Airway Management and Difficult Intubation

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بیمارستان قائم (عج)


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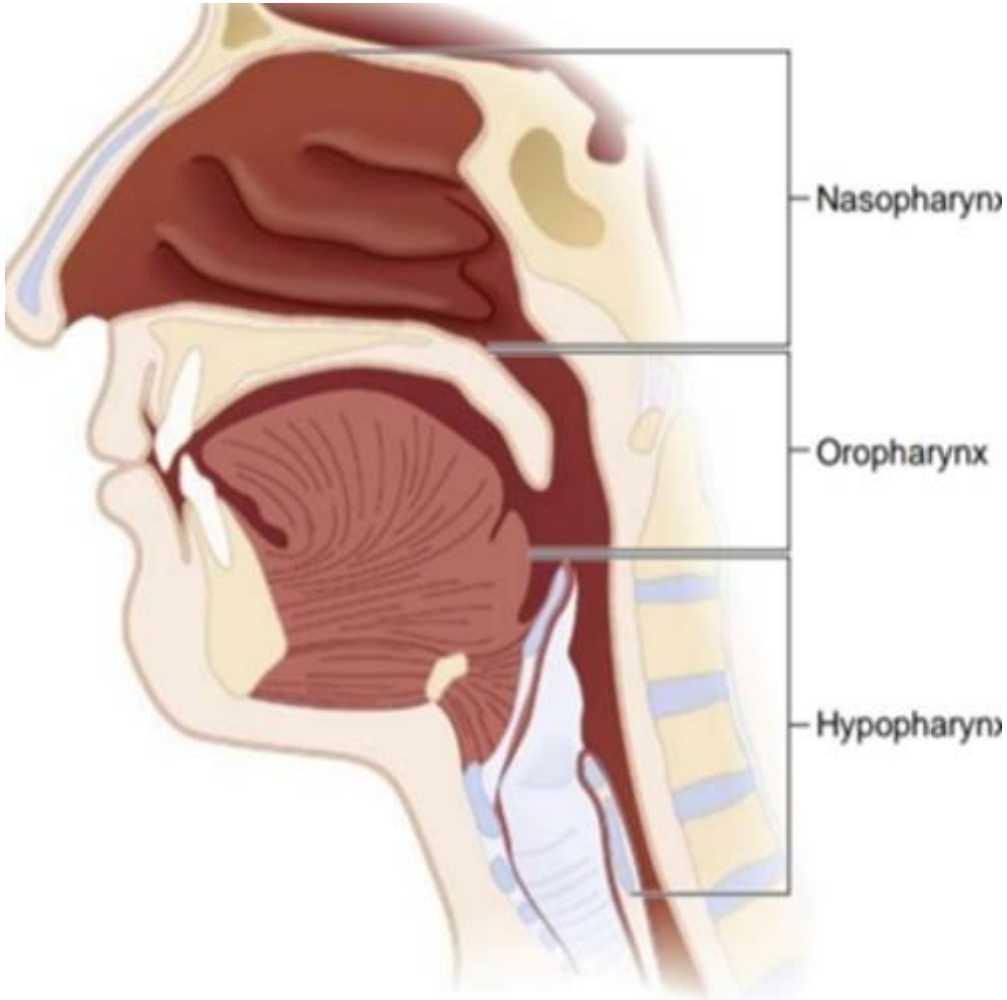
Difficult Airway

- The difficult airway involves a difficult mask ventilation and/or a difficult tracheal intubation.
- Identification of a difficult airway, whenever possible, is vital prior to manipulation.
- An essential member of the difficult airway response team is an otolaryngologist with training and expertise in endoscopic techniques such as rigid/flexible laryngoscopy, bronchoscopy, and the ability to provide open surgical access of the airway.
- Techniques commonly used in management of the difficult airway include obtaining a surgical airway or intubation through either awake fiberoptic laryngoscopy, a laryngeal mask airway (LMA), direct laryngoscopy with an anterior commissure laryngoscope, or laryngoscopy using a videolaryngoscope.
- Insufficient experience in fiberoptic laryngoscopy and bronchoscopy is a common cause of failure in awake fiberoptic intubation.
- Once a "cannot intubate, cannot ventilate" situation has been identified, immediate consideration should be given to providing surgical airway access.

Subdivisions of Pharynx



Innervation of Nasal Cavity

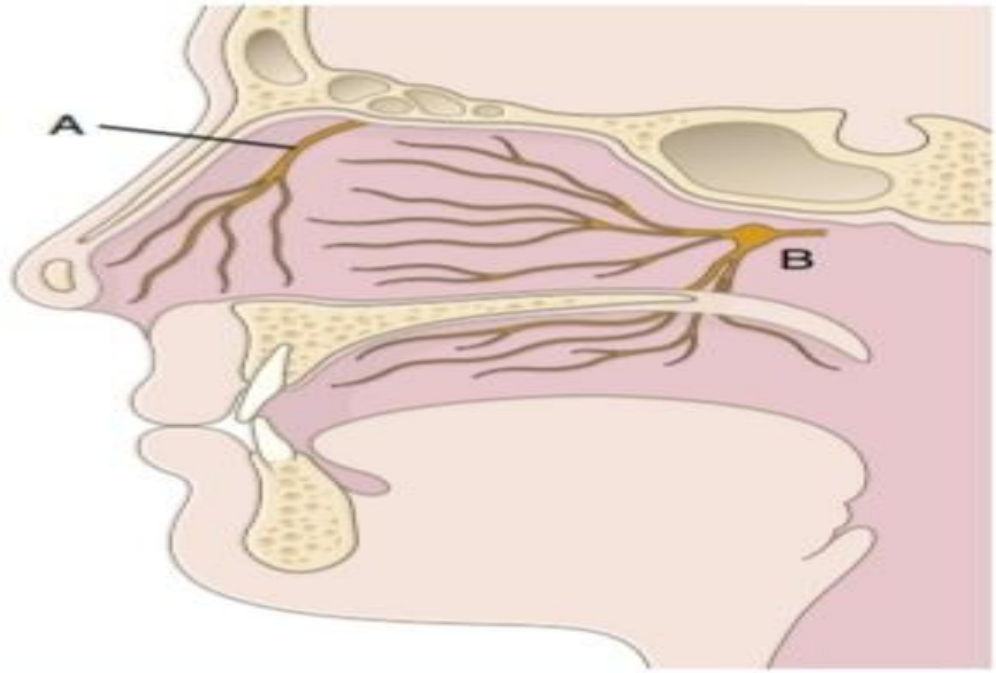
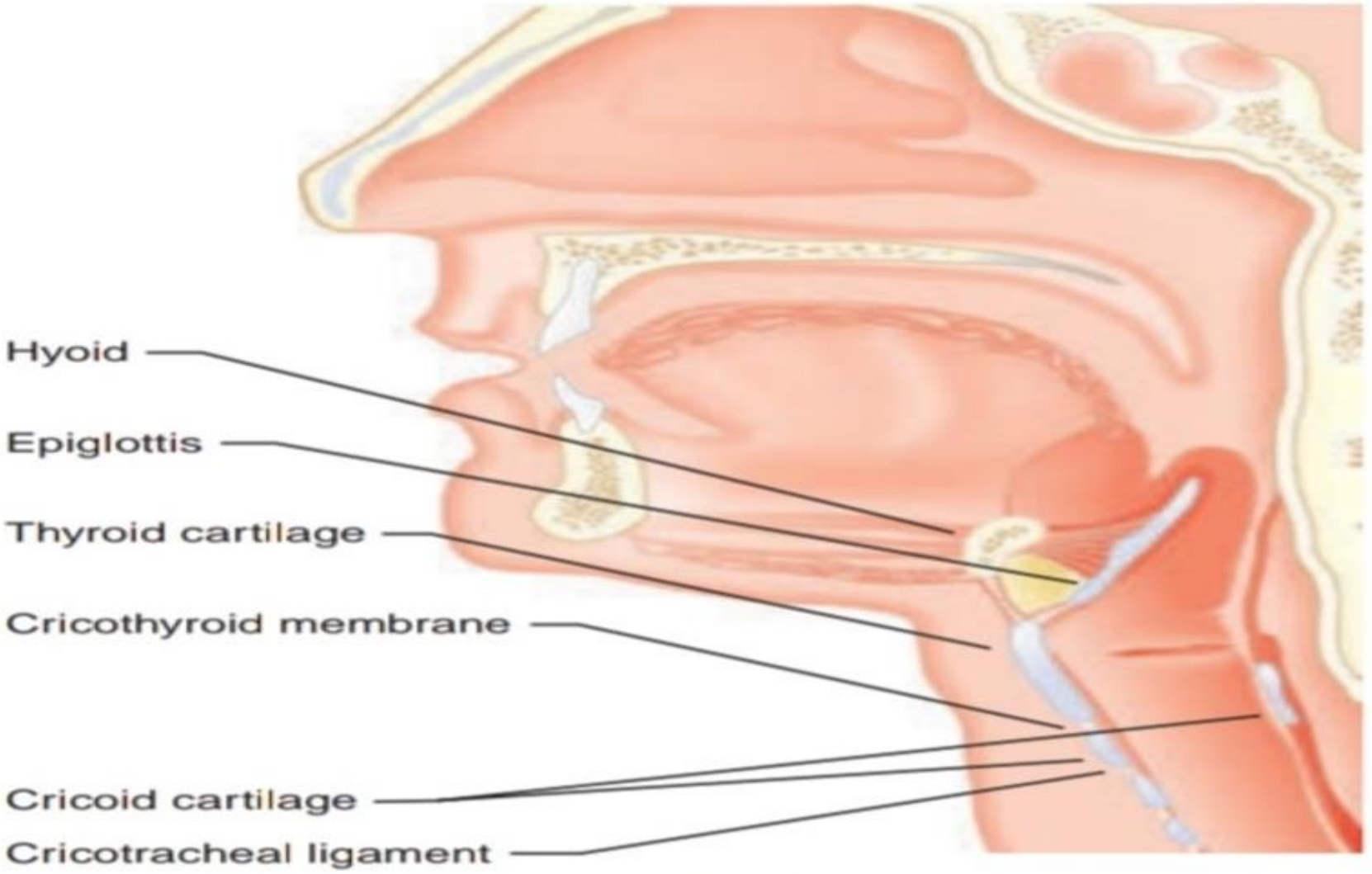
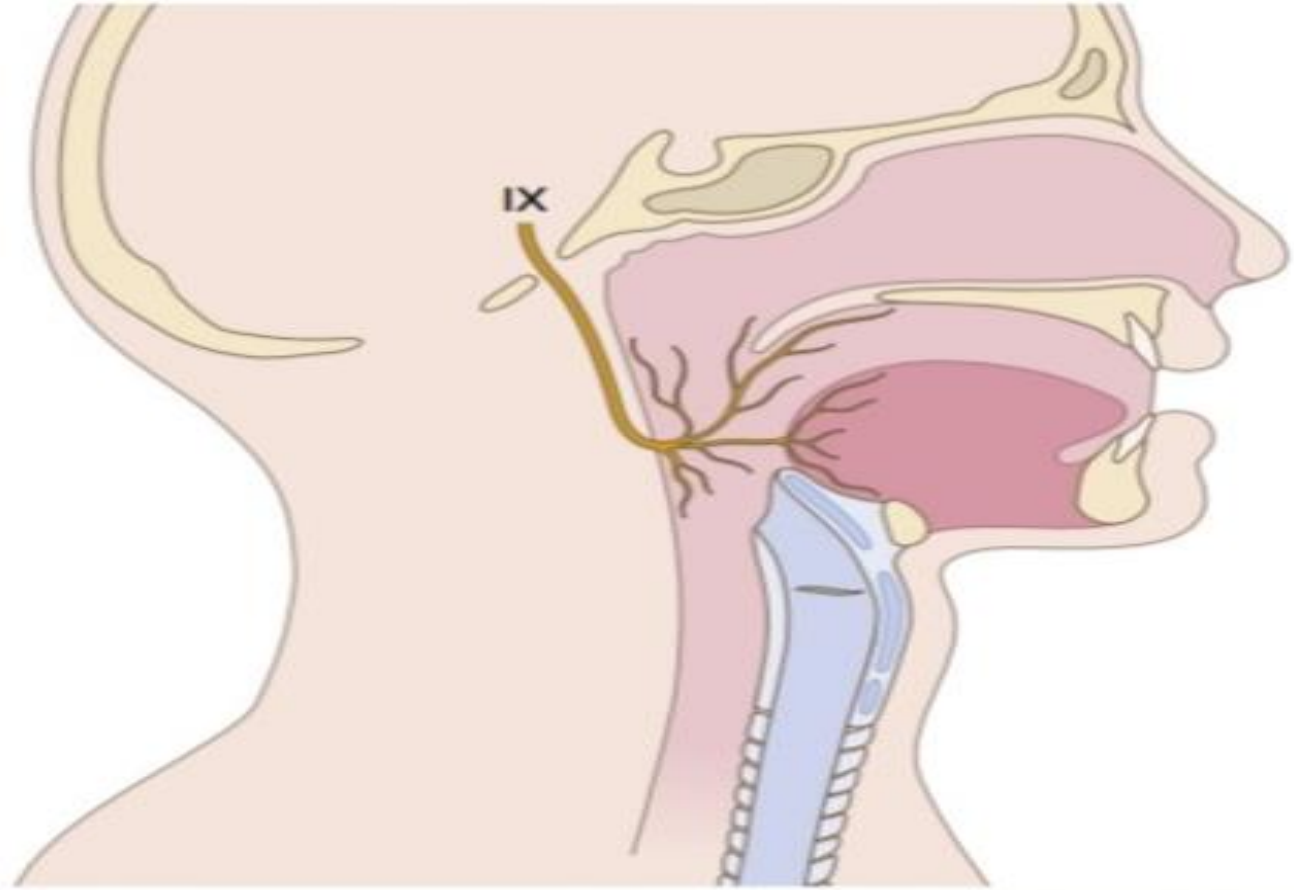


Fig. 16.2 Innervation of the nasal cavity. A diagram of the lateral wall of the nasal cavity illustrates its sensory nerve supply. The anterior ethmoidal nerve, a branch of the ophthalmic division of the trigeminal nerve, supplies the anterior third of the septum and lateral wall (*A*). The maxillary division of the trigeminal nerve via the sphenopalatine ganglion supplies the posterior two thirds of the septum and the lateral wall (*B*). (From Ovassapian A. *Fiber-optic Airway Endoscopy in Anesthesia and Critical Care*. New York: Raven Press; 1990:57–79, used with permission.)

