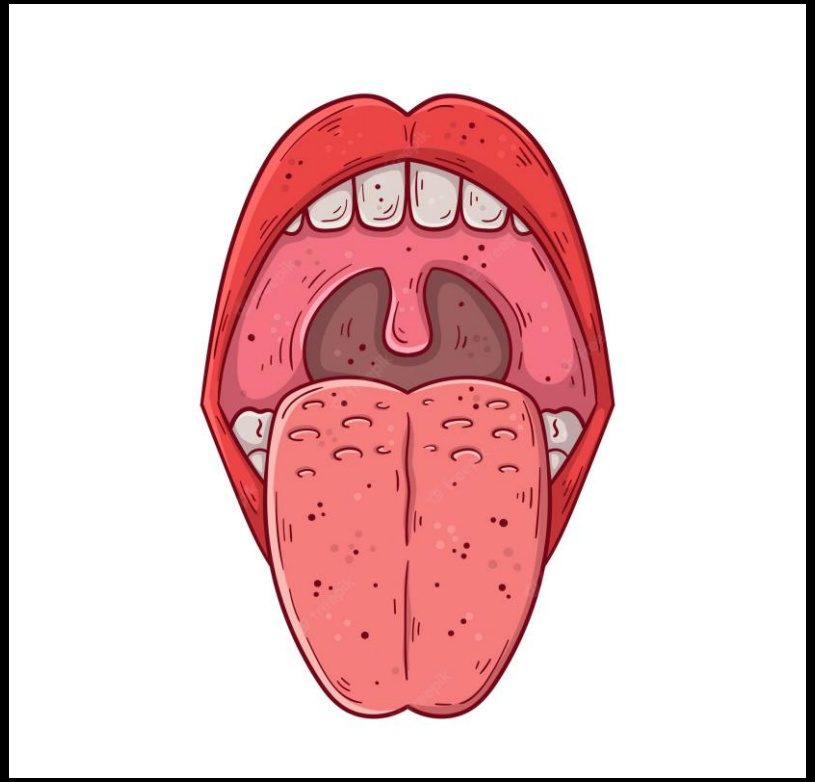
IMAGING OF TONGUE



DR. ALKA AGRAWAL

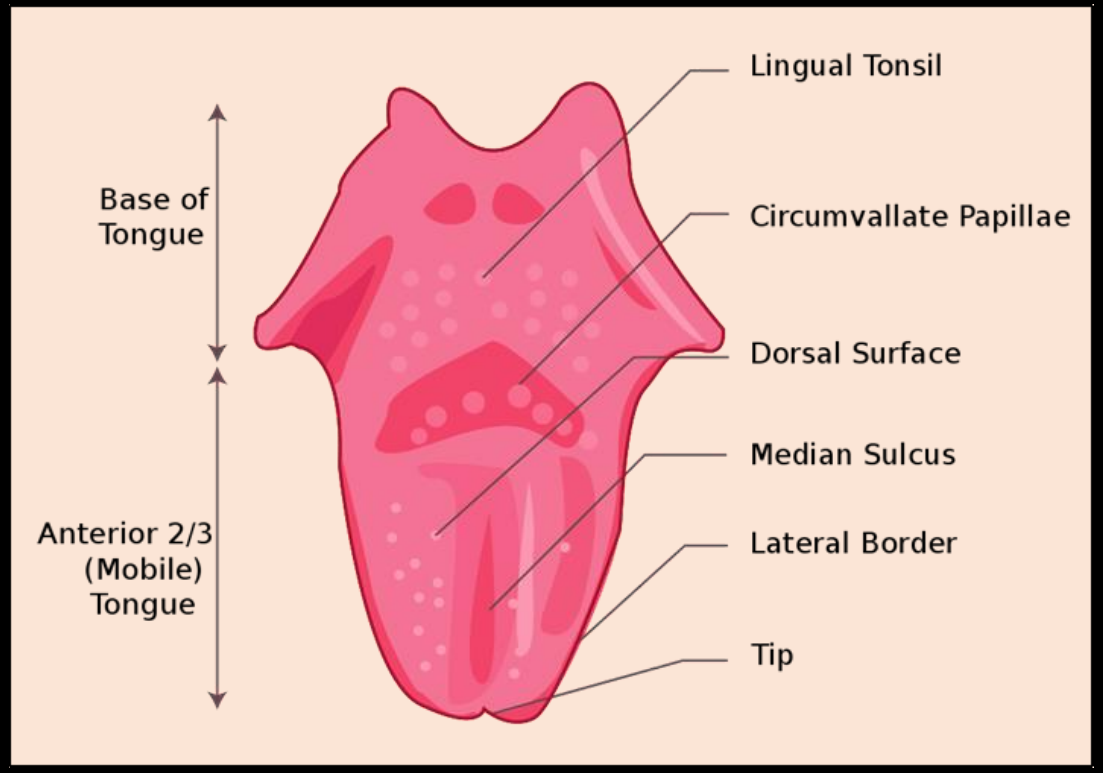
PROFESSOR & H.O.D.

