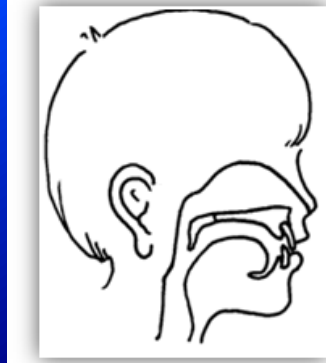




Resonance disorders

Hypernasality = consequence of uncomplete velopharyngeal closure - e.g. cleft palate, disproportion between the pharyngeal depth nad soft palate length, innervation disorders, scars after surgeries, irradiation

Nasality in vowels, disordered articulation of all plosives and fricatives (intraoral pressure)



Resonance disorders

Hyponasality = decresed resonance space in nose or nasopharynx

e.g.- enlarged adenoids, rhinitis, nasal polyposis, tumor in nasal cavity or nasopharynx

Nasals > some plosives (m>b, n>t,d)

Treatment of articulation disorders

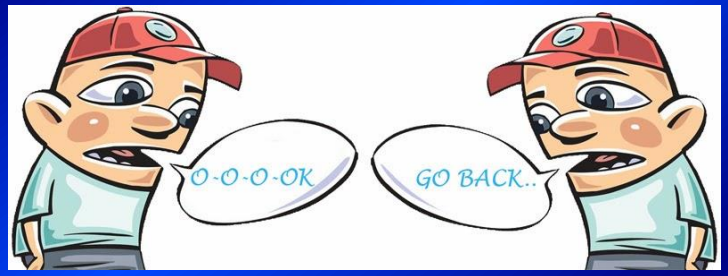
- Etiology?
- team approach in diagnostics and therapy (speech pathologist, phoniatrician, pediatrician, neurologist, orthodontist, psychologist, …)
- treatment -speech pathologist

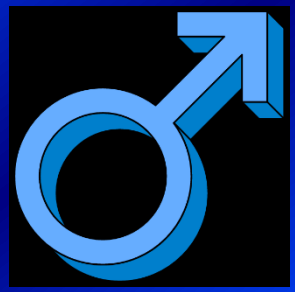
Speech fluency disorders

Cluttering (tachyphemia)

- similar in normal development between age of 3 - 5 years – CNS development
- dyspraxia
- speech: fast, incorrect articulation (blurred speech), omition or substitution of parts of words, complete words
- weak concentration, short attention
- speech and language disorder
- treatment: speech pathologist, psychologist, neurologist, phoniatrician

Speech fluency disorders





Stuttering (hesitatio)

- 5% children, 75% boys, 30% family history +
- genetic and neurophysiologic disorders, dystonia
- clonical-tonical repetition of sounds, syllables, words, tonical blockades of speech, lengthening of syllables, parakinetic accompanying gestures
- strong psychical reaction to the disorder

- Treatment: speech pathologist, psychologist, neurologist, phoniatrician, bio feed-back methods

Stuttering

- speech disorder
- organized thinking process, difficult expression
- effortful speaking
- blackade at the beginning, the continuation is better
- good listener
- aware of the disorder
- handwriting usually in order
- reserved, shy, introverted
- no troubles in early childhood, later problems
- treatment – relaxation techniques
- TH: attention is drawn away from speech

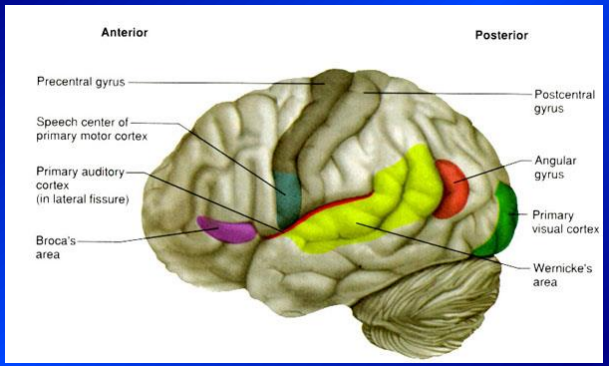
Cluttering

- language disorder
- disorganized thinking
- speaking without troubles
- understandable in the beginning, later acceleration of the tempo, less understandable
- bad listener, interuptions of the cospeaker
- not aware of his disorder
- handwriting fast and not in order
- extroverted
- never fluent speech
- TH: attention is drawn to speech particularities

Agnosia, apraxia

- not able to understand the meaning of sensorical stimuli
- Receptive: agnosia

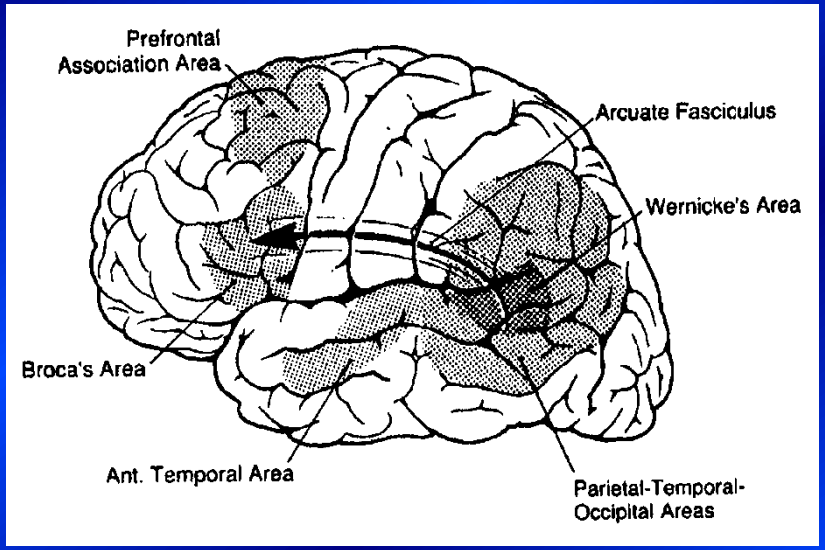
- not able to reasonably perform certain movements, the idea about the movement exists
- Expresive: apraxia, e.g. dysarthria



- Cause: CNS lesion

- Treatment: speech pathologist, psychologist, neurologist

Aphasia



- Cause: lesion, dysfunction of the speech centers in CNS, connections between them
- Disorders in understanding, speech production, reading and writing
- Sensorical (receptive) and motorical (expresive) forms, 70% mixed forms
- Treatment: speech pathologist, psychologist, neurologist