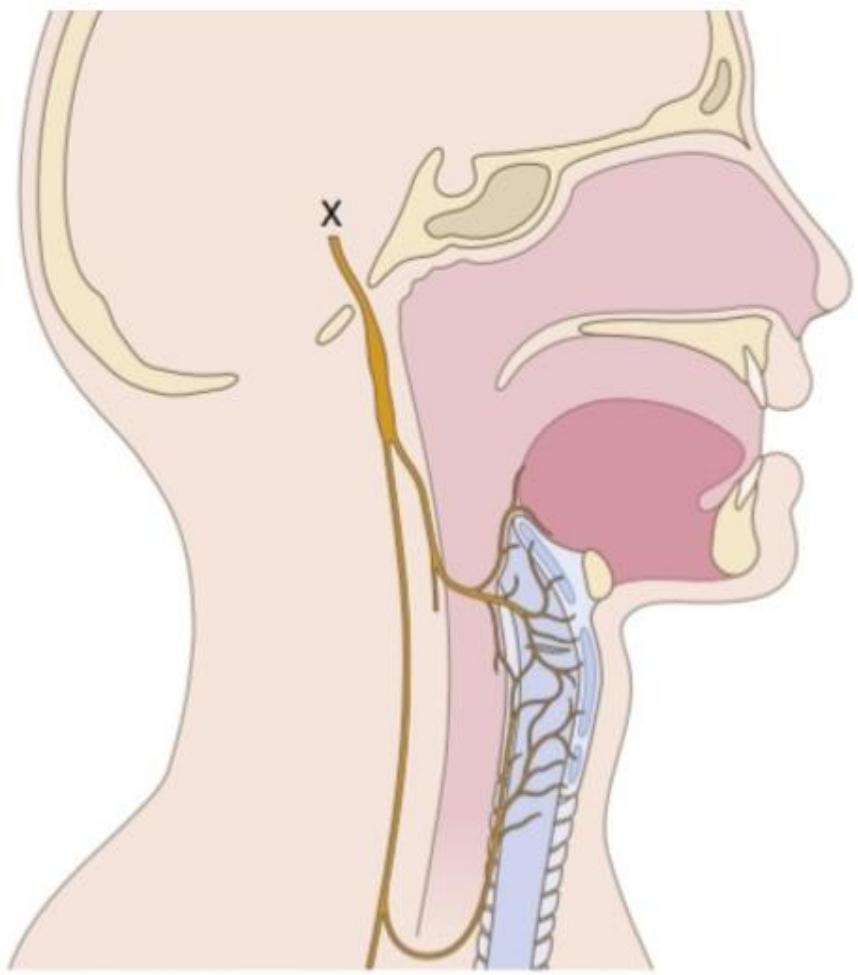
Landmarks of Airway



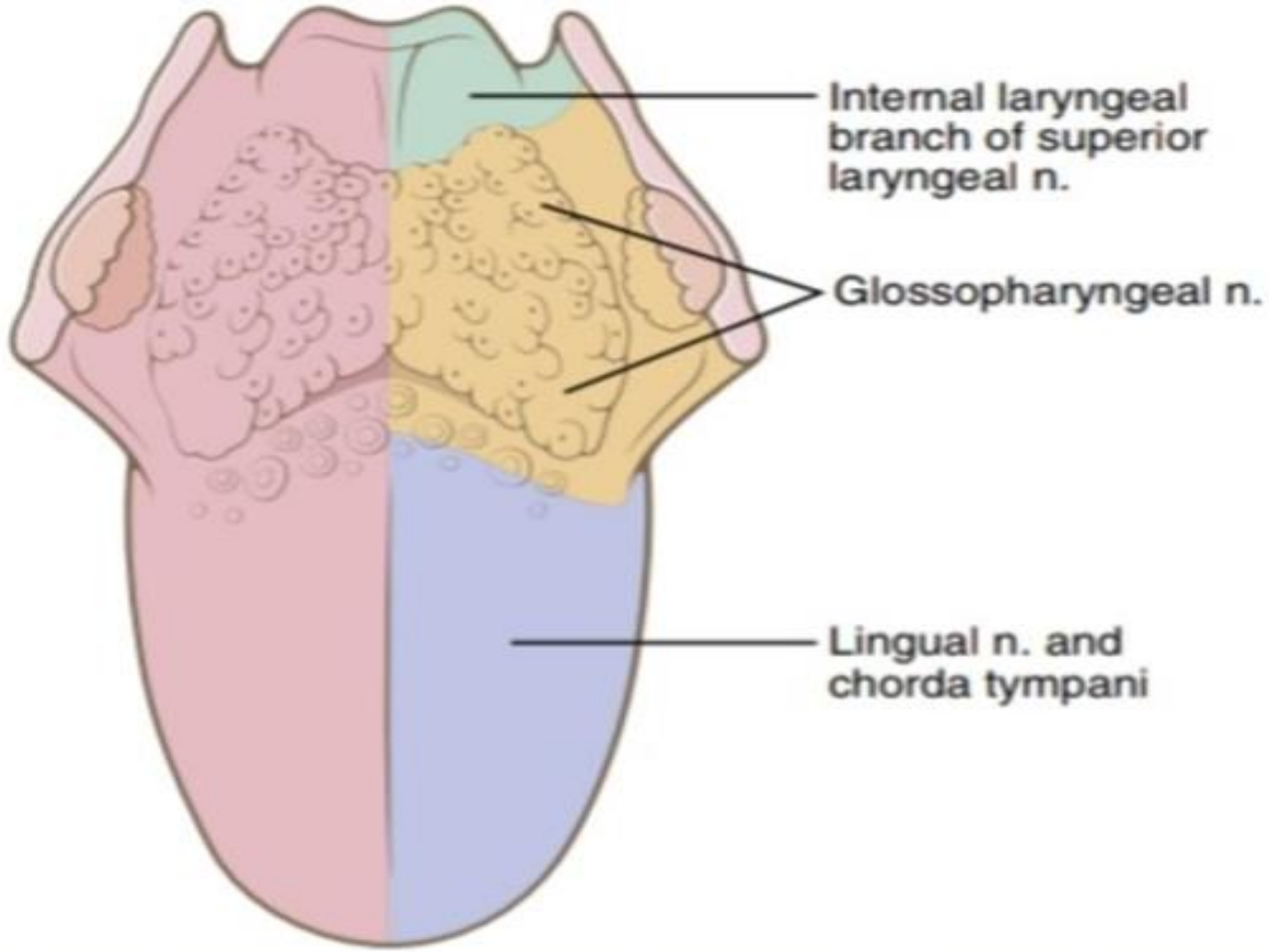
Sensory distribution of Glossopharyngeal nerve(Cranial nerve IX)



Sensory Distribution of the Vagus nerve (cranial nerve X)



Sensory Innervation of Tongue



Trigeminal Nerve Branch and Regional Blocks via Intraoral Approach

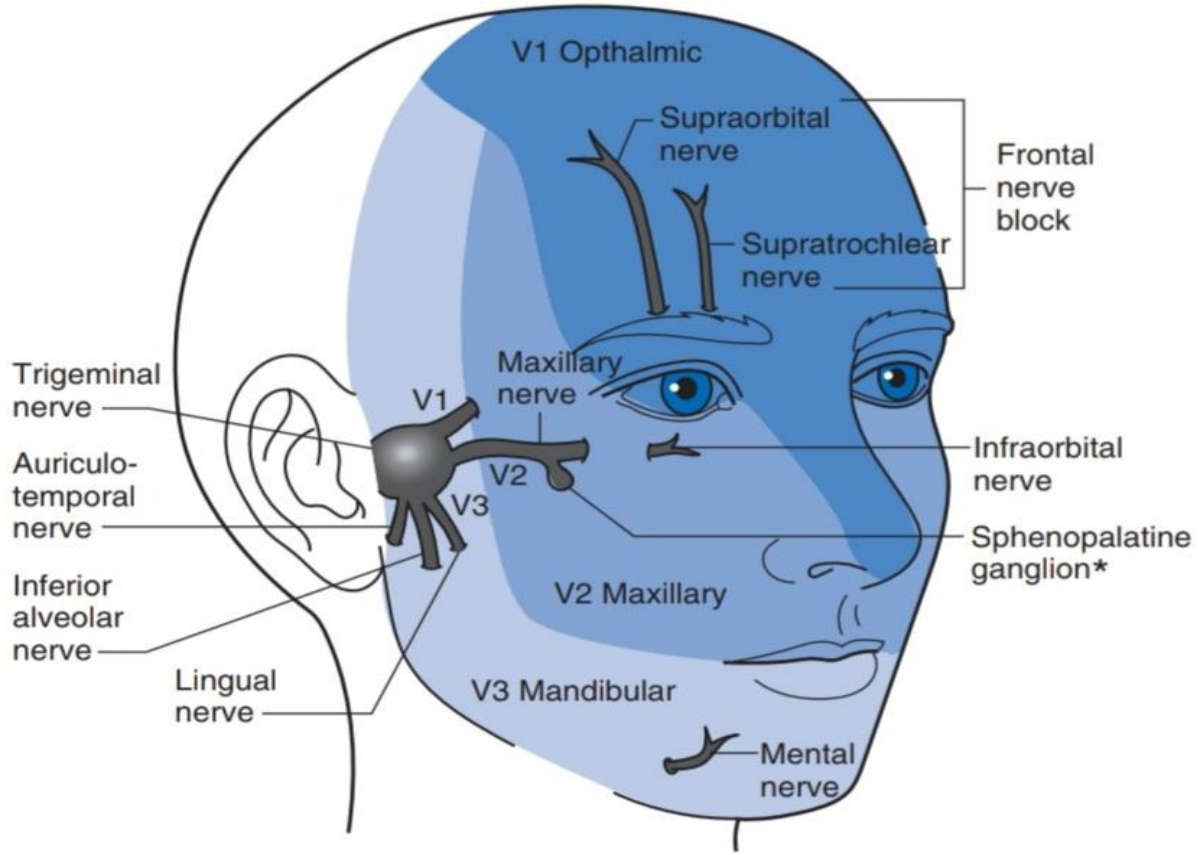
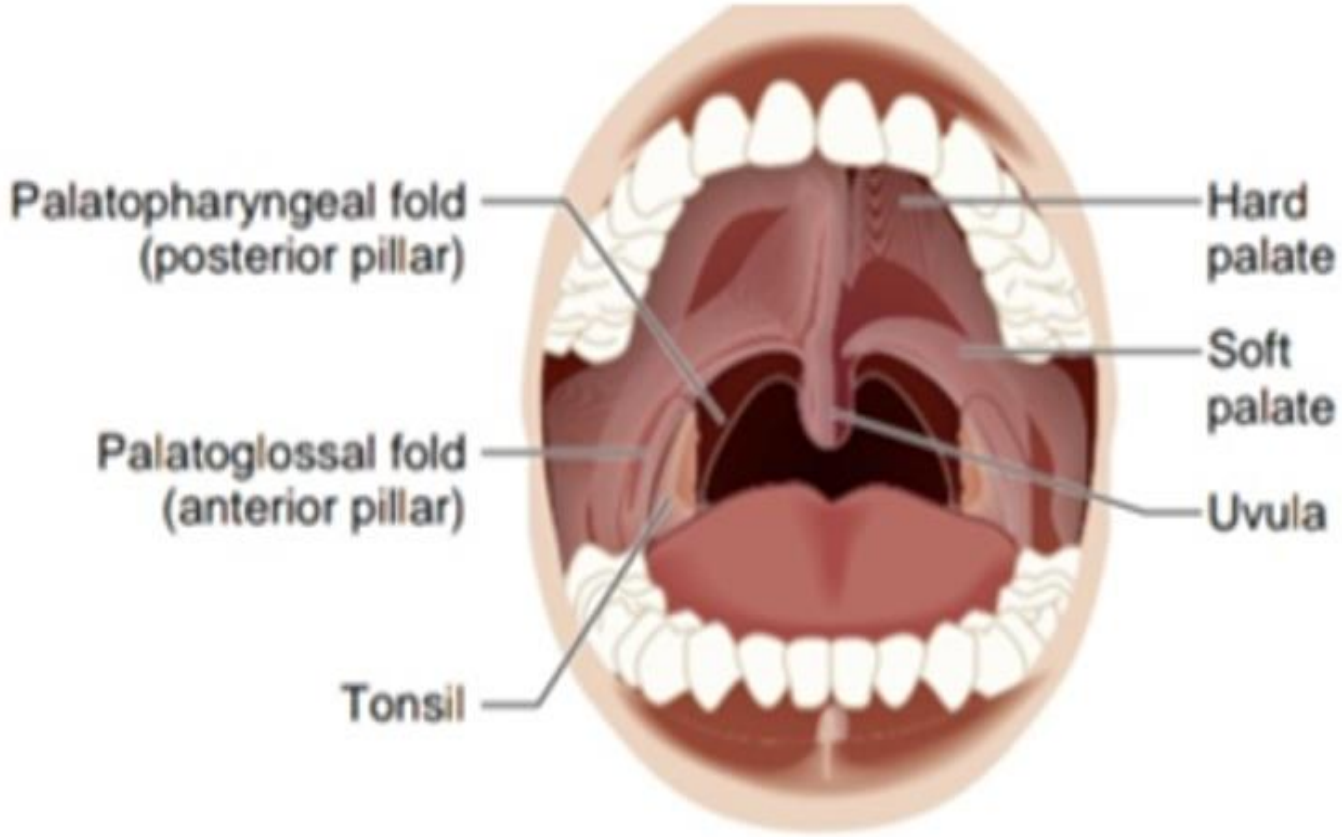
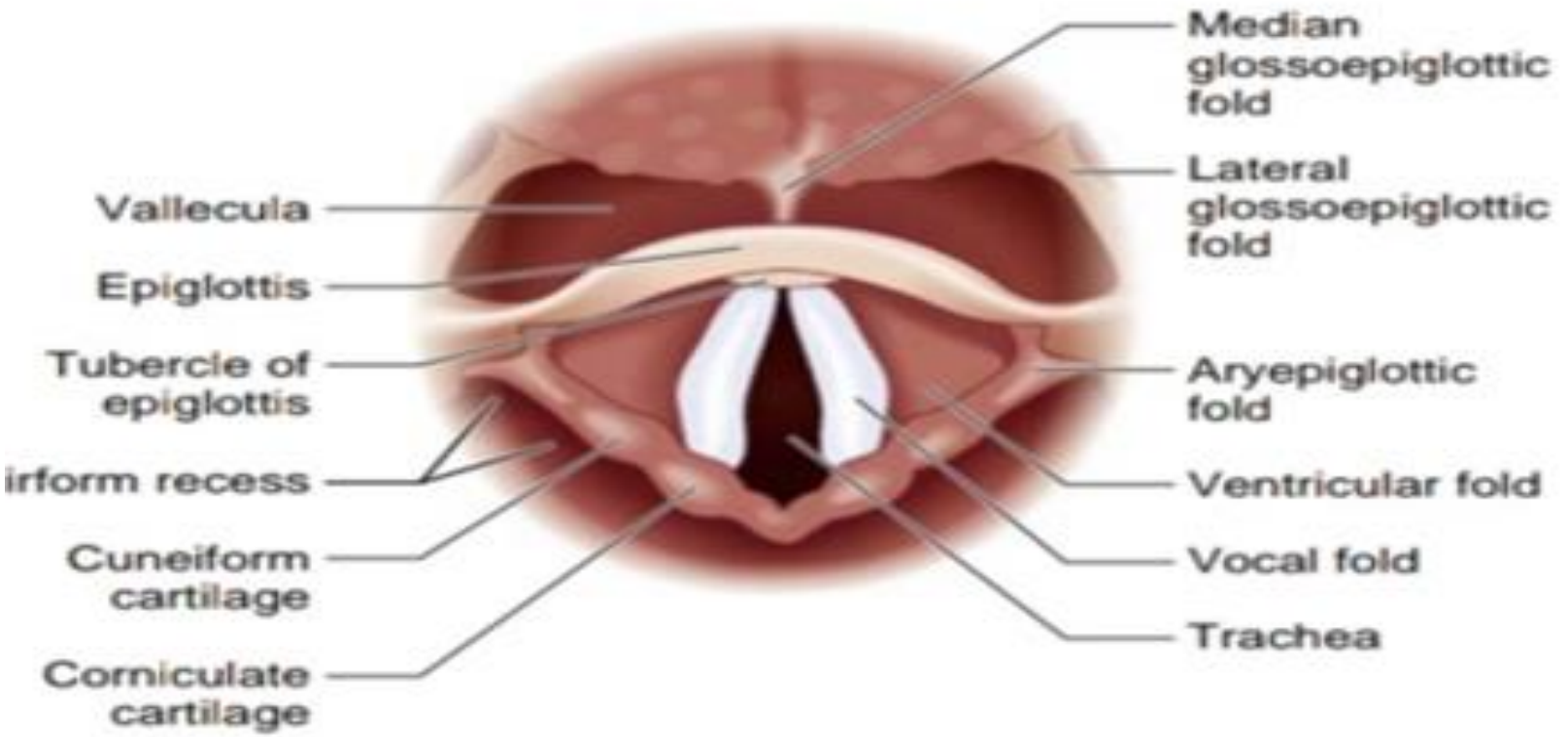


Fig. 70.1 Trigeminal nerve branches that are targets for regional blocks. *Regional blocks performed via intraoral approach.