DEPARTMENT OF RADIO-DIAGNOSIS

MGM MEDICAL COLLEGE & M.Y. HOSPITAL, INDORE

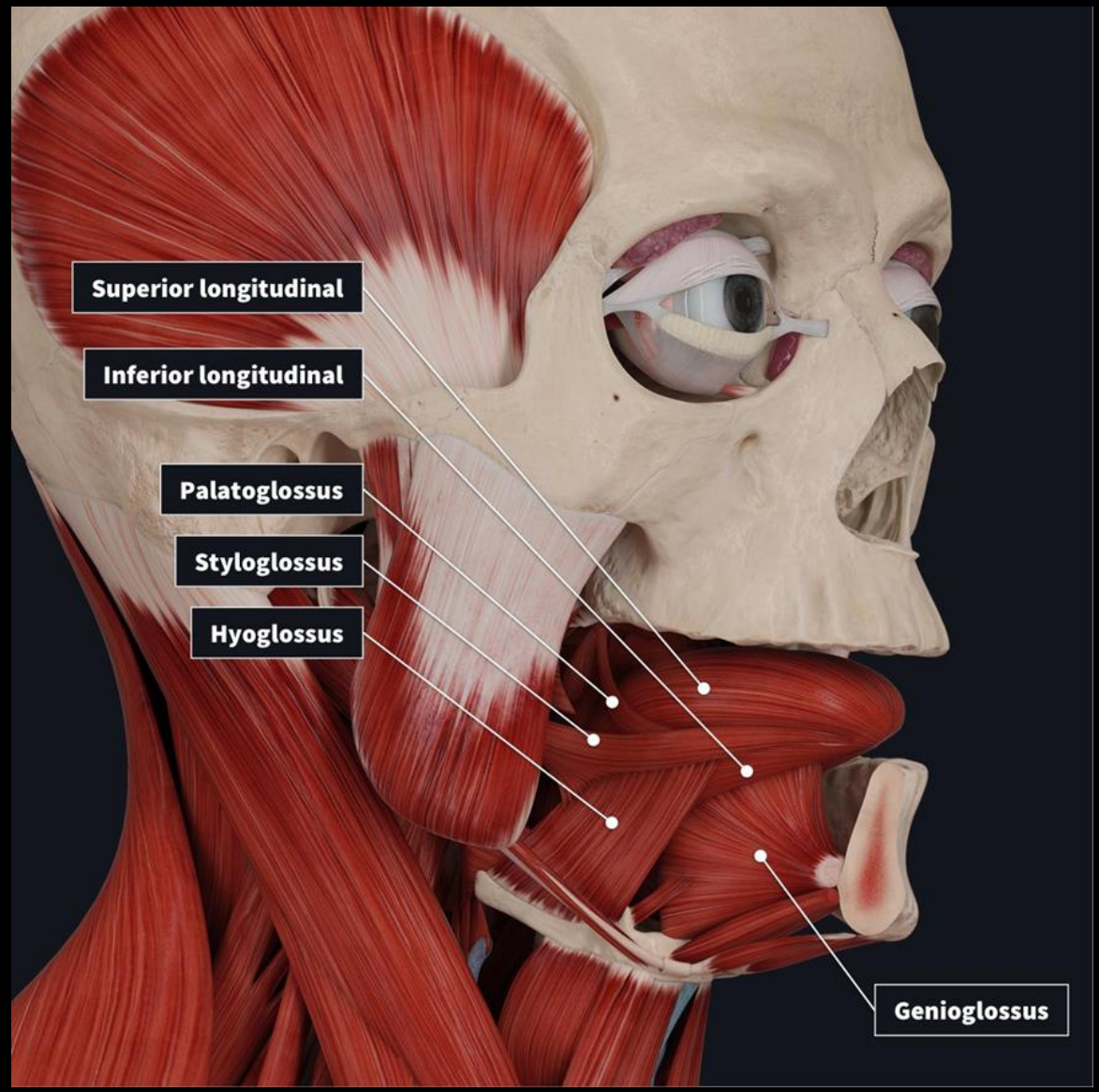
ANATOMY

- Muscular structure that extends from the oral cavity to the oropharynx
- Divided by sulcus terminalis into Anterior 2/3rd and Posterior 1/3rd
- Axial imaging - line joining the anterior aspect of the mandibular rami
- Parts
- Root or Base of tongue
- Apex
- Dorsum
- Inferior surface



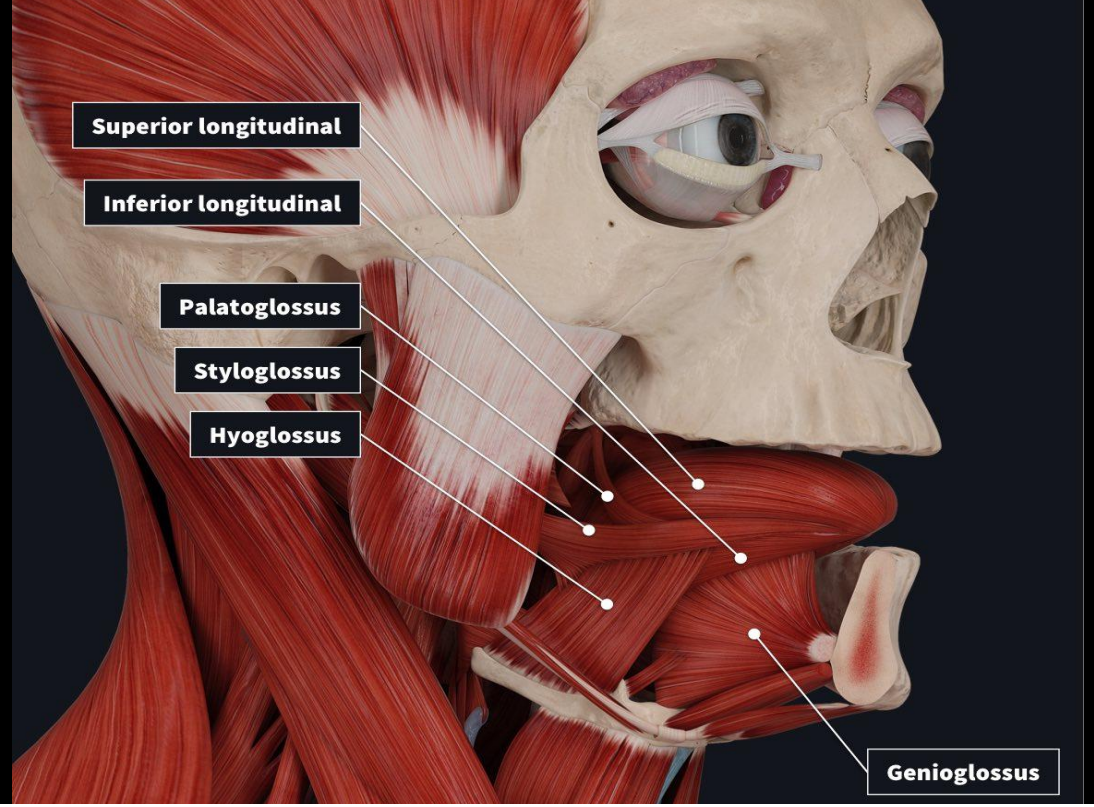
EXTRINSIC MUSCLES
Genioglossus
Hyoglossus
Styloglossus
Palatoglossus