Oral Cavity and Oropharynx

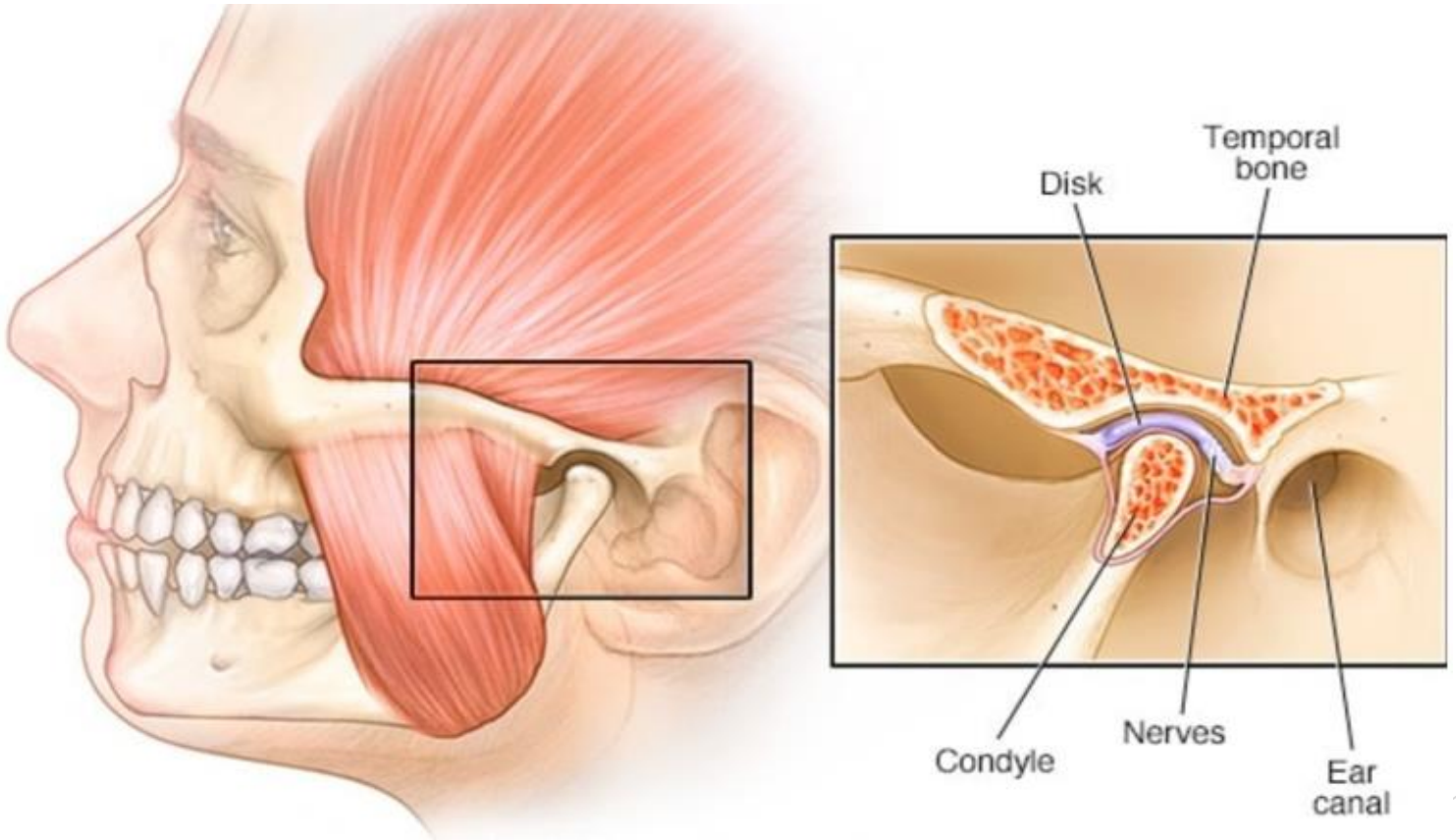


Larynx

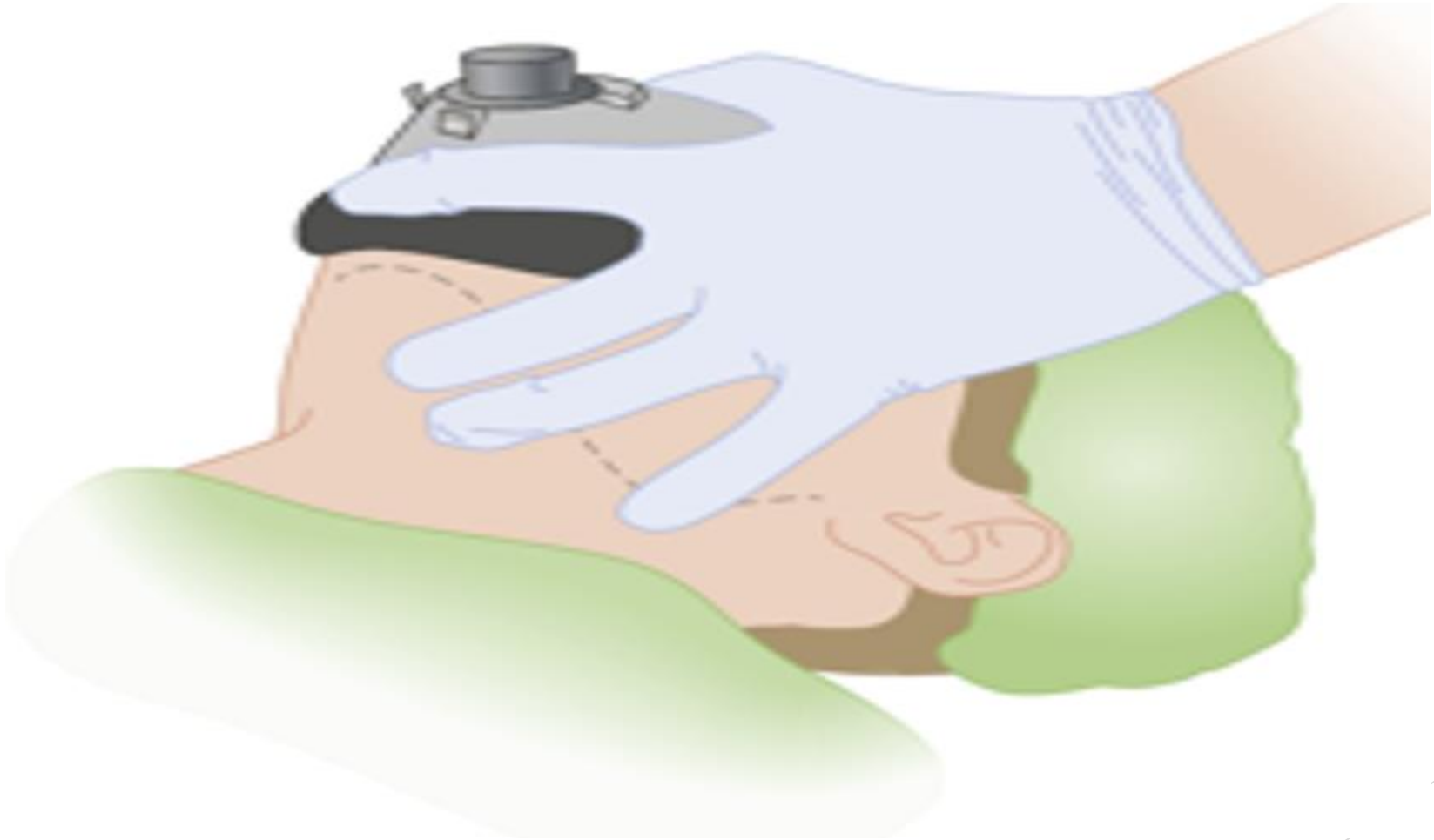


ig. 44.6 Larynx as visualized from the hypopharynx. (From Redden RJ,

Temporo Mandibular Joint



Face Mask Ventilation (one Handed)



Mask Ventilation with Anesthesia Attending (Two Handed)

HEAD TILT-CHIN LIFT –JAW THRUST

Oropharyngeal and Nasopharyngeal Airway in Place

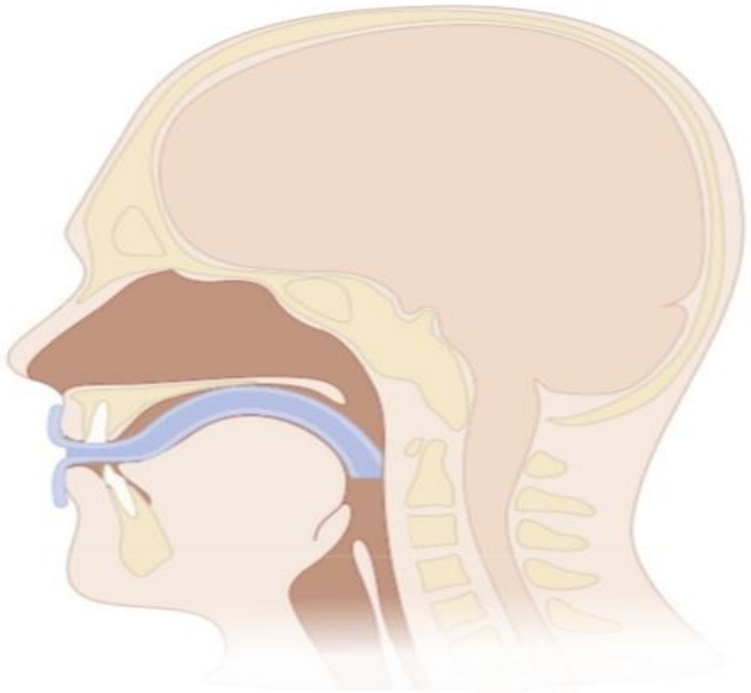


Fig. 44.13 Oropharyngeal airway in place. The airway follows the curvature of the tongue. It pulls the tongue and the epiglottis away from the posterior pharyngeal wall and provides a channel for the passage of air. (Modified from Dorsch JA, Dorsch SE. *Understanding Anesthesia Equipment*. 4th ed. Baltimore: Williams & Wilkins; 1999.)

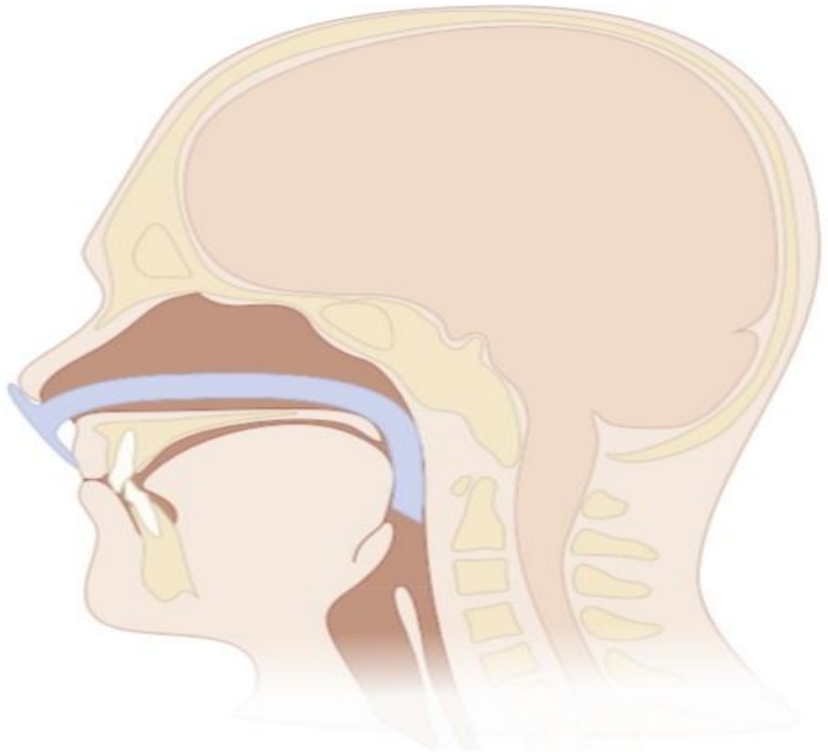


Fig. 44.14 Nasopharyngeal airway in place. The airway passes through the nose and ends at a point just above the epiglottis. (Modified from Dorsch JA, Dorsch SE. *Understanding Anesthesia Equipment*. 4th ed. Baltimore: Williams & Wilkins; 1999.)

Nasal and Oral Airway

O2 Saturation (Sao2) Versus time of Apnea of Various Type of Patient

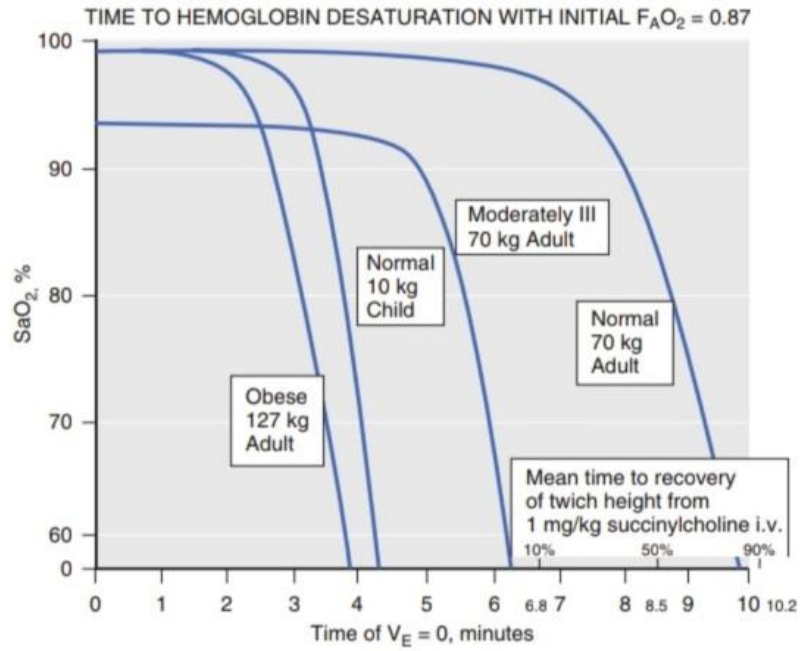


Fig. 16.8 The oxygen saturation (SaO_2) versus time of apnea of various types of patients. The time to reach an oxygen saturation of 80% was 8.7 minutes in a healthy 70-kg adult, but was 3.1 minutes in an obese patient. F_AO_2, alveolar fraction of oxygen; V_E, minute ventilation. (From Benumof JL, Dagg R, Benumof R. Critical hemoglobin desaturation will occur before return to an unparalyzed state following 1 mg/kg intravenous succinylcholine. *Anesthesiology.* 1997;87(4):979-982.)

Predictors of Difficult Mask Ventilation

- Obstructive sleep apnea or history of snoring
- Age older than 55 years
- Male gender
- Body mass index of 30 kg/m^2 or greater
- Mallampati classification III or IV
- Presence of a beard
- Edentulousness

Possible Difficult Airway Management

Difficult Mask Ventilation[a]	Difficult Direct Laryngoscopy
Age > 55 years	Reported history of difficult intubation, aspiration pneumonia after intubation, dental or oral trauma following intubation
Obstructive sleep apnea (OSA) or snoring	OSA or snoring
Previous head/neck radiation, surgery, or trauma	Previous head/neck radiation, surgery, or trauma
Lack of teeth	Congenital disease: Down syndrome, Treacher-Collins syndrome, Pierre Robin syndrome
A beard	Inflammatory/arthritic disease: rheumatoid arthritis, ankylosing spondylitis, scleroderma
Body mass index (BMI) > 26 kg/m^2	Obesity Cervical spine disease or previous surgery

Inadequate Mask Ventilation (Signs)

- Absent or minimal chest rise
- Absent or inadequate breath sounds
- Cyanosis
- Gastric air entry
- Decreasing or inadequate oxygen saturation
- Absent or inadequate exhaled carbon dioxide
- Hemodynamic changes associated with hypoxemia or hypercarbia or both

Assessment and Predictability of Difficult Mask Ventilation

Criteria for Difficult Mask Ventilation
Inability for one anesthesiologist to maintain oxygen saturation >92%
Significant gas leak around face mask
Need for ≥4 L/min gas flow (or use of fresh gas flow button more than twice)
No chest movement
Two-handed mask ventilation needed
Change of operator required

Independent Risk Factors for Difficult Mask Ventilation	Odds Ratio
Presence of a beard	3.18
Body mass index >26 ng/m^2	2.75
Lack of teeth	2.28
Age >55 yrs	2.26
History of snoring	1.84

Indication of Endotracheal Intubation

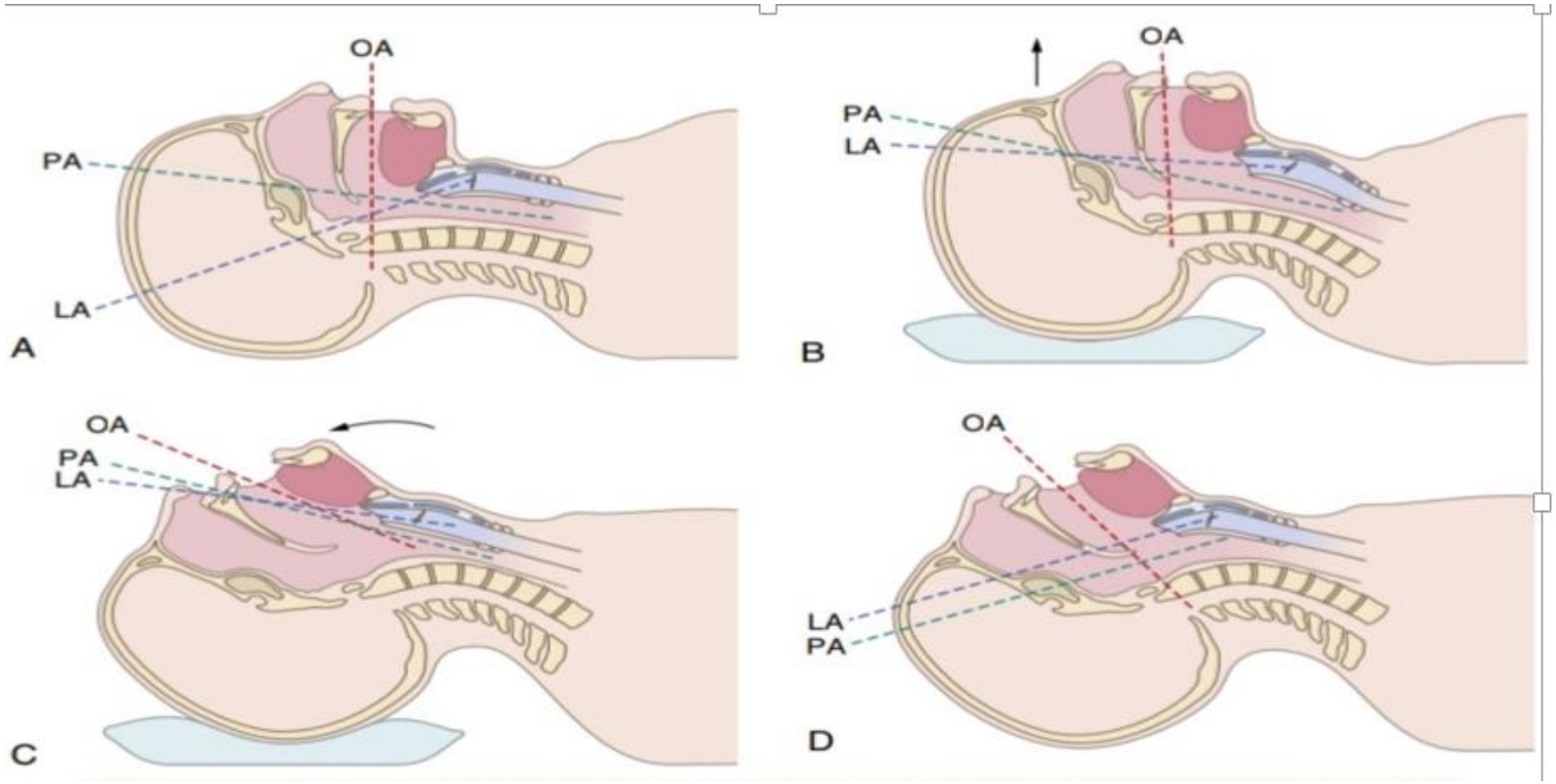
Box 16.1 Indications for Endotracheal Intubation

- Provide a patent airway
- Prevent inhalation (aspiration) of gastric contents
- Need for frequent suctioning
- Facilitate positive-pressure ventilation of the lungs
- Operative position other than supine
- Operative site near or involving the upper airway
- Airway maintenance by mask difficult

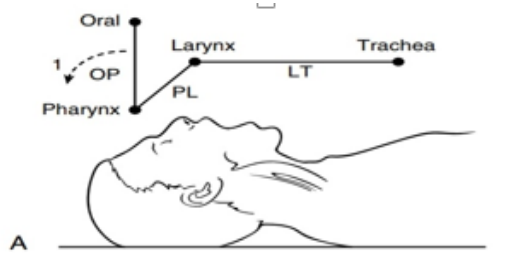
Direct Laryngoscopy (DL)

- Direct Visualization of Glottis
- Needs Wide Mouth Opening , Cervical Flexion and Atlanto occipital Extension
- Line of Sight from Mouth to Larynx
- Positioning in Sniffing Position for Alignment of OA,OP and OL Axis
- Maximal Head Extension at the Atlanto occipital Joints bring OA to other Axis, Neck Flexion and Mouth Opening

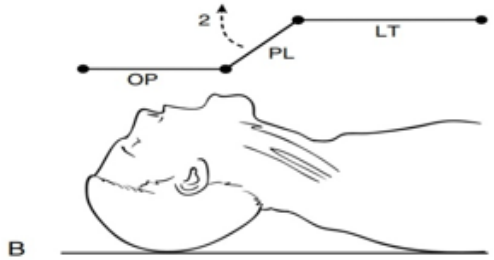
Alignment of the Axis (OA),(PA),(LA) (different Head Position)