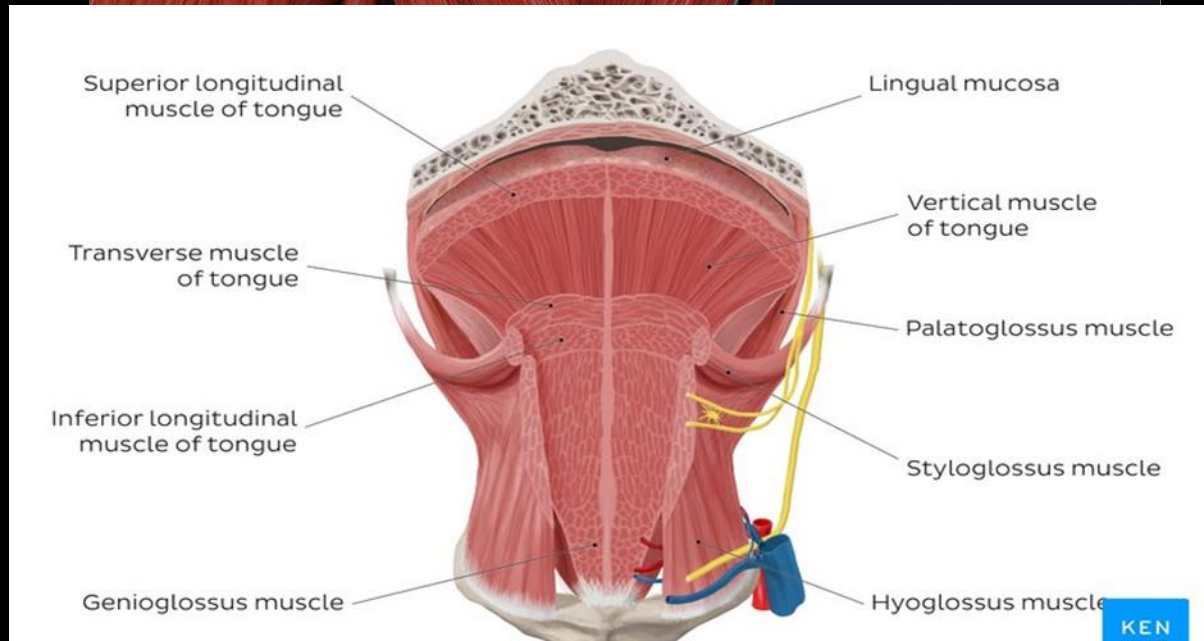
- Attachment- outside the tongue
- Action - alter the position of the tongue



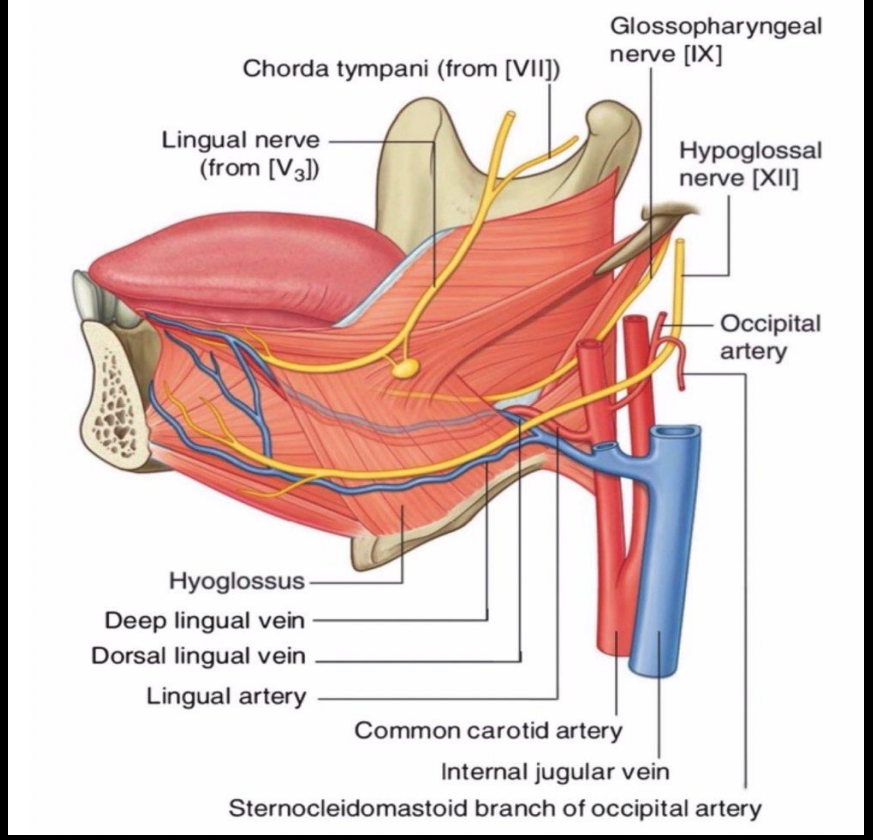
INTRINSIC MUSCLES
Superior longitudinal muscle of the tongue
Inferior longitudinal muscle of the tongue
Transverse muscle of the tongue
Vertical muscle of the tongue

- No attachment outside the tongue
- Action - alter the shape of the tongue





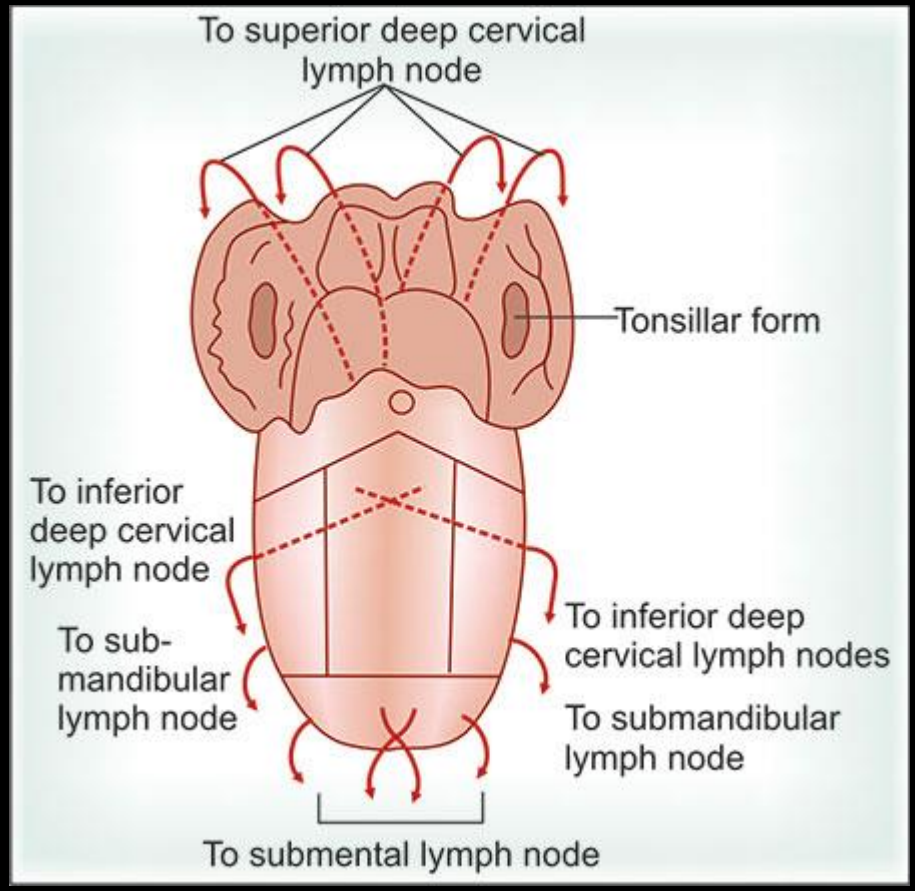
BLOOD SUPPLY	
ARTERIAL	Lingual artery Branches of facial and ascending pharyngeal arteries.
VENOUS	Lingual, facial, internal jugular veins



NERVE SUPPLY			
MOTOR		• All the muscles except Palatoglossus – Hypoglossal nerve • Palatoglossus- Cranial part of XI nerve through pharyngeal plexus	
SENSORY	General sensation	Anterior 2/3rd – Lingual Nerve	Posterior 1/3rd – Glossopharyngeal nerve (Internal laryngeal branch of vagus nerve – posterior most part of tongue)
	Taste	Anterior 2/3rd (except circumvallate papillae) - Chorda tymani	Posterior 1/3rd and circumvallate papillae - Glossopharyngeal


a
b
c

LYMPHATIC DRAINAGE		
ANTERIOR	Apex	Submental and Submandibular nodes
	Body	Submandibular nodes then to the Deep cervical nodes (especially the jugulodigastric and juguloomohyoid nodes)
POSTERIOR	Directly to deep cervical nodes.	