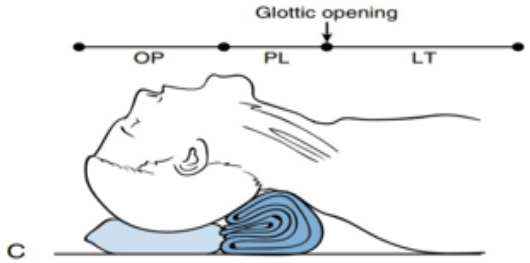
AXIS ALLIGNMENT



1) Head extension

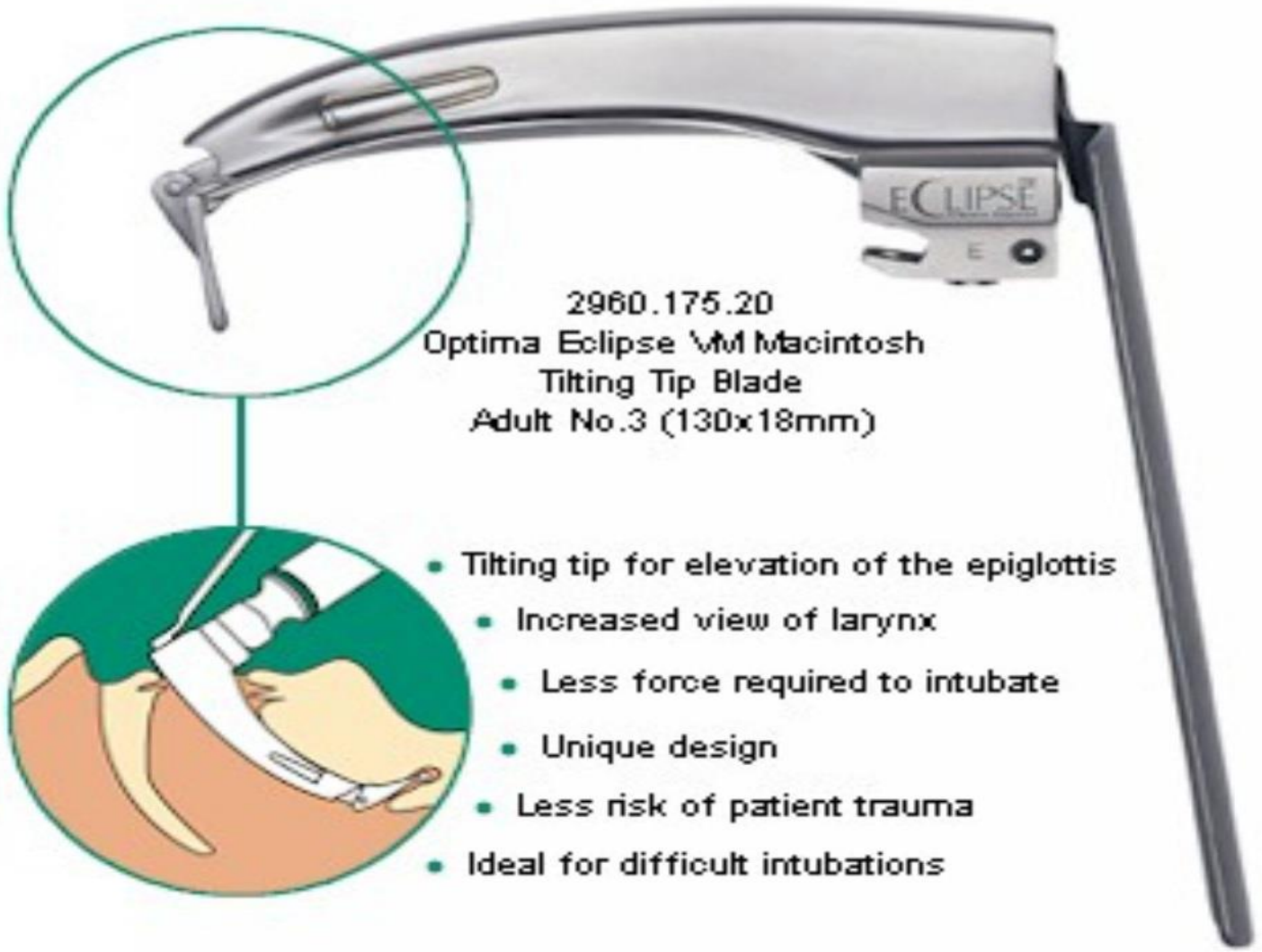


2) Neck flexion



MC COY Laryngoscope

Flexion Tip Blade of Laryngoscope



Blades of Laryngoscope

Direct Laryngoscopy (Curved or Straight Blade, Advantage and Disadvantage)

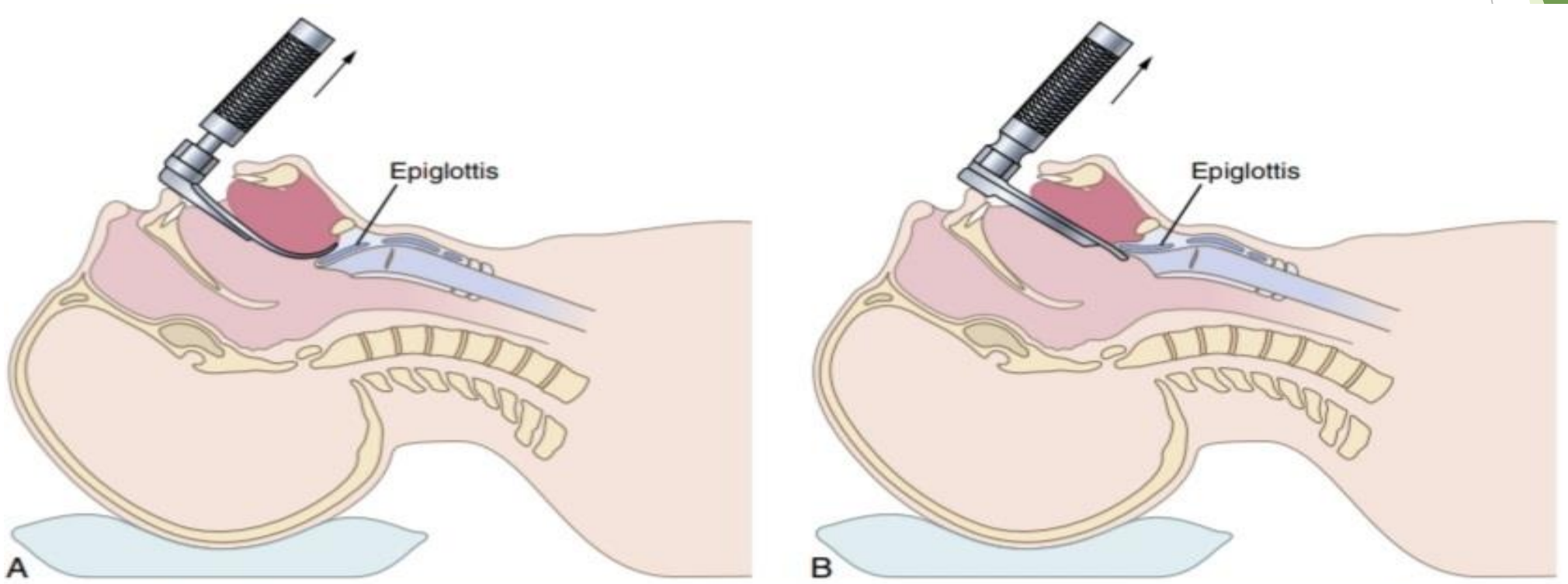


Fig. 16.13 Schematic diagram depicting the proper position of the laryngoscope blade for exposure of the glottic opening. (A) The distal end of the curved blade is advanced into the space between the base of the tongue and the pharyngeal surface of the epiglottis. (B) The distal end of the straight blade is advanced beneath the laryngeal surface of the epiglottis. Regardless of blade design, forward and upward movement exerted along the axis of the laryngoscope handle, as denoted by the arrows, serves to elevate the epiglottis and expose the glottic opening.

RAE ETT (preformed curve design oral tube for reduced risk of kinking and improved surgical access with soft rounded beveled tip , murphy eye and low pressure cuff)

RAE Tracheal Tube

Oral, Cuffed

For oral intubation
Preformed curve design
Reduces risk of kinking
Maximum security
Improved surgical access
Atraumatic, soft rounded beveled tip
Murphy eye
Accurate positioning depth mark
Radiopaque line
Standard volume, low pressure cuff
Special cuff design provides an efficient low pressure seal
Valve integrated pilot pressure cuff with designated size and nominal outside diameter markings
Standard connector

Ref	Size	I.D. (mm)	O.D. (mm)
551 8030 1	3.0	3.0	4.5
551 8035 1	3.5	3.5	5.2
551 8040 1	4.0	4.0	5.9
551 8045 1	4.5	4.5	6.5
551 8050 1	5.0	5.0	7.1
551 8055 1	5.5	5.5	7.7
551 8060 1	6.0	6.0	8.4
551 8065 1	6.5	6.5	9.1
551 8070 1	7.0	7.0	9.8
551 8075 1	7.5	7.5	10.3
551 8080 1	8.0	8.0	11.0
551 8085 1	8.5	8.5	11.4
551 8090 1	9.0	9.0	12.0

TraGate
RAE Tracheal Tube, Oral, Cuffed Surgical Instruments / Product ...

Armored and Cuffed Preformed Curved Oral ETT

Laser ETT-Stainless Steel

Box 31.3 Operating Room Precautions for Laser Surgery

Preoperative Period

1. Arrange surgical drapes to avoid accumulation of combustible gases (O_2, N_2O).
2. Allow time for flammable skin preparations to dry.
3. Moisten gauze and sponges in vicinity laser beam.

Intraoperative Period

1. Alert surgeon and OR personnel about ignition risk.
2. Assign specific roles to each OR member in case of fire.
3. Use appropriate laser-resistant ETT.
4. Reduce inspired O_2 to minimal values (monitor Spo_2).
5. Replace N_2O with air.
6. Wait a few minutes after steps 3 to 5 before activating laser.

ETT, Endotracheal tube; *OR*, operating room; *Spo_2*, oxygen saturation measured by pulse oximetry.

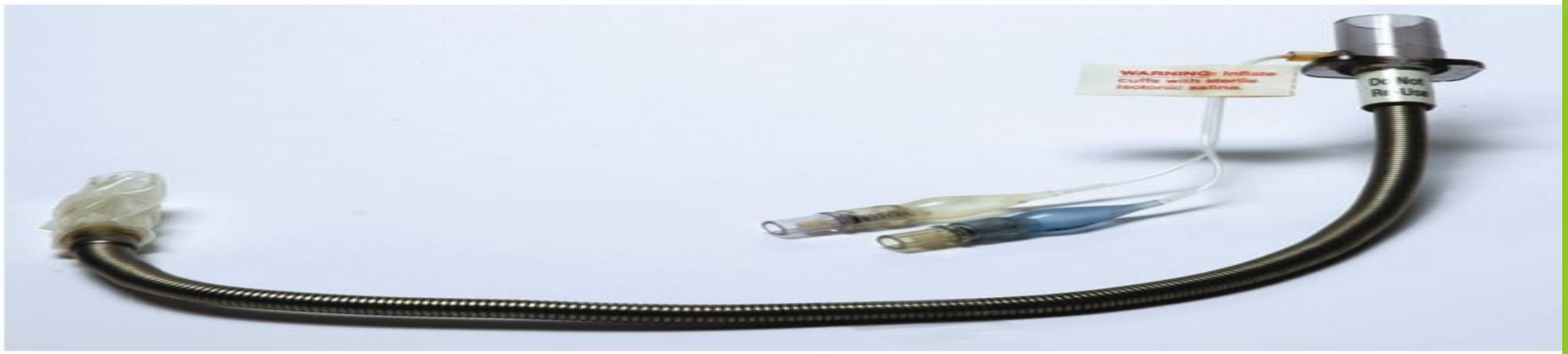
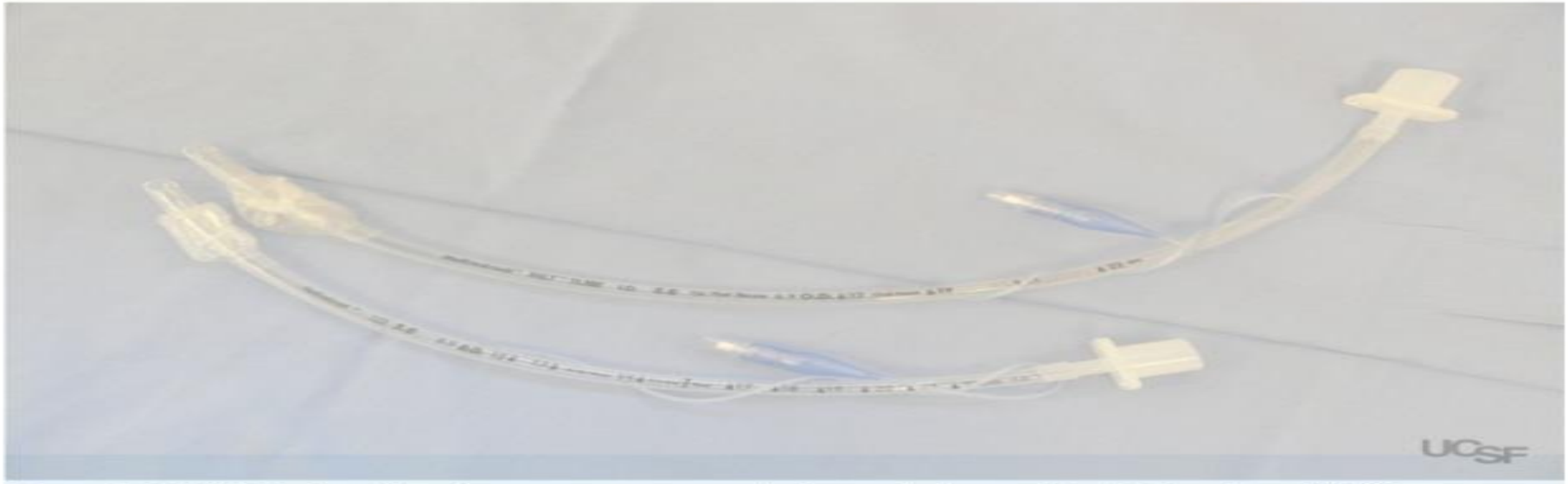


Fig. 31.5 Laser endotracheal tube—stainless steel.

Micro laryngoscopy Tube (MLT)

A microlaryngoscopy tube (also generally called '**MLT**', although this is a registered trademark) is in essence a **pediatric-sized standard ETT with an adult length** or an **adult standard ETT with a pediatric-sized diameter**, whichever way you want to look at it.



Size 5.0 MLT tube (top) versus same internal diameter 'standard' 5.0 pediatric tube (bottom)

'MLT' also stands for '**massively long tube**'!

VivaSight DL Tube

(Has Integrated Video Camera in the Tip ,confirming ETT Position Through Surgery)

Physical Examination of Airway

- Tall and Weight and Calculation of BMI
- Neck Extension(range of motion) and Cervical Spine Mobility
- Oral view (Mallampati class)
- Jaw opening and TM Joint
- Mouth opening(Three finger breadths or ..)
- Dentition
- Thyroid , Trachea and cricothyroid membrane
- External Facial Structure
- Nasal Passage Examination
- Speech : thickness and slurring of words
- Thyro Mental and Steno Mental Distance

Physical Examination of the Airway

- Oropharyngeal Space : 1- Mallampati Test 2-Inter Incisor Gap 3-Length of Upper Incisor 4- Relation of the Maxillary and Mandibular Incisors(During normal Jaw closure and Voluntary Protrusion of the Mandible) 4- Maxillary and Mandibular Teeth (Size and Position) 5- Palate Conformation 6- Maxillary Prominence and Receding Jaw 7- Submandibular Space and Compliance 8- Upper Lip Bite Test(ULBT)
- Atlanto Occipital Extension/ Cervical Spine Mobility)
- Length , Thickness of Neck(Circumference > 43 cm : difficult intubation)
- Jaw and Mouth Opening and TM Joint
- High Arched Palate and Macroglosia : Difficult intubation
- Decrease of Submandibular Compliance : prior neck surgery or burns , neck radiation and scar formation , Ludwigs angina , tumor or abscess

Pathologic States that influence Airway Management

Table 16.3 Pathologic States That Influence Airway Management

Pathologic State	Difficulty
Epiglottitis (infectious)	Laryngoscopy may worsen obstruction
Abscess (submandibular, retropharyngeal, Ludwig's angina)	Distortion of the airway renders face mask ventilation or endotracheal intubation extremely difficult
Croup, bronchitis, pneumonia	Airway irritability with a tendency for cough, laryngospasm, bronchospasm
Papillomatosis	Airway obstruction
Tetanus	Trismus renders oral endotracheal intubation impossible
Traumatic foreign body	Airway obstruction
Cervical spine injury	Neck manipulation may traumatize the spinal cord
Basilar skull fracture	Nasotracheal intubation attempts may result in intracranial tube placement
Maxillary or mandibular injury	Airway obstruction, difficult face mask ventilation and endotracheal intubation Cricothyroidotomy may be necessary with combined injuries
Laryngeal fracture	Airway obstruction may worsen during instrumentation Endotracheal tube may be misplaced outside the larynx and worsen the injury
Laryngeal edema (after intubation)	Irritable airway Narrowed laryngeal inlet
Soft tissue neck injury (edema, bleeding, subcutaneous emphysema)	Anatomic distortion of the upper airway Airway obstruction
Neoplastic upper airway tumors (pharynx, larynx)	Inspiratory obstruction with spontaneous ventilation
Lower airway tumors (trachea, bronchi, mediastinum)	Airway obstruction may not be relieved by endotracheal intubation Lower airway is distorted
Radiation therapy	Fibrosis may distort the airway or make manipulation difficult
Inflammatory rheumatoid arthritis	Mandibular hypoplasia, temporomandibular joint arthritis, immobile cervical vertebrae, laryngeal rotation, and cricoarytenoid arthritis make endotracheal intubation difficult
Ankylosing spondylitis	Fusion of the cervical spine may render direct laryngoscopy impossible
Temporomandibular joint syndrome	Severe impairment of mouth opening
Scleroderma	Tight skin and temporomandibular joint involvement make mouth opening difficult
Sarcoidosis	Airway obstruction (lymphoid tissue)
Angioedema	Obstructive swelling renders ventilation and endotracheal intubation difficult
Endocrine or metabolic acromegaly	Large tongue Bony overgrowths
Diabetes mellitus	May have decreased mobility of the atlanto-occipital joint
Hypothyroidism	Large tongue and abnormal soft tissue (myxedema) make ventilation and endotracheal intubation difficult
Thyromegaly	Goiter may produce extrinsic airway compression or deviation

Airway Assessment

- Head and Neck Mobility Assessment : Steno Mental Distance in fully Extension of Head and Mouth closed Position (Distance < 12.5 cm : DI)
- Neck Range of Motion : Measurement the angle Created by the Forehead when the Neck is fully flexed and fully extend (< 80 degree is predictive of DI)
- Sub Mandibular Space : Space for Tongue displacement During DL, measured by Thyromental Distance (Thyroid Notch to Lower Border of the Mentum) , less than< 6.5 cm (3 Fingerbreadth) is indicative of reduced Mandibular Space and DI as seen in small Mandible (Anterior Larynx) also lack of Compliance or Mass in this Space is important
- Test of the Ability for Mandibular protrusion (Prognatism) such as ULBT
- Mallampati : predict DI based on the size of base of Tongue
- Mouth opening : Inter Incisor Distance with maximal opening< 3 cm(2 fingerbreadth) suggest DI

Component of the Preoperative Airway Physical Examination

Airway Examination Component	Nonreassuring Findings
Length of upper incisors	Relatively long
Relationship of the maxillary and mandibular incisors during normal jaw closure	Prominent overbite (maxillary incisors anterior to the mandibular incisors)
Relationship of the maxillary and mandibular incisors during voluntary protrusion of the mandible	Patient cannot bring the mandibular incisors anterior to (in front of) the maxillary incisors
Interincisor distance	Less than 3 cm
Visibility of the uvula	Not visible when the tongue is protruded with the patient in a sitting position (Mallampati class higher than II)
Shape of the palate	Highly arched or very narrow
Compliance of the mandibular space	Stiff, indurated, occupied by a mass, or nonresilient
Thyromental distance	Less than three fingerbreadths
Length of the neck	Short
Thickness of the neck	Thick
Range of motion of the head and neck	Patient cannot touch the tip of the chin to the chest or cannot extend the neck

Signs, Symptoms, and Disorders with Airway Management Implications

TABLE 27-2. SIGNS, SYMPTOMS, AND DISORDERS WITH AIRWAY MANAGEMENT IMPLICATIONS

Aspiration risk
- History of voice changes
- History of vocal cord polyps
- History of frequent pneumonias
- Coughing after eating/drinking
- Acute narcotic therapy
- Acute trauma
- Intensive care unit admission (current)
- Pregnancy (gestational age ≥12 weeks)
- Immediate postpartum (before second postpartum day)
- Systemic disease associated gastroparesis: Diabetes mellitus, postvagotomy, collagen vascular disease, Parkinson disease, thyroid dysfunction, liver disease, CNS tumors, chronic renal insufficiency

Difficult laryngoscopy/SGA ventilation
- History of surgical manipulation in or around the airway
- History of radiation therapy of the head/neck
- Various congenital and acquired syndromes (Table 29-3)

Obstructive sleep apnea
- Body mass index >35 kg/m^2 (indicative)
- Loud snoring
- Pauses in breathing during normal sleep
- Sleep interruption (with choking)
- Daytime somnolence/napping
- Airway affecting craniofacial abnormalities

Lingual tonsil hyperplasia/supraglottic cyst or tumors
- Chronic sore throat
- Globus sensation
- Voice change
- Dysphagia
- Obstructive sleep apnea
- History of tonsillectomy (controversial)[18]

Thyroglossal duct cyst
- Asymptomatic anterior cervical mass that moves with deglutination
- Complications: Cysts infection, fistula, spontaneous rupture, voice change, dysphagia, dyspnea, and snoring

Signs and symptoms related to the airway
- Snoring
- Changes in voice
- Dysphagia
- Stridor
- Bleeding
- Cervical spine pain or limited range of motion
- Upper extremity neuropathy
- Temporomandibular joint pain or dysfunction

Sequelae of previous intubation
- Chipped teeth
- Significant prolonged sore throat/mandible after a previous anesthetic

Airway Indexes Measurement

Thyromental distance: Measured along a straight line from tip of mentum to thyroid notch in neck-extended position

Mouth opening: Interincisor distance (or interalveolus distance when edentulous) with the mouth fully opened[19]

Mallampati score (see Fig. 27-7)

Head and neck movement: The range of motion from full extension to full flexion[20]

Ability to prognath: Capacity to bring the lower incisors in front of the upper incisors[19]

Sensitivity and Specificity of Airway Evaluation Methods

Examination	Sensitivity (%)	Specificity (%)
Mallampati classification	49	86
Thyromental distance	20	94
Sternomental distance	62	82
Mouth opening	46	89

Risk Score for Difficult Intubation

Number of Risk Factor[a]	Incidence of Difficult Intubation
0	0
1	2%
2	4%
3	8%
4 or 5	17%

[a]Presence of upper front teeth, History of a difficult intubation, Mallampati >1, Mallampati of 4, mouth opening <4 cm.

ULBT(Upper Lip Bite Test)
Predicting Difficult Intubation

Airway Factors and Difficult Intubation Score

Airway factors	Score		
	0	1	2
Mallampati classification	Class I	Class II	Class III−IV
Thyromental distance (cm)	> 6.5	6−6.5	< 6
Head & neck movement (°)	> 90	90	< 90
BMI (kg/m^2)	< 25	≥ 25	-
Buck teeth	No	Mild	Severe
Inter-incisor gap (cm)	> 5	4−5	< 4
ULBT	Class I	Class II	Class III

BMI: body mass index, ULBT: upper lip bite test.

Cervical Spine Mobility

- Extension of Head on the Atlanto-Occipital Joint is Important for Aligning the Oral and Pharyngeal Axes . Normal is 35 Degree and 30% limitation is associated with increased risk of Difficult ETT placement (or less than 80 Degrees of Flexion/Extension)
- Flexion of the Lower Neck (elevating the head 10 cm) aligne Laryngeal and Pharyngeal Axes

Sub Mandibular Space Pathology (limits Space or Compliance)

- Ludwigs Angina
- Tumors or Masses
- Radiation Scarring
- Burns
- Previous Neck Surgery
- Micognathia

Micrognathia:

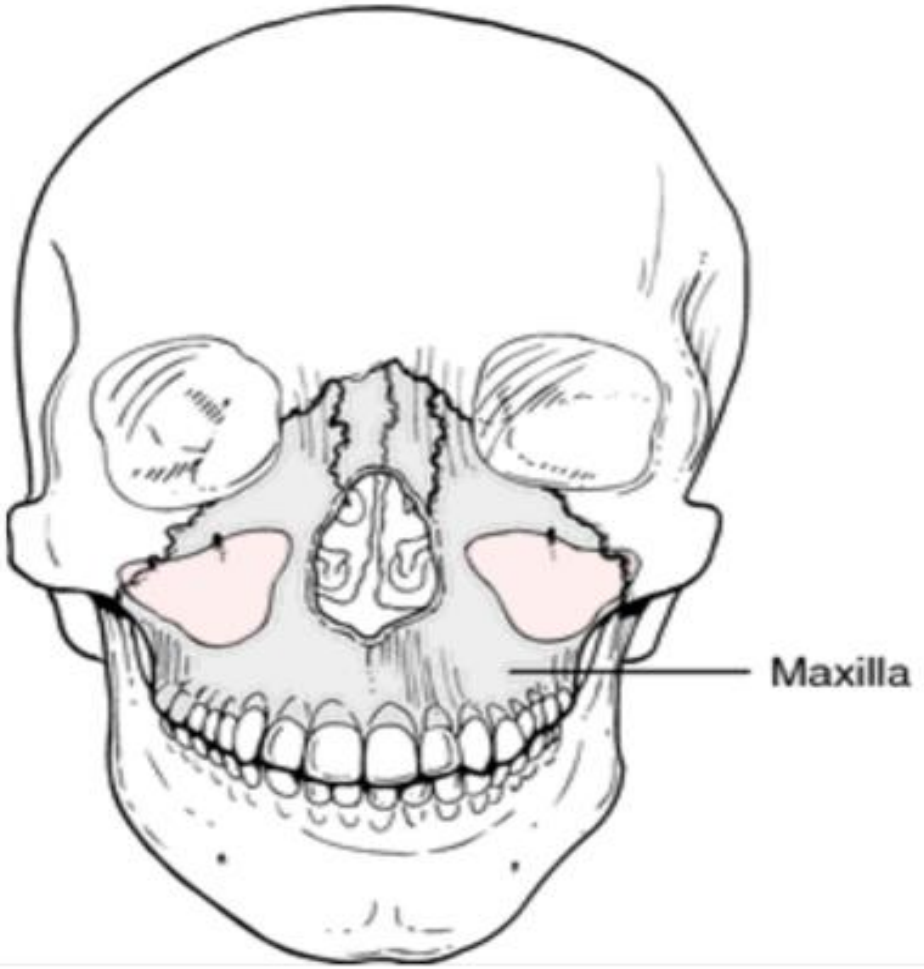
Decrease sub mandibular Space and induce Anterior Glottis

Microgenia

Recede Jaw : Before and After Surgery

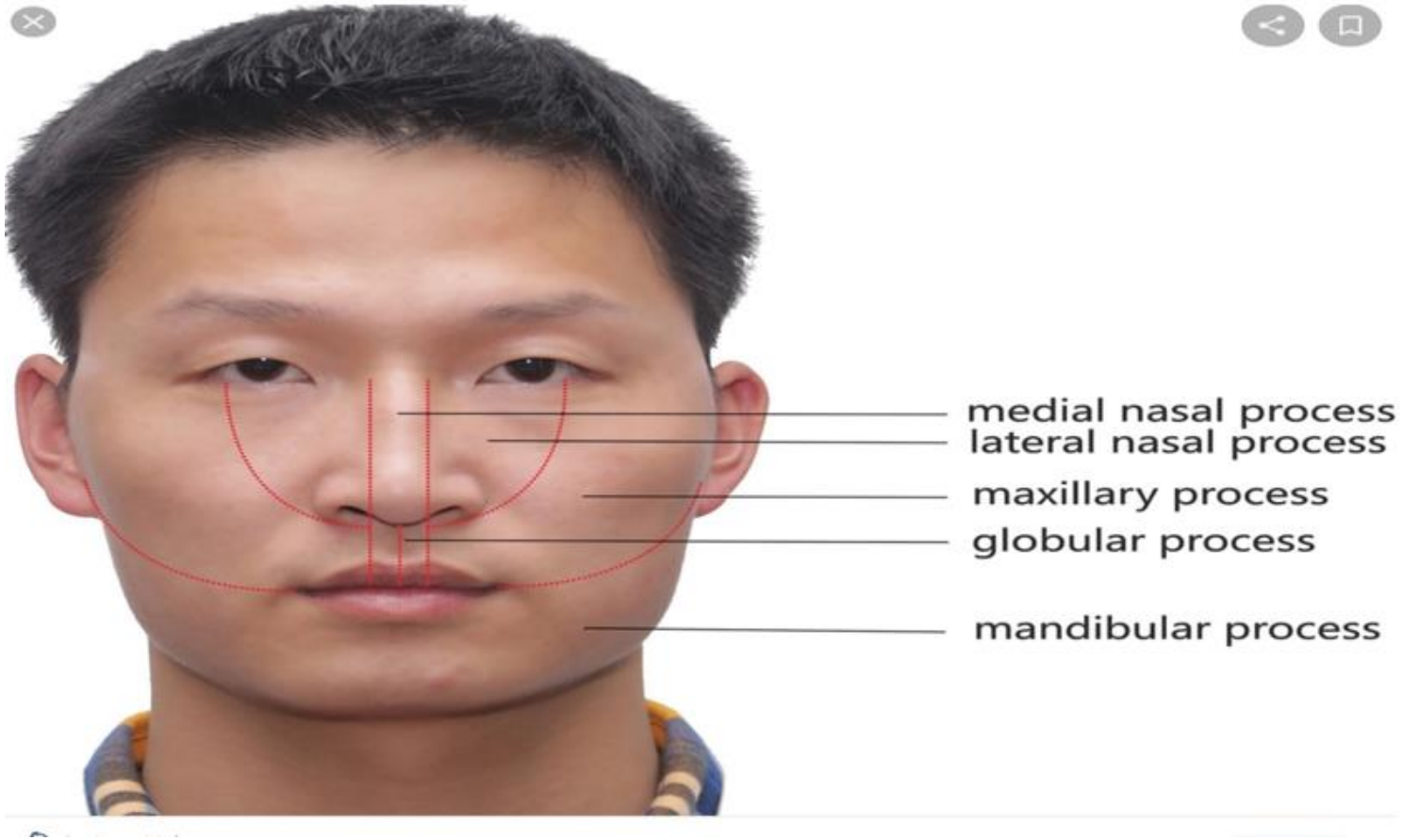
(Lesser Sterno Mental distance in short neck or Recede jaw result in DI)

Maxillary Prominence



Maxillary Prominence:

Decrease effective inter Incisor gap and result in DI



Mylohyoid Line

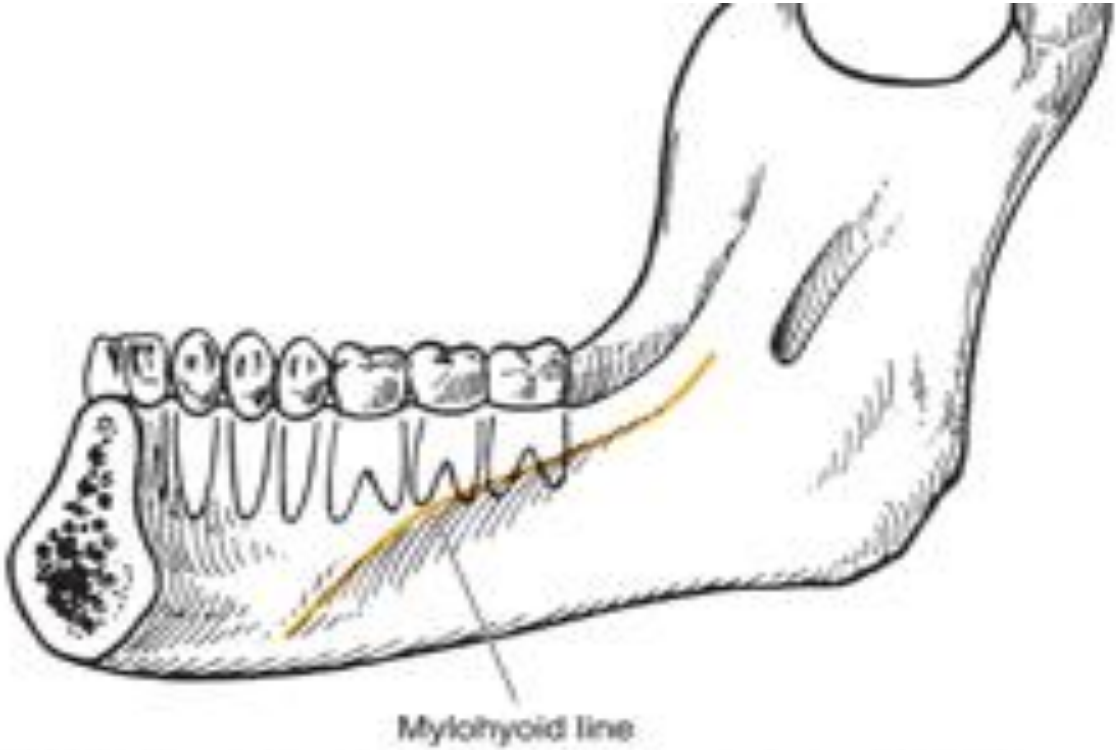


Fig. 9.3 The mylohyoid line is the attachment of the mylohyoid muscle. Infections above this line affect the sublingual space and infections below affect the submandibular space.

Ludwig Angina
(swelling of Bilateral Sublingual Spaces Causing the tongue Obstruct the Upper Airway)

Ludwig Angina with Swelling of Bilateral Upper neck

Fig. 9.4 A patient with Ludwig angina with swelling of spaces causing the tongue to obstruct the upper airwa

Mallampati Ciassification

- Class I : Uvula, fauces, soft palate, pillars visible.
- Class II : Uvula, Soft palate, fauces visible.
- Class III : Base of uvula visible, Soft palate, .
- Class IV : Only hard palate visible

Mallampati Classification

FIGURE 27-7. Mallampati/Samsoon–Young classification of the oropharyngeal view.[77] **A:** Class I: uvula, faucial pillars, soft palate visible. **B:** Class II: Faucial pillars, soft palate visible. **C:** Class III: Soft and hard palate visible. **D:** Class IV: Hard palate visible only (added by Samsoon and Young).