CARCINOMA OF TONGUE

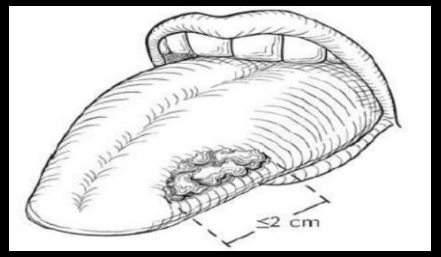
- Mostly seen on lateral and under-surface of tongue
- Major risk factors – Somking, Alcohol invasion
- Tumour invasion
- Anterior 1/3rd – Floor of the mouth
- Middle 1/3rd - Musculature of the tongue and later the lateral floor of the mouth
- Posterior 1/3rd - Musculature of the tongue, the floor of the mouth, the anterior tonsillar pillar, the tongue base, the glossotonsillar sulcus and the mandible
- Earliest involved nodes are the submandibular and jugulodigastric nodes

TONGUE BASE CARCINOMA

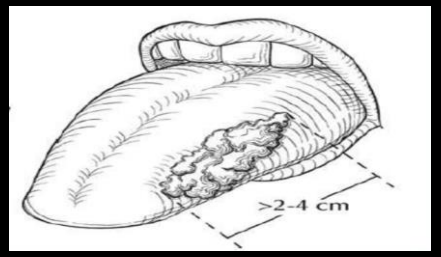
- Clinically silent region
- Tend to spread with deep infiltration - extent of these tumours is underestimated during clinical examination
- May extend into the tonsillar fossa
- Earliest involved nodes are the jugulodigastric nodes, followed by mid and lower jugular nodes

TUMOR STAGING

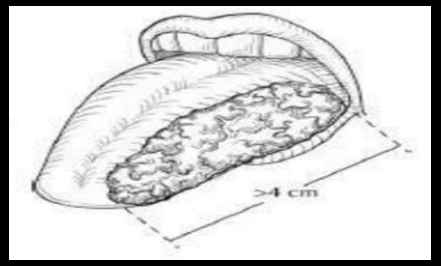
T1 : Tumour 2 cm or less in greatest dimension



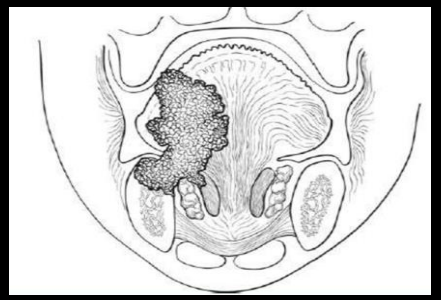
T2 : Tumour more than 2 cm but not more than 4 cm in greatest dimension



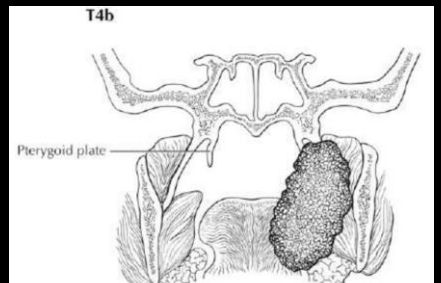
T3 : Tumour more than 4 cm in greatest dimension



T4a :
Oral Tongue - Tumour invades through cortical bone, into deep/extrinsic muscle of tongue (genioglossus, hyoglossus, palatoglossus, and styloglossus), maxillary sinus, or skin of face
Pharyngeal Tongue - Tumour invades any of the following: larynx, deep/extrinsic muscle of tongue (genioglossus, hyoglossus, palatoglossus, and styloglossus), medial pterygoid, hard palate, and mandible



T4b :
Oral Tongue - Tumour invades masticator space, pterygoid plates, or skull base, or encases internal carotid artery
Pharyngeal Tongue - Tumour invades any of the following: lateral pterygoid muscle, pterygoid plates, lateral nasopharynx, skull base; or encases the carotid artery



NODAL STAGING

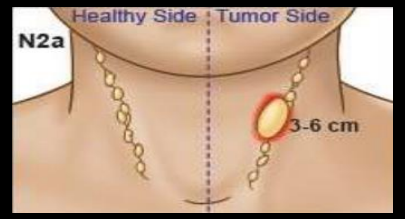
N1 - Single ipsilateral node ≤ 3cm in greatest dimension

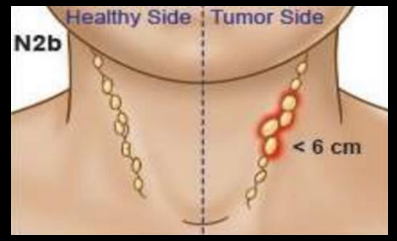
N2a - Single ipsilateral node >3cm and < 6 cm in greatest dimension

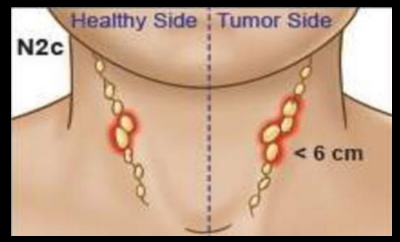
N2b – Multiple ipsilateral nodes, < 6cm in greatest dimension

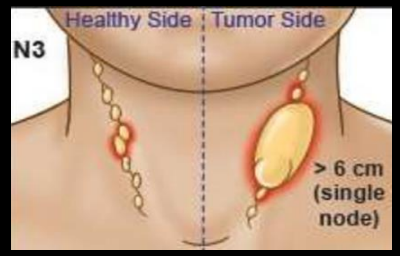
N2c – Bilateral or contralateral lymph nodes < 6cm in greatest dimension

N3 - Lymph nodes > 6 cm in greatest dimension



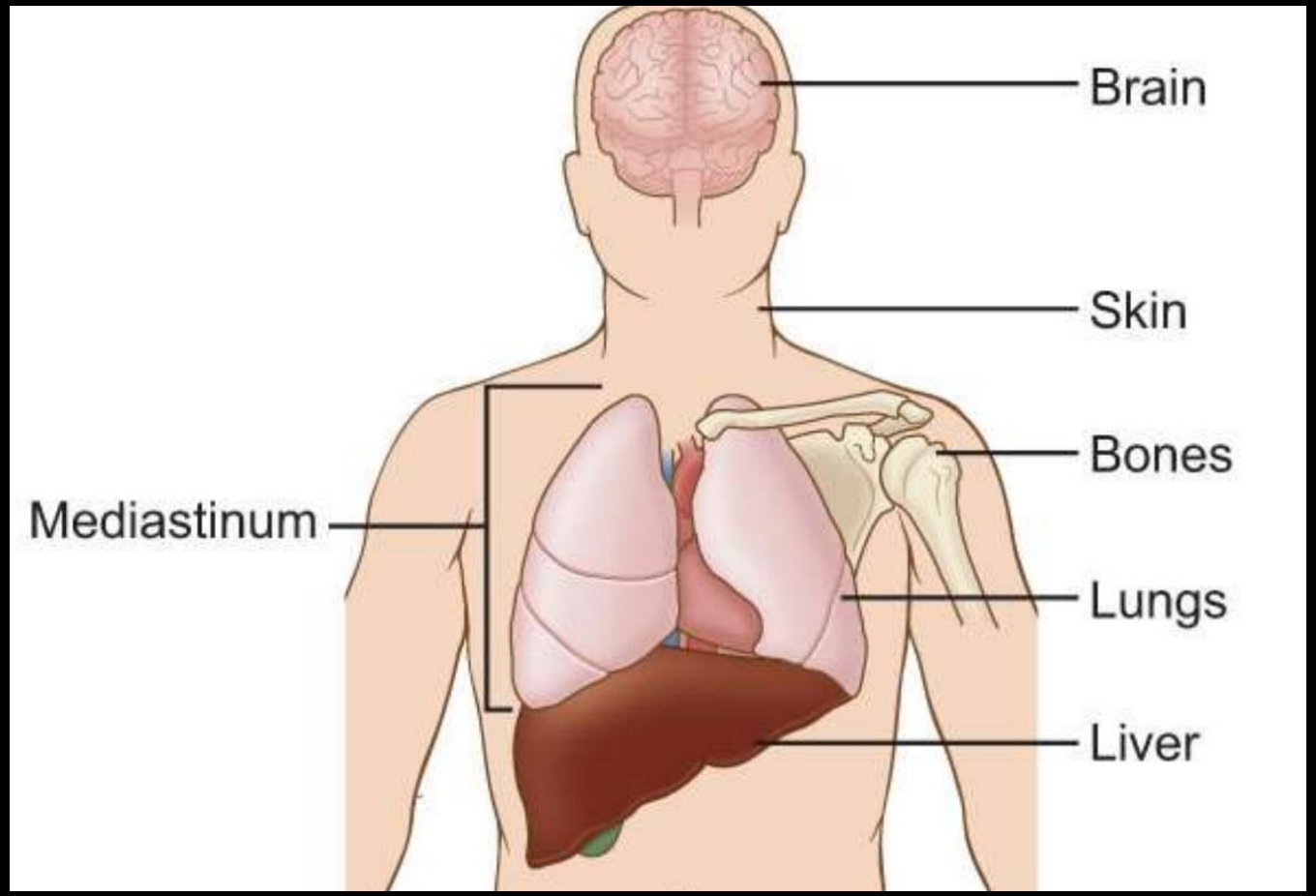






DISTANT METASTASIS

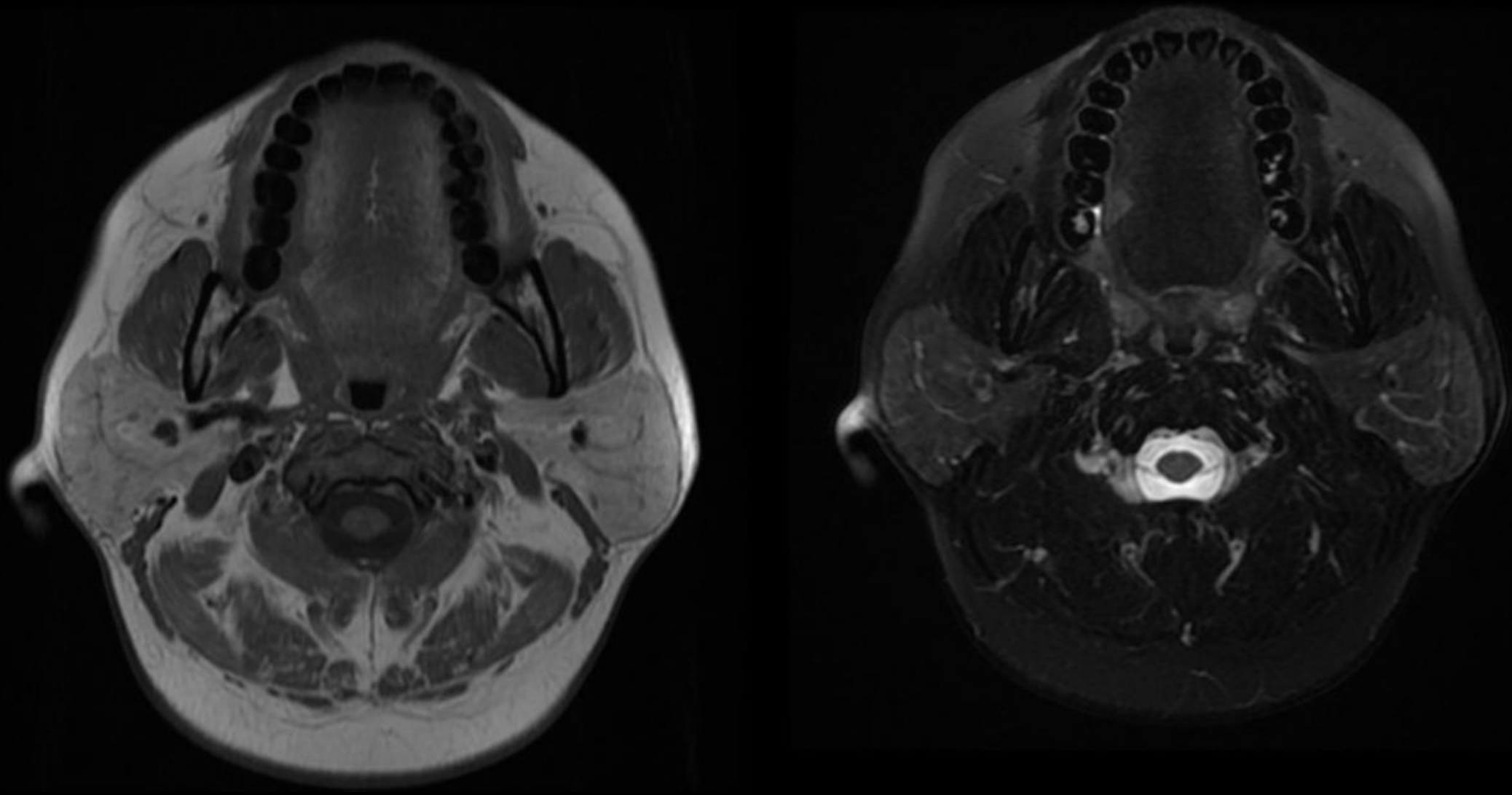
M – DISTANT METASTASIS	
MX	Distant metastasis cannot be assessed
M0	No distant metastasis
M1	Distant metastasis