Cormack-Lehan Laryngeal view Scoring System

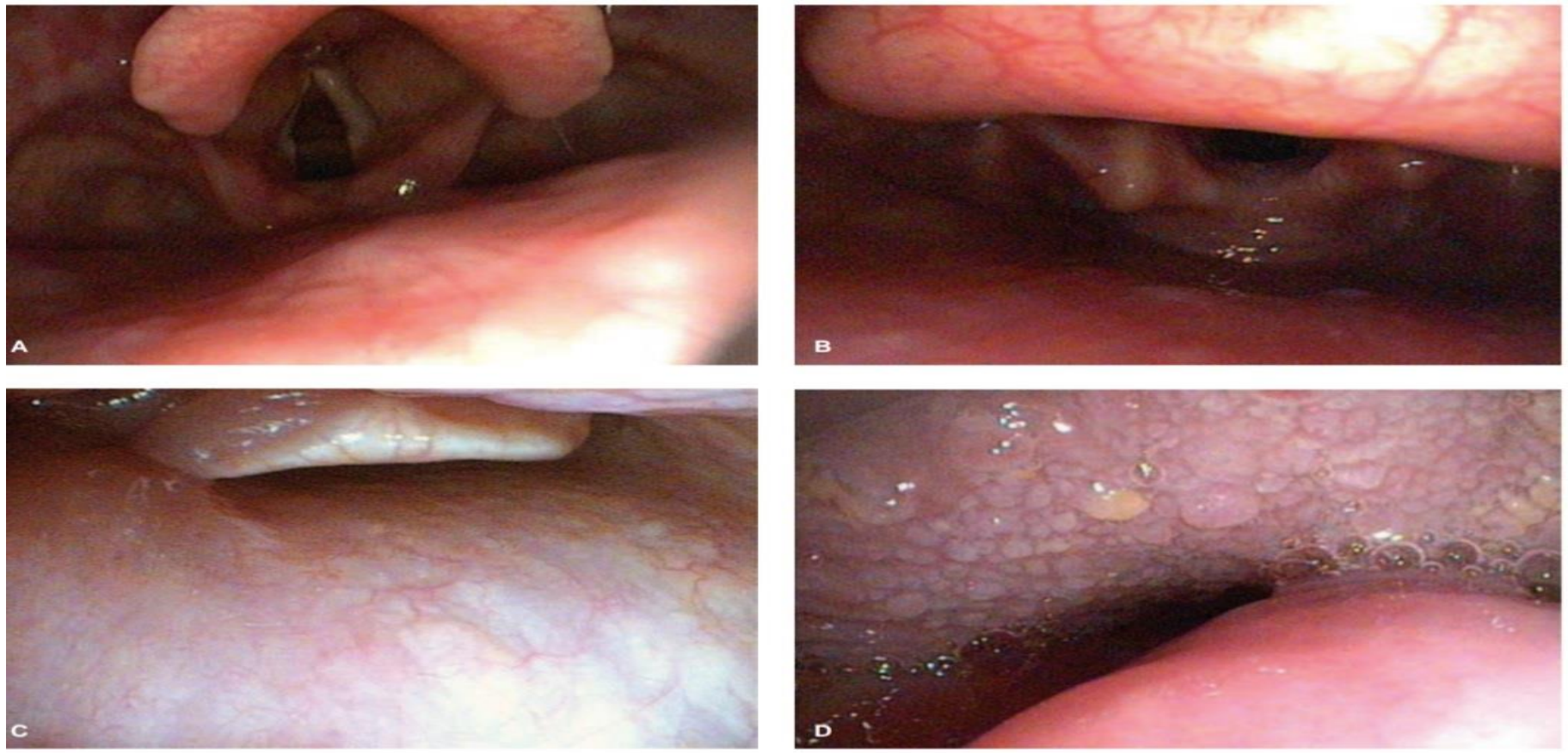


FIGURE 27-10. The Cormack–Lehane laryngeal view scoring system: Grade 1 **(A)**, grade 2 **(B)**, grade 3 **(C)**, and grade 4 **(D)**.

Laryngoscopic View (Four Grade)

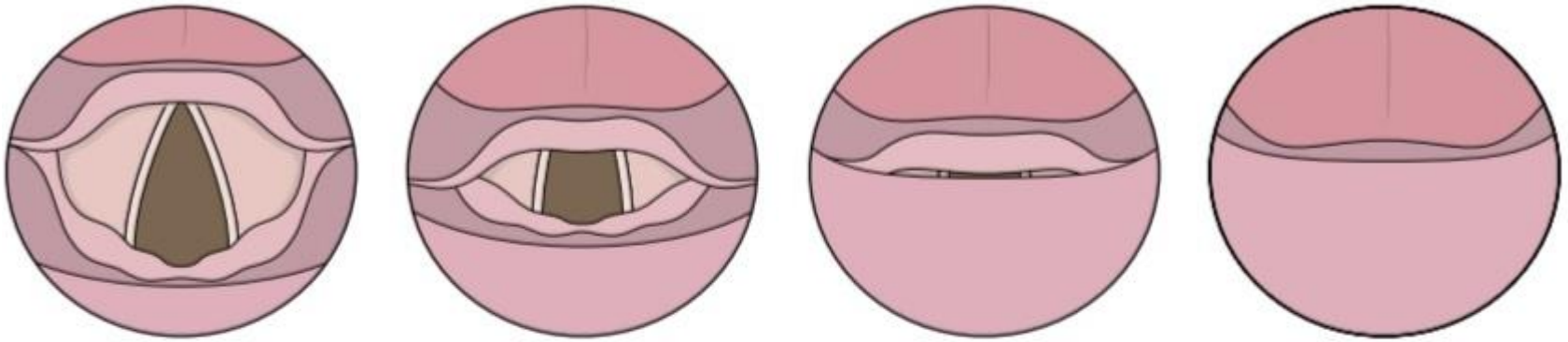


Fig. 16.12 Four grades of laryngoscopic view. Grade I is visualization of the entire laryngeal aperture, grade II is visualization of just the posterior portion of the laryngeal aperture, grade III is visualization of only the epiglottis, and grade IV is visualization of just the soft palate. (From Cormack RS, Lehane J. Difficult tracheal intubation in obstetrics. *Anaesthesia.* 1984;39(11):1105-1111.)

Lingual Tonsil Hyperplasia

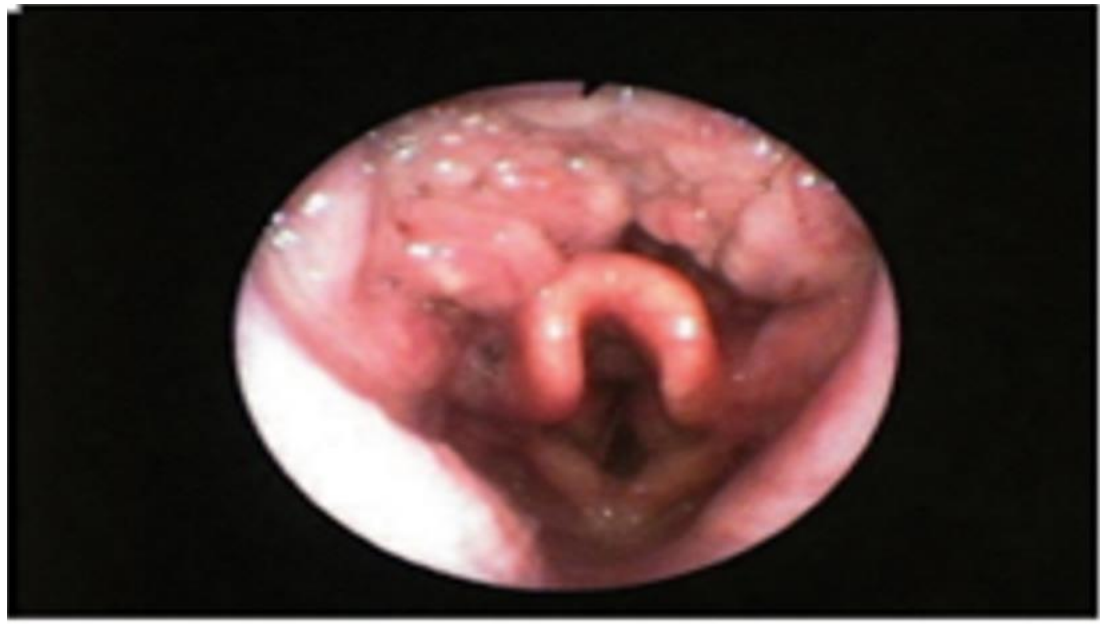


FIGURE 27-8. Lingual tonsil hyperplasia: The vallecula is filled with hyperplastic lymphoid tissue in a patient who had an unanticipated difficult direct laryngoscopy.

Laryngeal Sarcoidosis

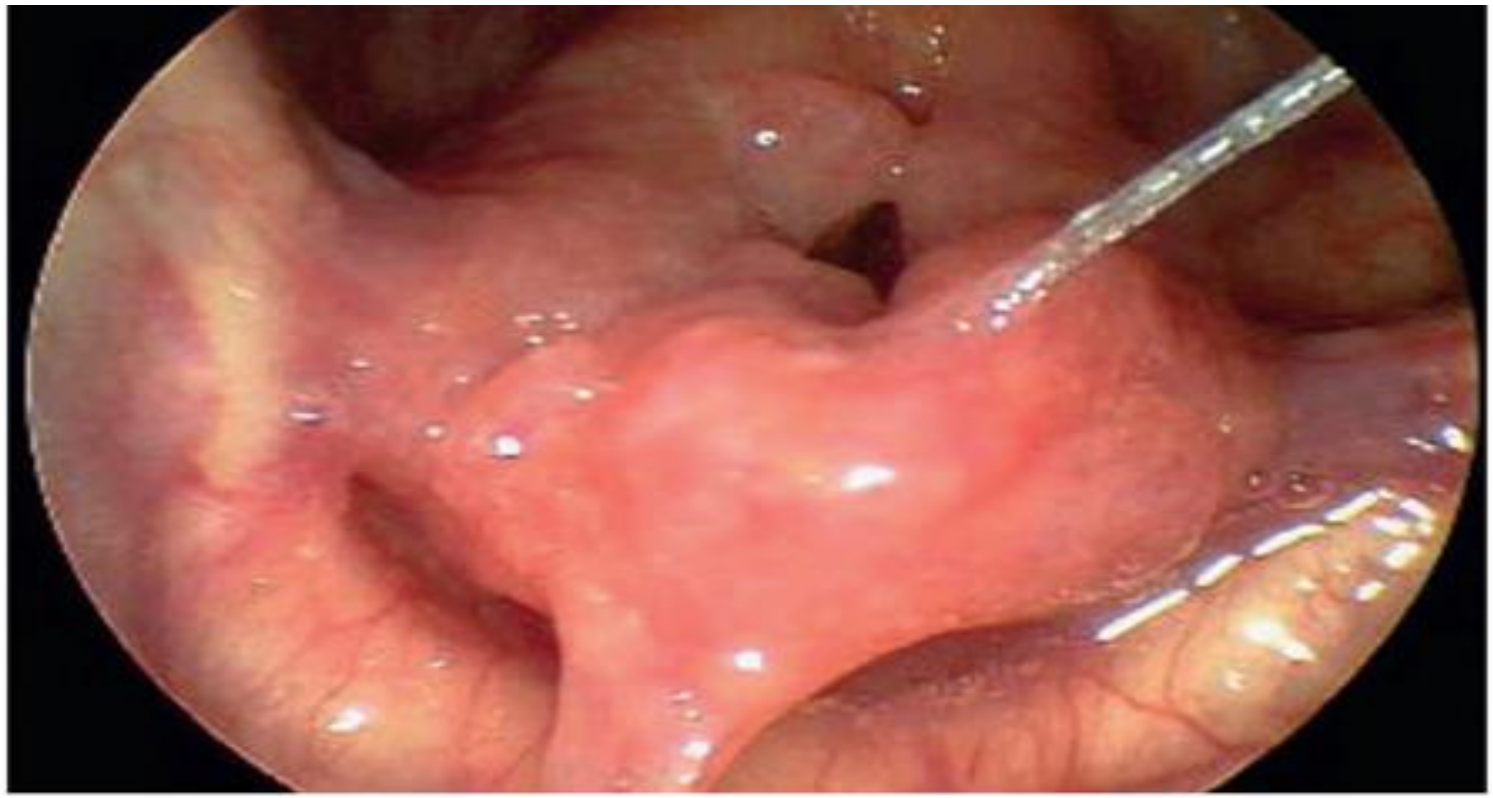


Fig. 11.3 Laryngeal sarcoidosis. Note the hyoepiglottic ligament and the prominence of the hyoid bone. The epiglottis has the classic nodular and turbanlike appearance.

Laryngeal Amyloidosis

Fig. 11.4 Laryngeal amyloid deposition in the supraglottis (right ventricular fold, laryngeal surface of epiglottis) and sparing of the true vocal folds. The patient came to medical attention with hoarseness and a nonproductive cough.

`Peri Tonsilar Swelling (Space Tumor)

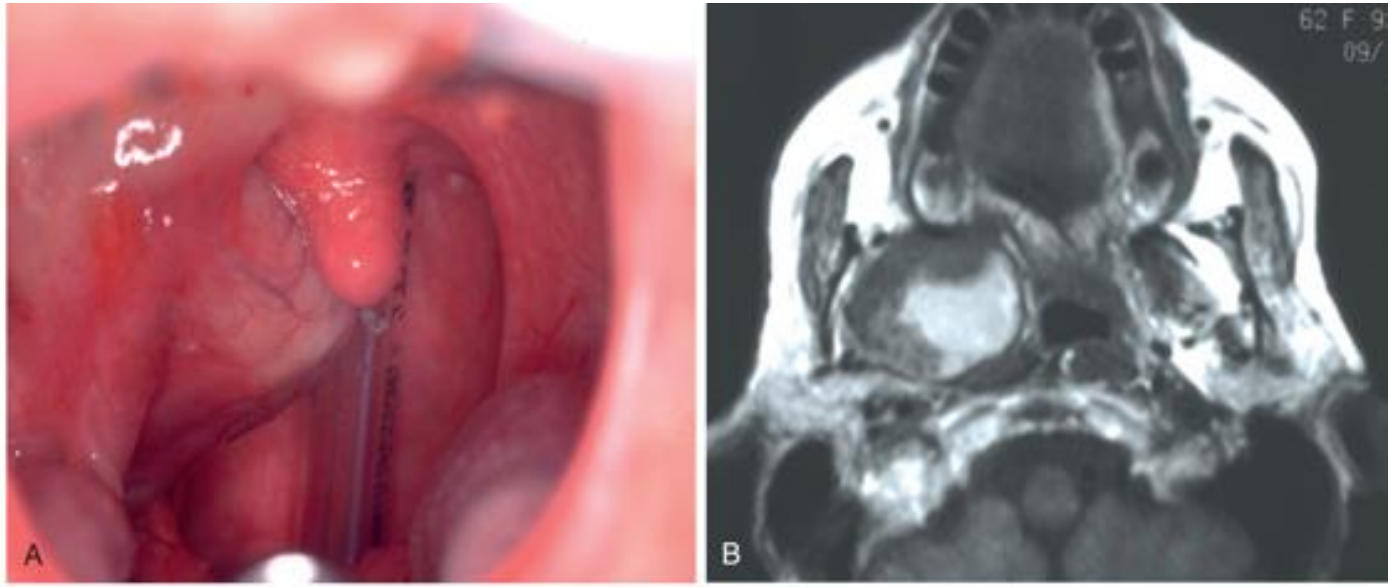


Fig. 9.8 Right peritonsillar swelling without pain or inflammation (A) is shown to be due to a right parapharyngeal space tumor on CT imaging (B).

Rheumatoid Arthritis (Larynx View)