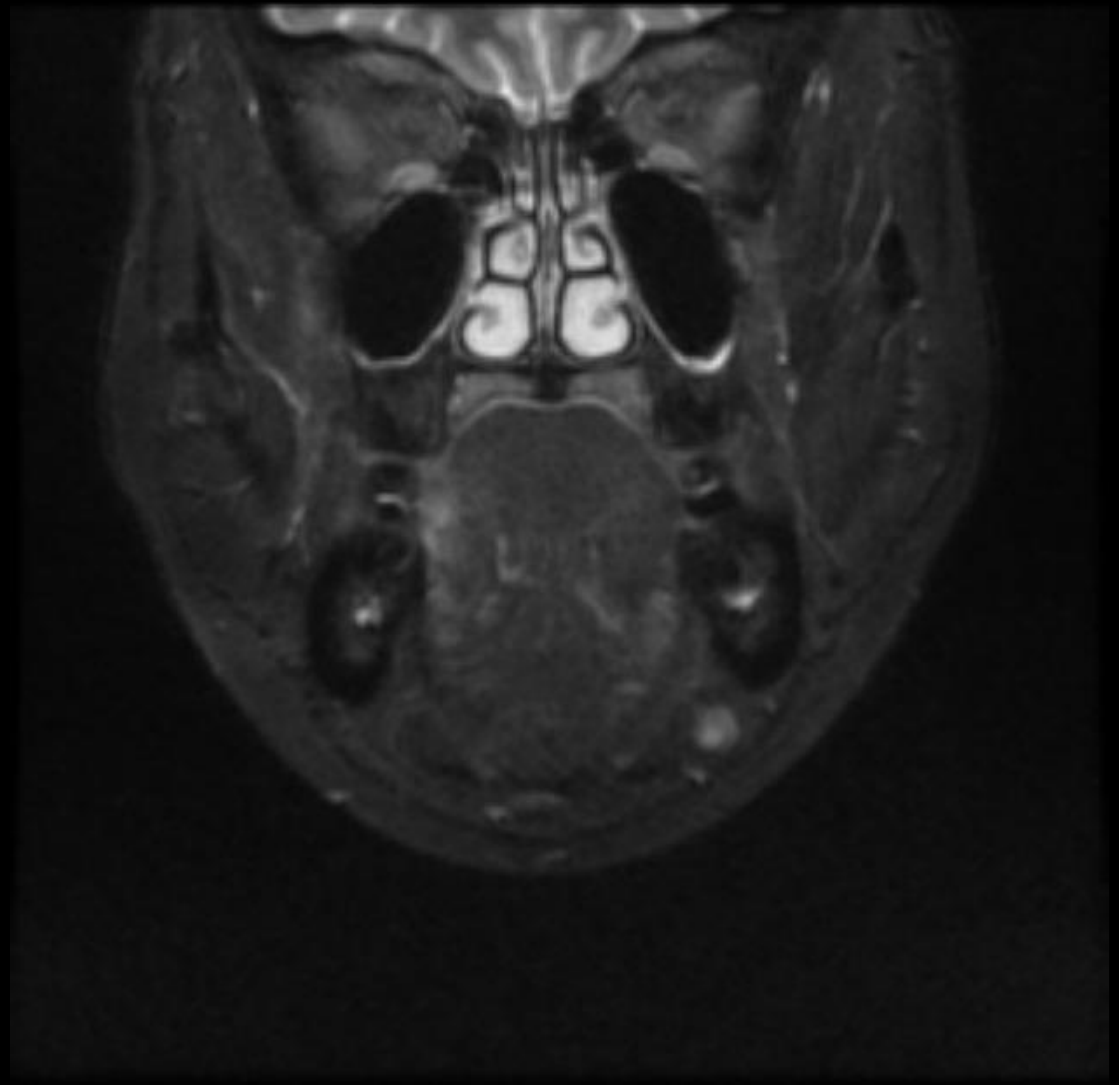


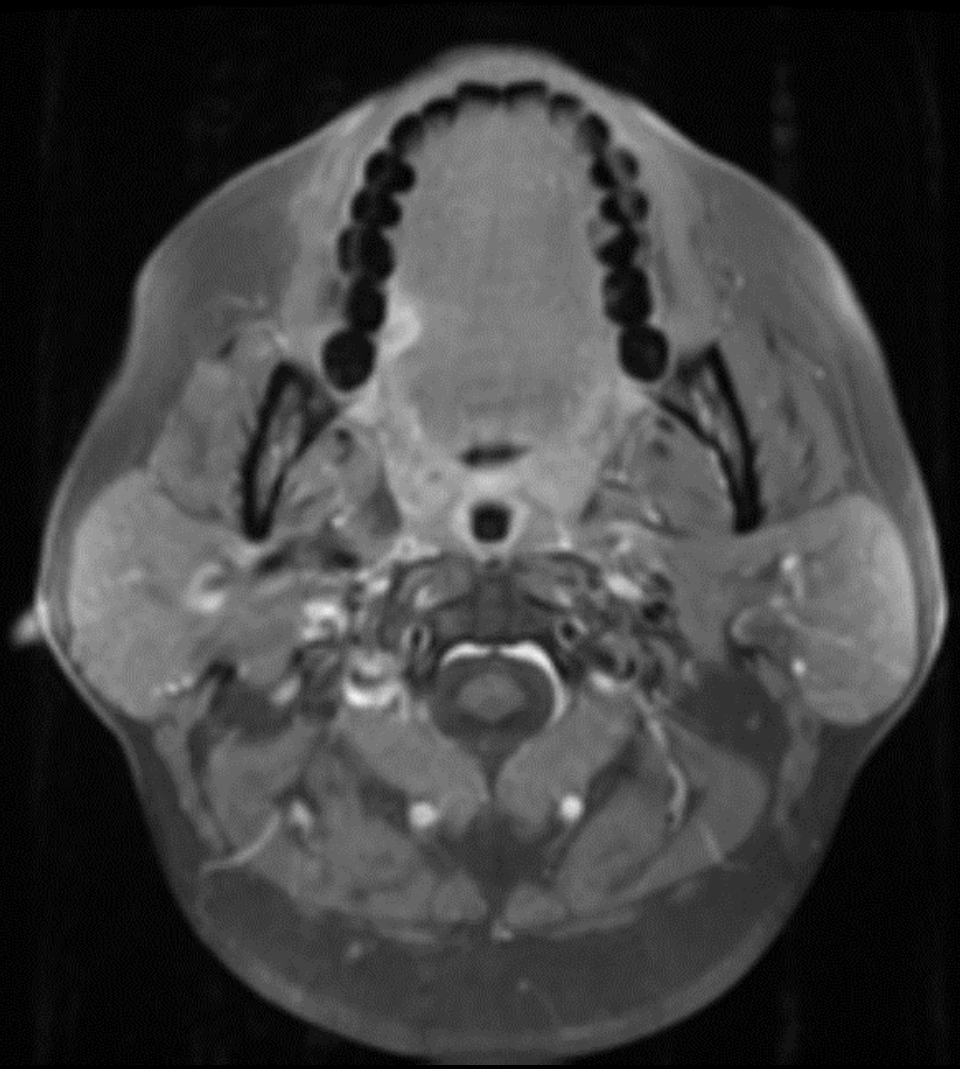
TNM CLASSIFICATION

CANCER STAGE	T CATEGORY	N CATEGORY	M CATEGORY
0	Tis	N0	M0
I	T1	N0	M0
II	T2	N0	M0
III	T1, T2 T3	N1 N0, N1	M0 M0
IV A	T1, T2, T3 T4a	N2 N0, N1, N2	M0 M0
IV B	Any T4b	N3 Any	M0 M0
IV C	Any	Any	M1