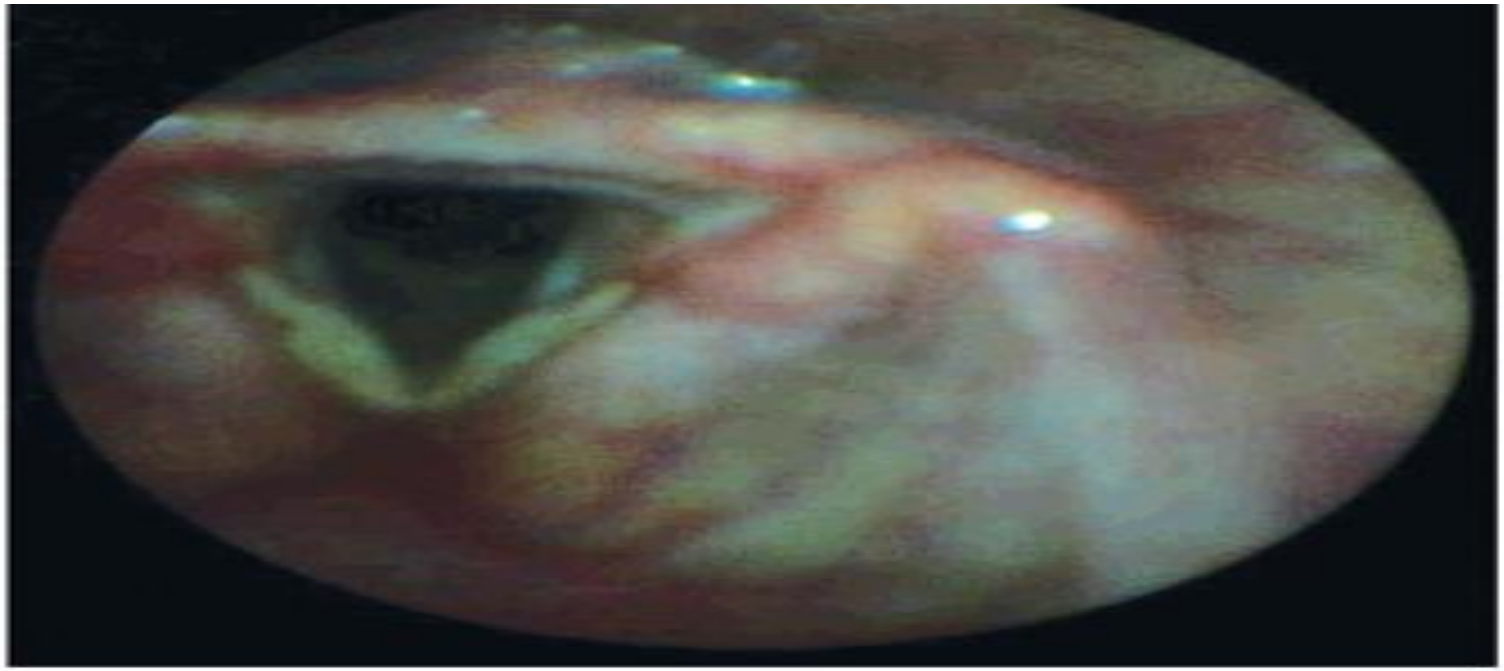
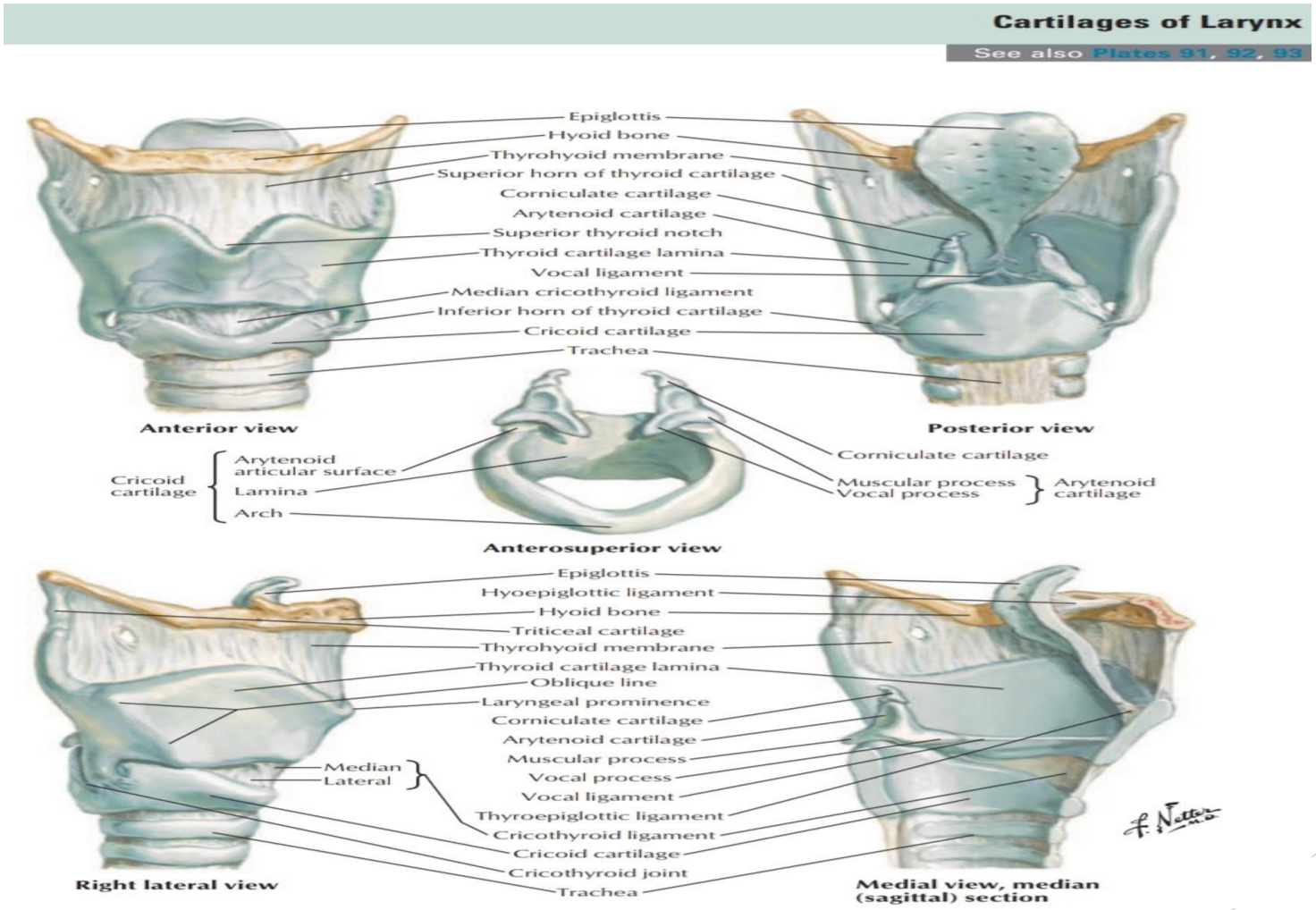
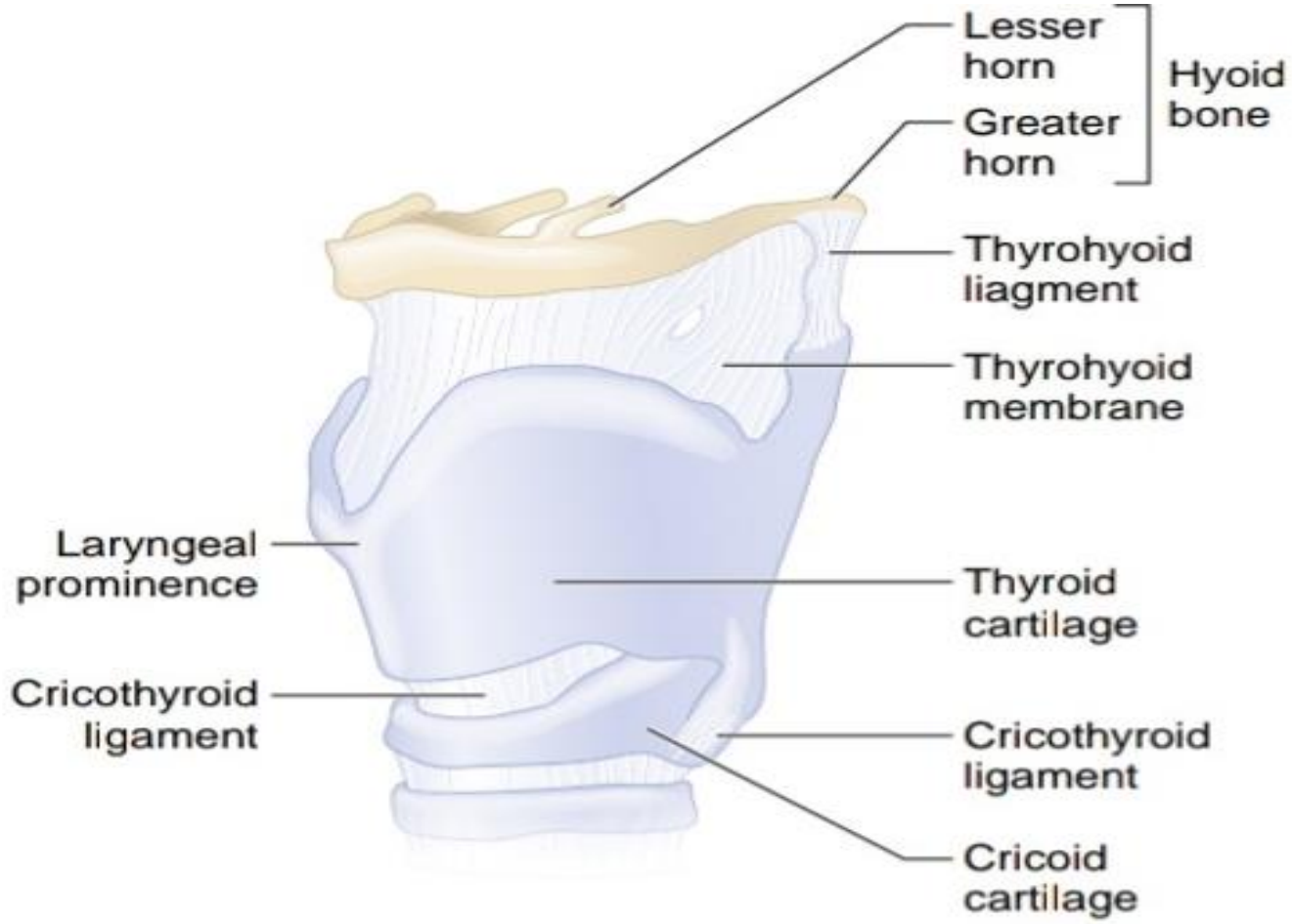


Fig. 11.5 This patient reporting hoarseness was known to have rheumatoid arthritis. Fiberoptic examination showed bilateral midfold thickening.

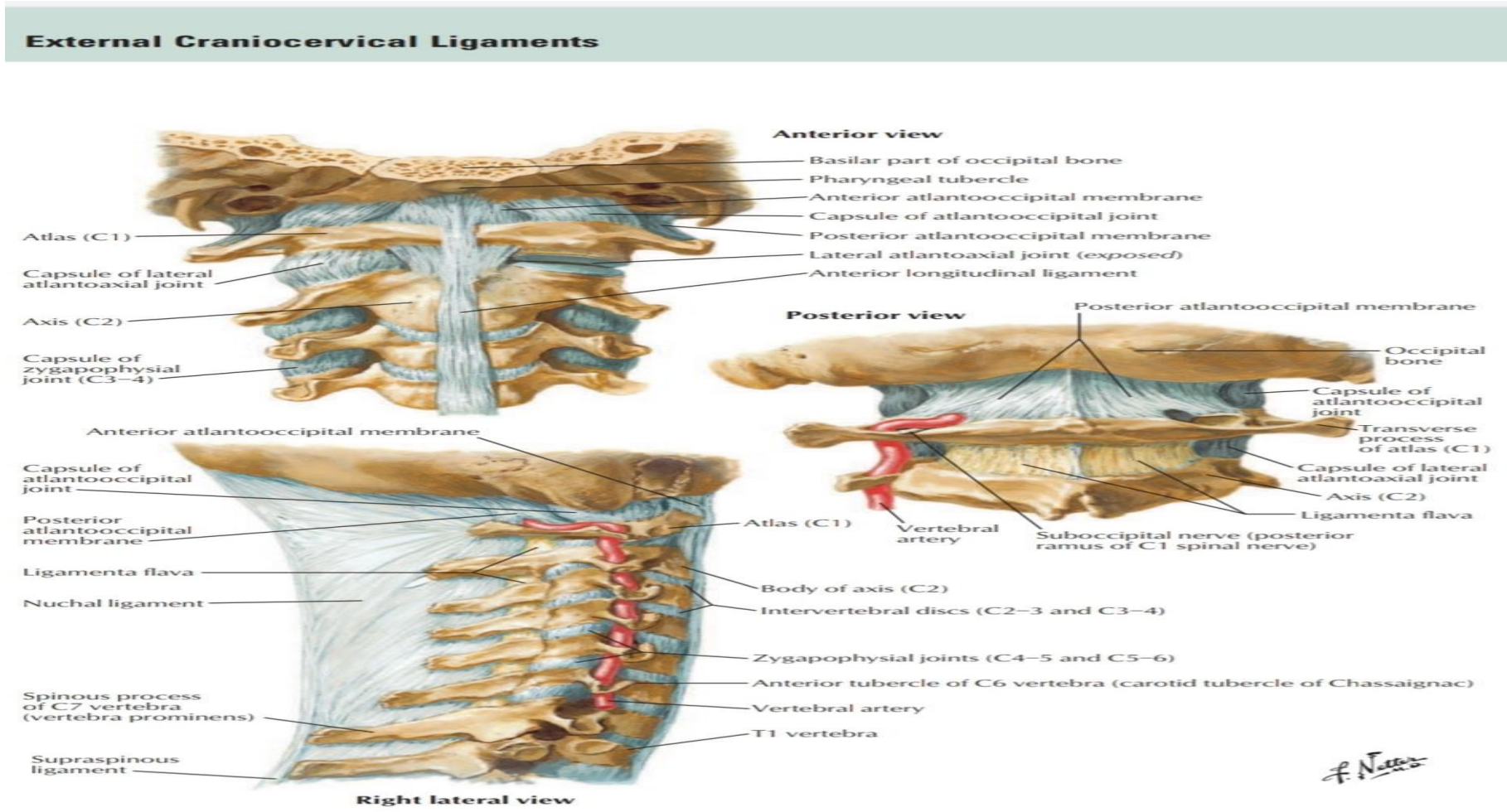
Anatomy of Larynx



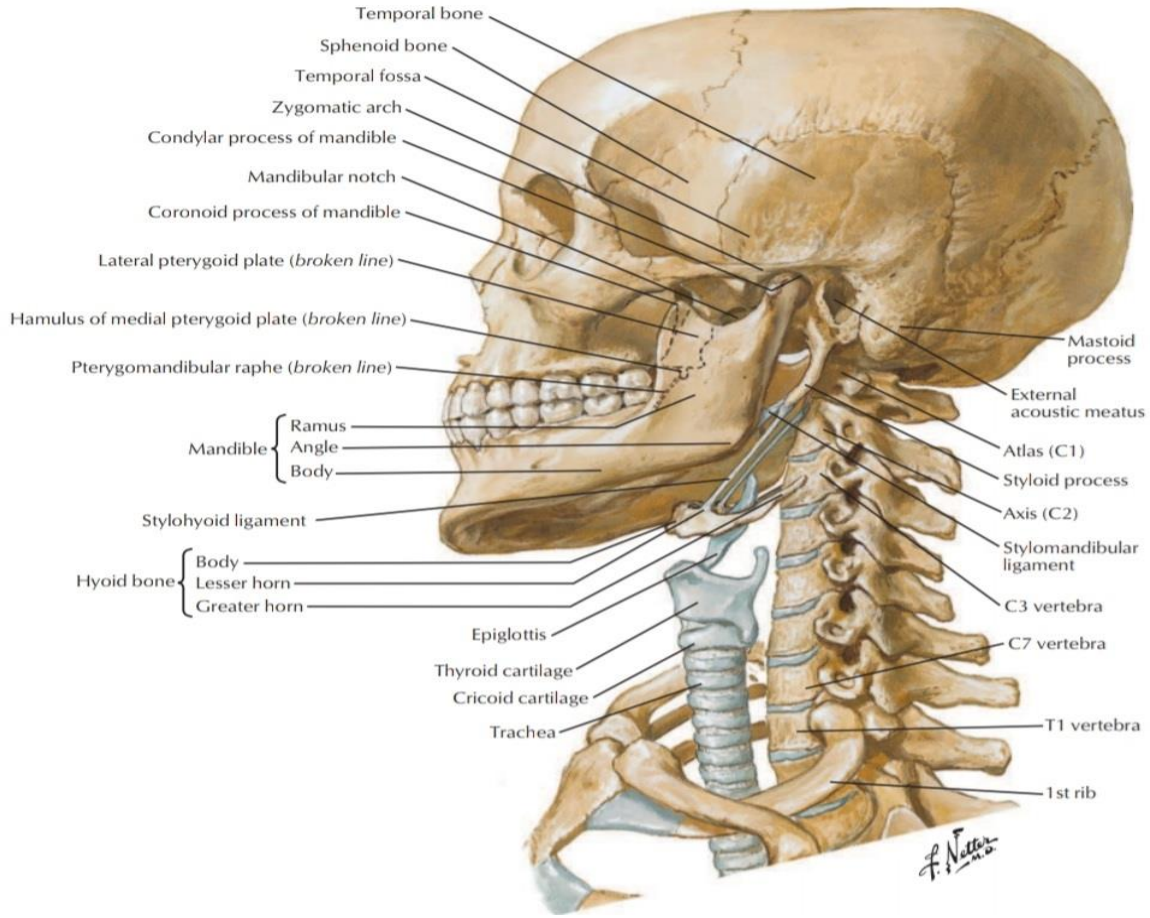
Cartilaginous and Membranous components of the Larynx



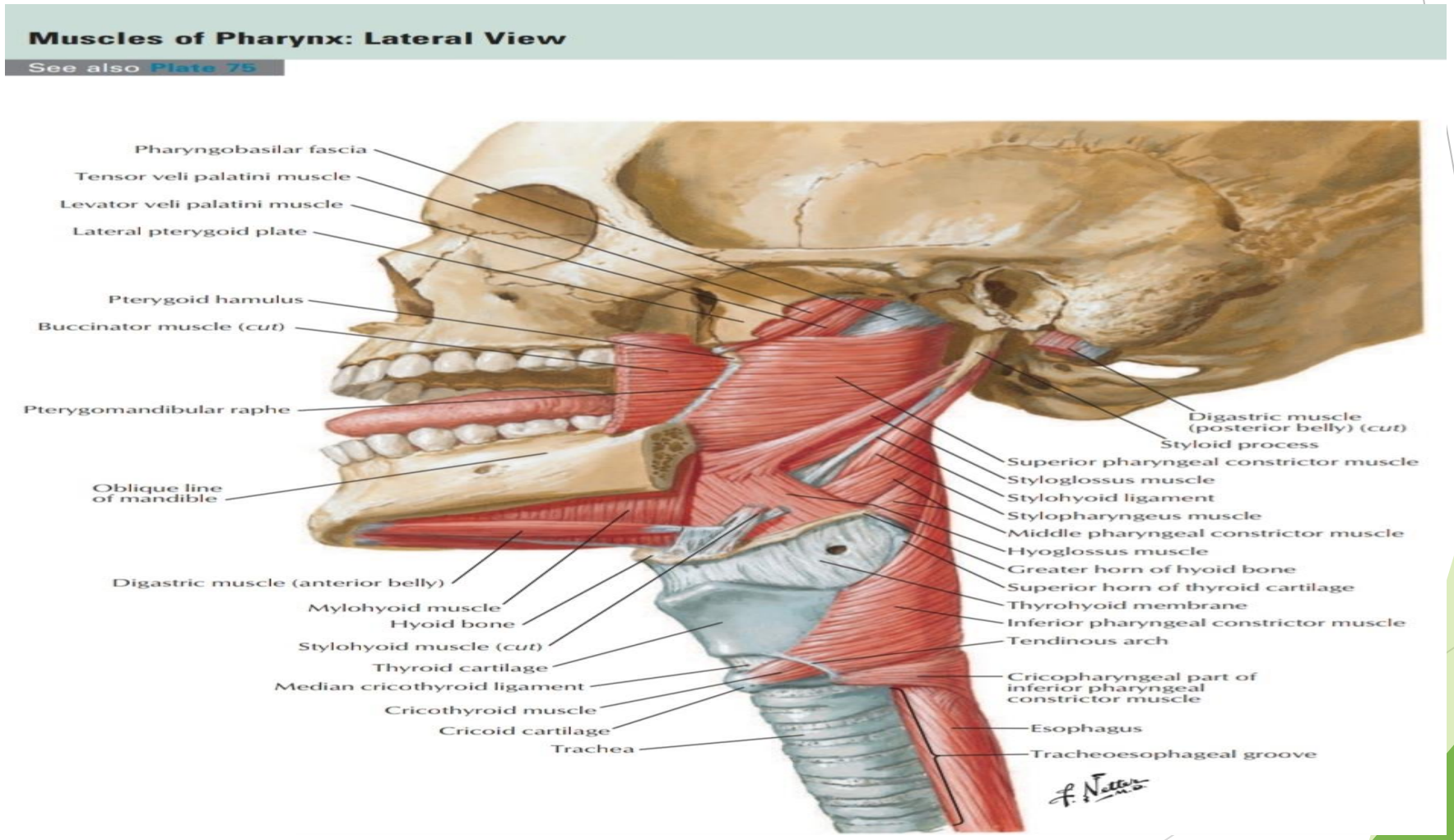
Cervical spine and External Craniocervical Ligaments



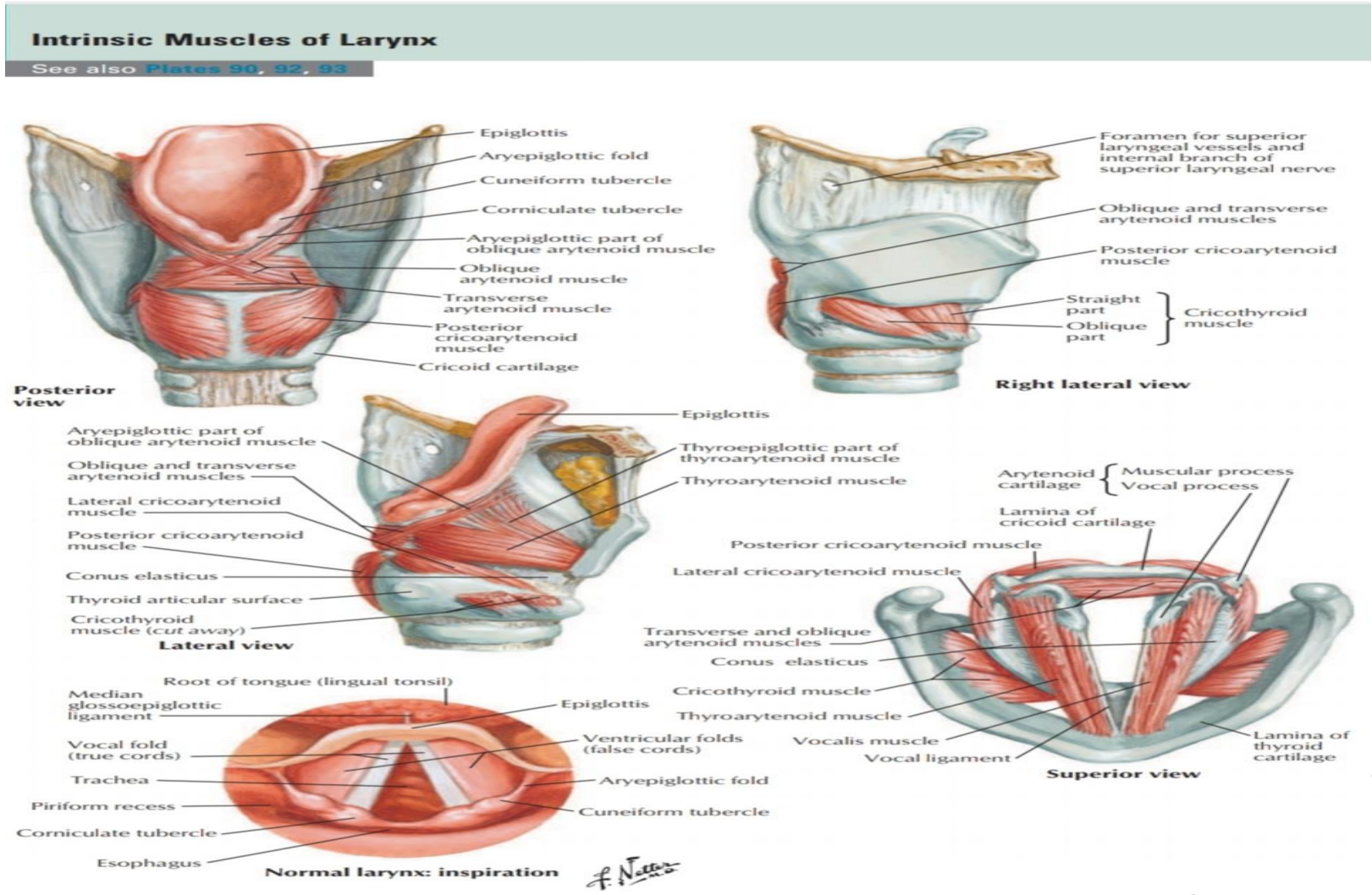
Cervical Spine and Larynx



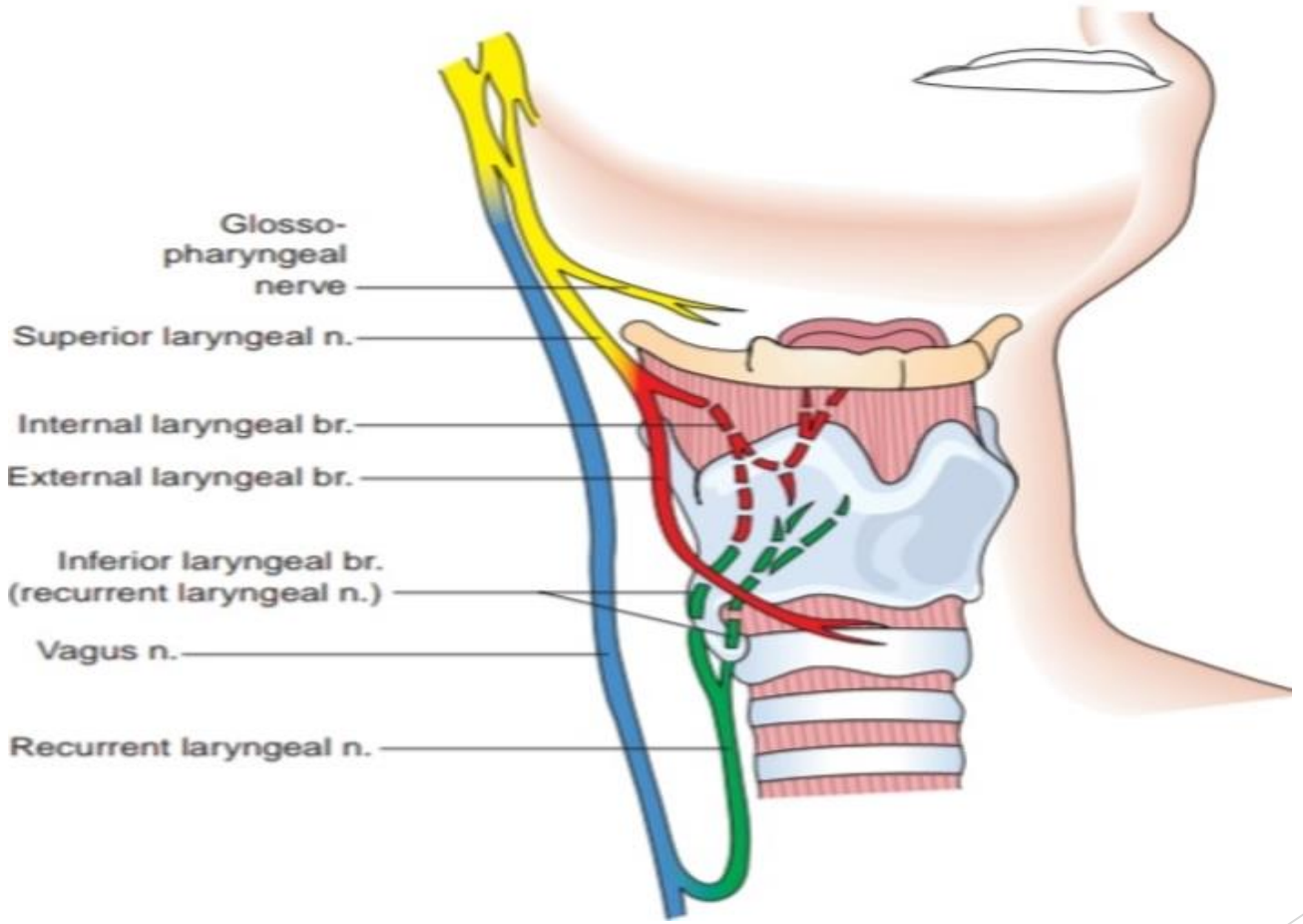
Muscles of Pharynx (lateral view)



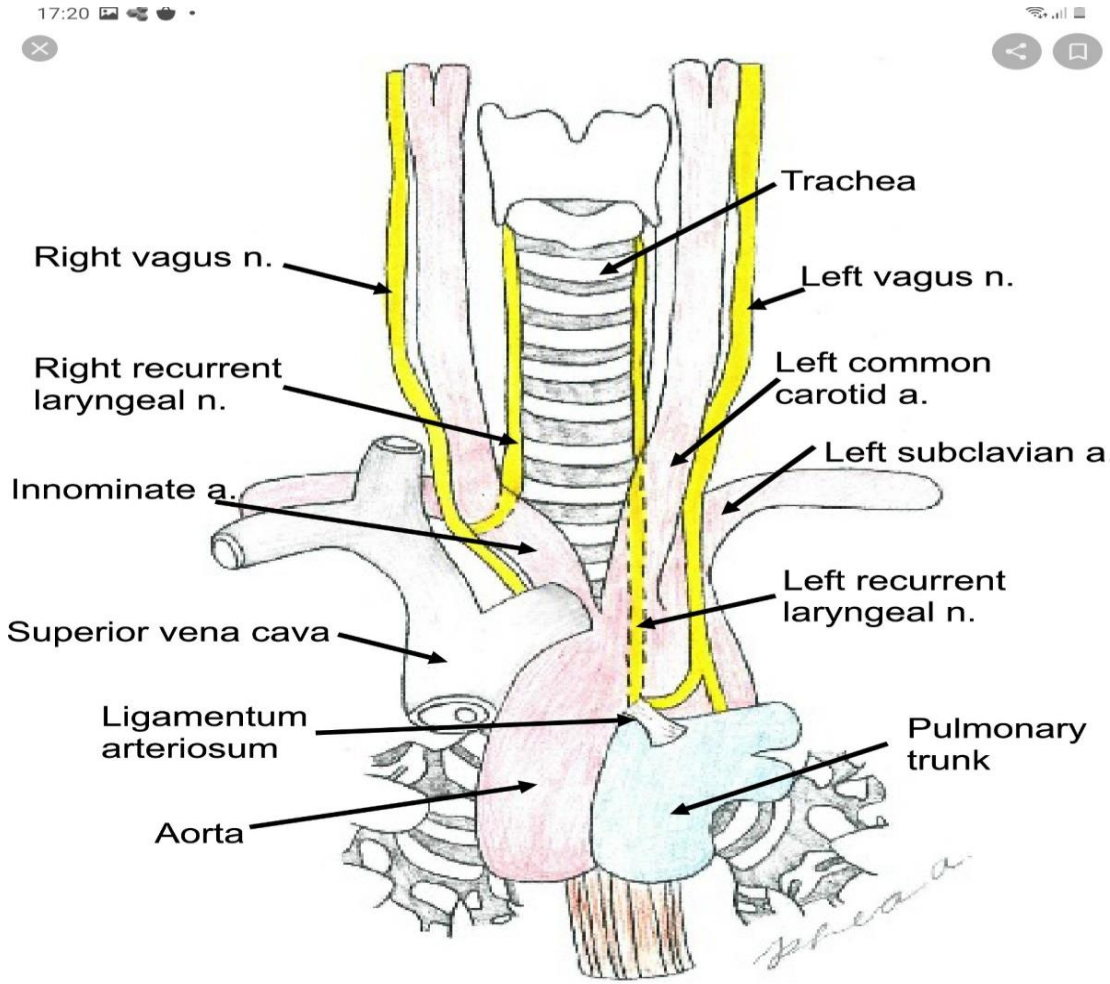
Intrinsic Muscles of Larynx



Laryngeal Innervation



Motor and Sensory Innervation of Larynx



Motor and Sensory Innervation of Larynx

Nerve	Sensory	Motor
Superior laryngeal, internal division	Epiglottis Base of tongue Supraglottic mucosa Thyroepiglottic joint Cricothyroid joint	None
Superior laryngeal, external division	Anterior subglottic mucosa	Cricothyroid membrane
Recurrent laryngeal	Subglottic mucosa Muscle spindles	Thyroarytenoid membrane Lateral cricoarytenoid membrane. Interarytenoid membrane Posterior cricoarytenoid membrane

Evaluation of the Patient

Fig. 5.3 Patient with thick neck, 68 inches tall, and 95 kg, viewed by the anesthesiologist as an easy airway. Mallampati class I oral view. Airway algorithm for elective surgery: mask ventilation easy; direct laryngoscopy times one with a Macintosh No. 4 with full grade I laryngoscopic view. (Courtesy Johns Hopkins Medical Institutions, Baltimore, MD.)

Evaluation of the Patient

Fig. 5.4 Patient evaluated with a tongue blade to have a Mallampati class II airway and anticipated easy intubation with conventional laryngoscopy. Airway algorithm for elective surgery: mask ventilation easy; unsuccessful direct laryngoscopy with a Macintosh No. 3/4, Miller No. 2/3 times four; successful asleep video-assisted laryngoscope and intubation with a No. 7.0 endotracheal tube with view of complete glottic opening. (Courtesy Johns Hopkins Medical Institutions, Baltimore, MD.)

Post Operative Evaluation of the Patient

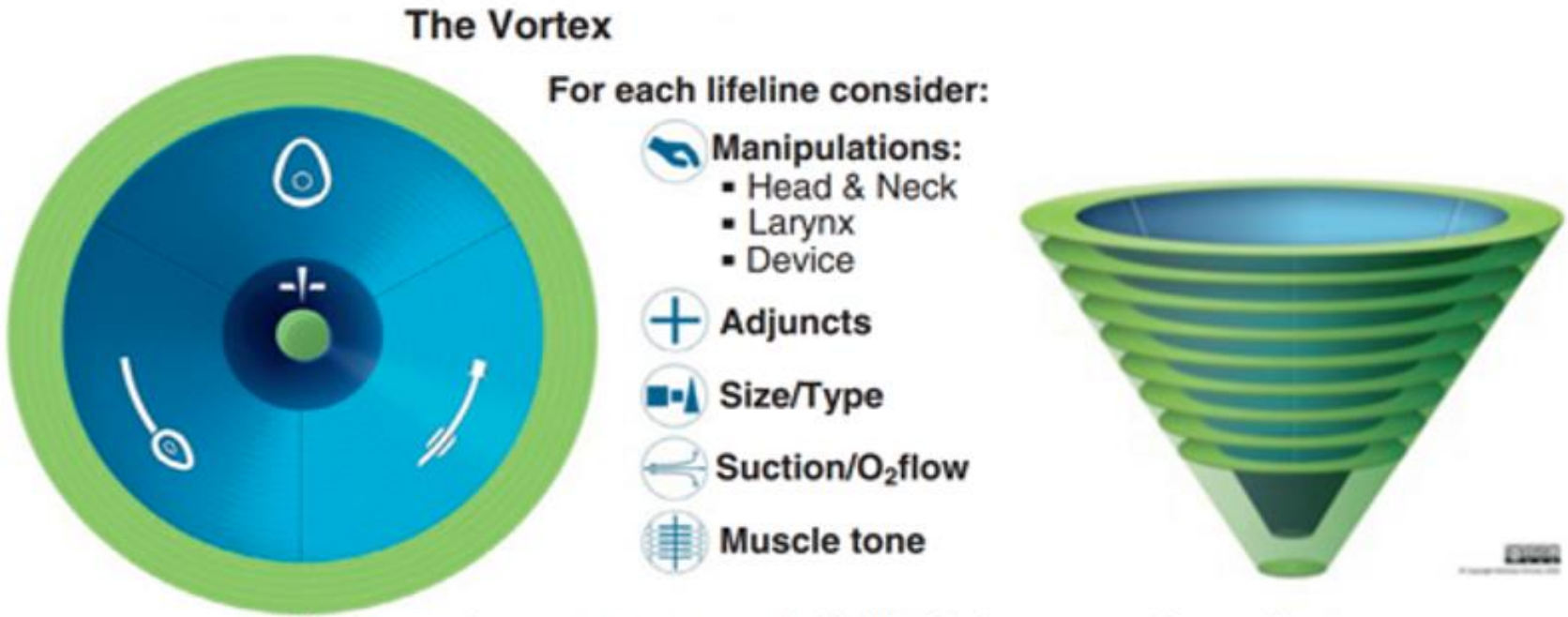
Fig. 5.5 Postoperative evaluation of the patient in Fig. 5.4. Note that without the tongue blade, the patient has a Mallampati class IV airway and should have been considered to be an anticipated difficult intubation with conventional laryngoscopy. (Courtesy Johns Hopkins Medical Institutions, Baltimore, MD.)

Vortex Approach

Table 28-18 The Vortex Approach: Maneuvers and Alterations between Noninvasive Airway Attempts

Manipulation: head, neck, larynx
Change in device or device size
Change in operator
Airway adjuncts: oral/nasal airways, bougie, suction
Pharmacologic adjuncts: muscle relaxants, reversal agents

Vortex Approach to Airway Management



Maximum three attempts at each lifeline (unless gamechanger)
at least one attempt should be by most experienced clinician
CICO (Can't Intubate, Can't Oxygenate) status escalates with unsuccessful best effort at any lifeline

Difficult Airway Response Team Cart Arrangement of Equipment

Fig. 5.8 Difficult Airway Response Team cart arrangement of equipment. The cart includes laryngeal mask airway, video bronchoscope, rigid laryngoscopes, rigid bronchoscopes, Eschmann stylet, surgical scalpel, and tracheotomy tubes. (Courtesy Johns Hopkins Medical Institutions, Baltimore, MD.)

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