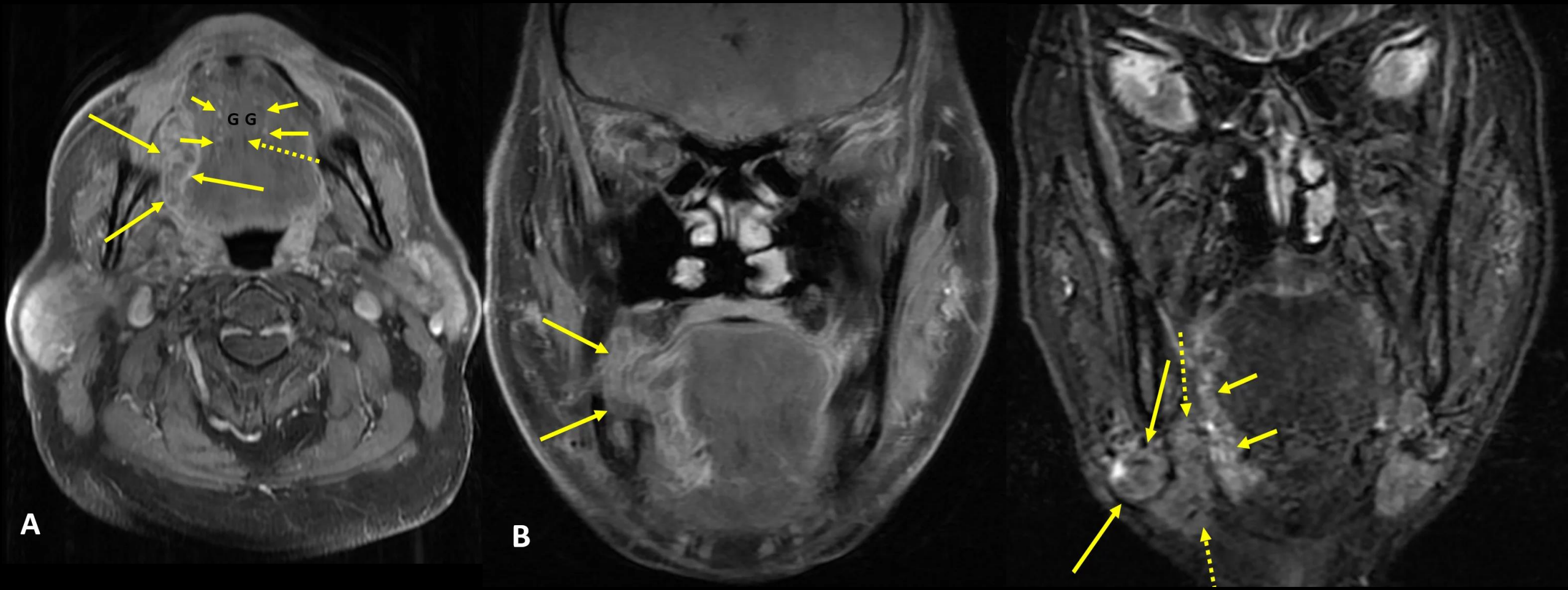
CASE - 1



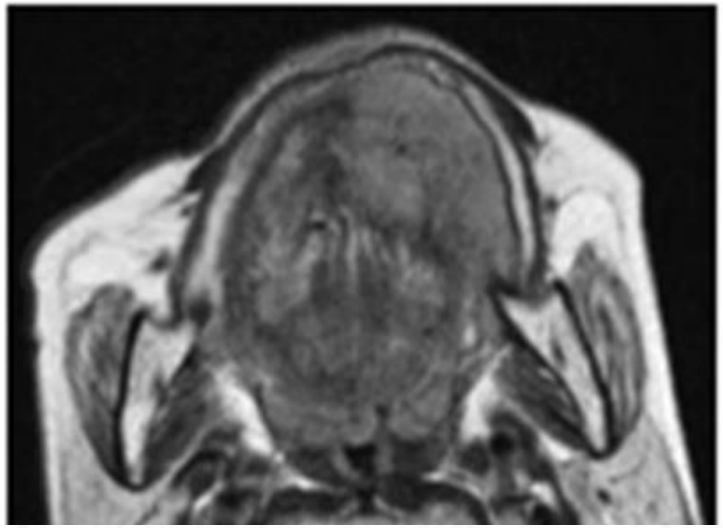


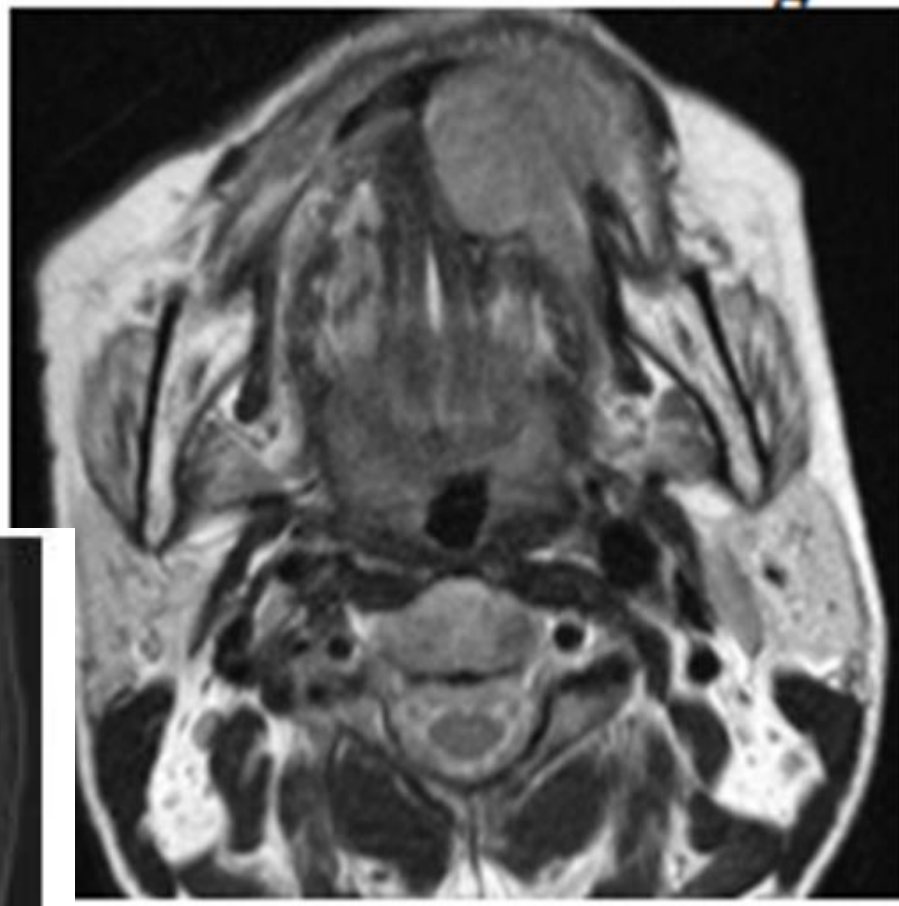


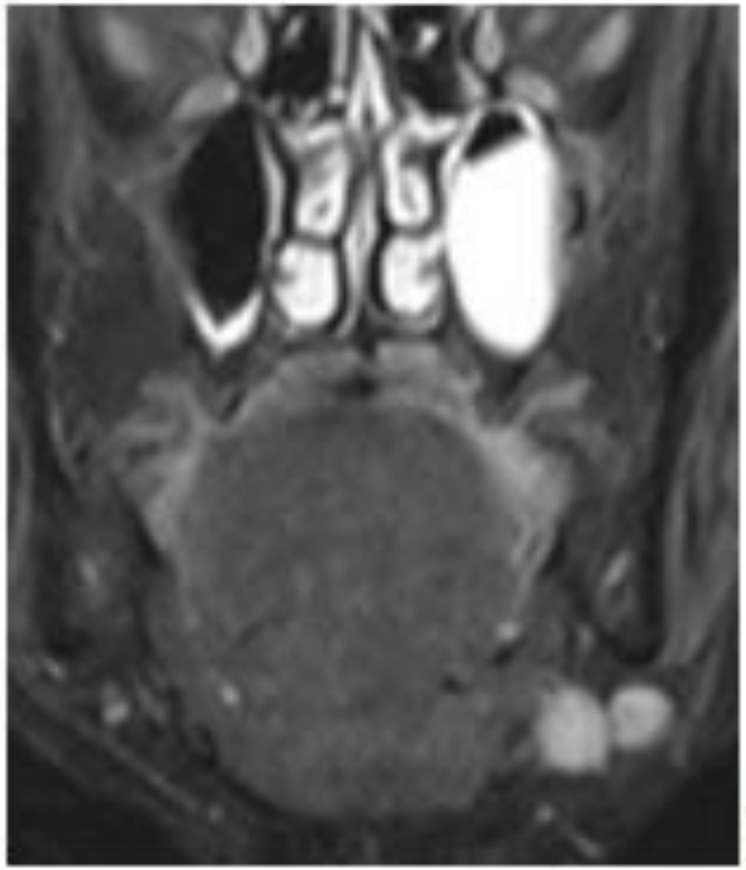
CASE 2 -



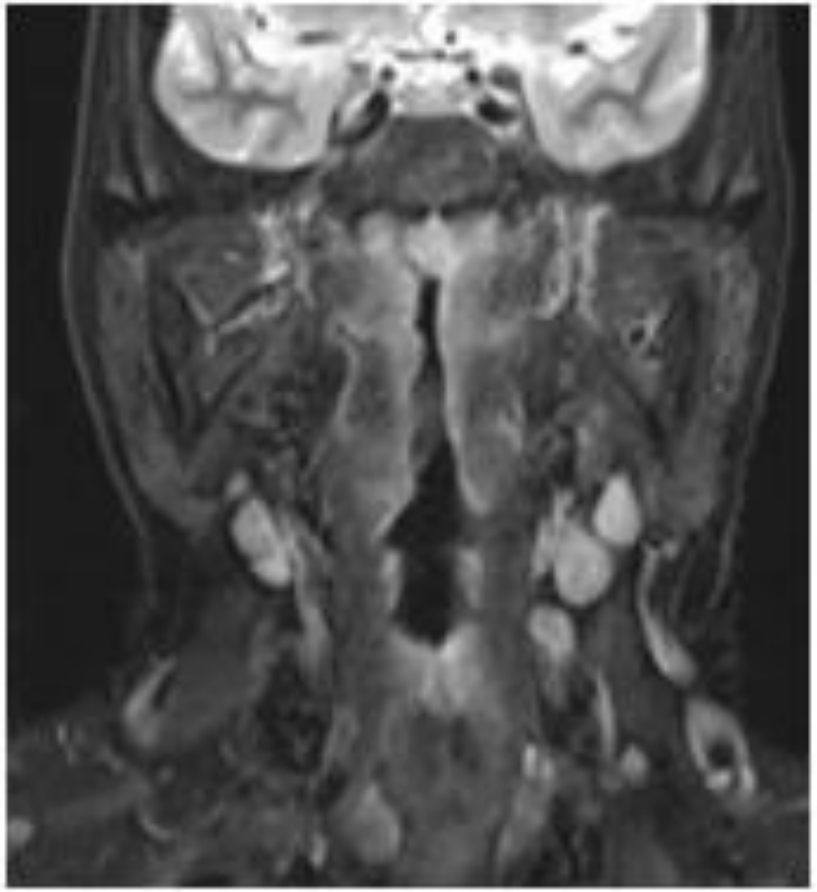
CASE - 3



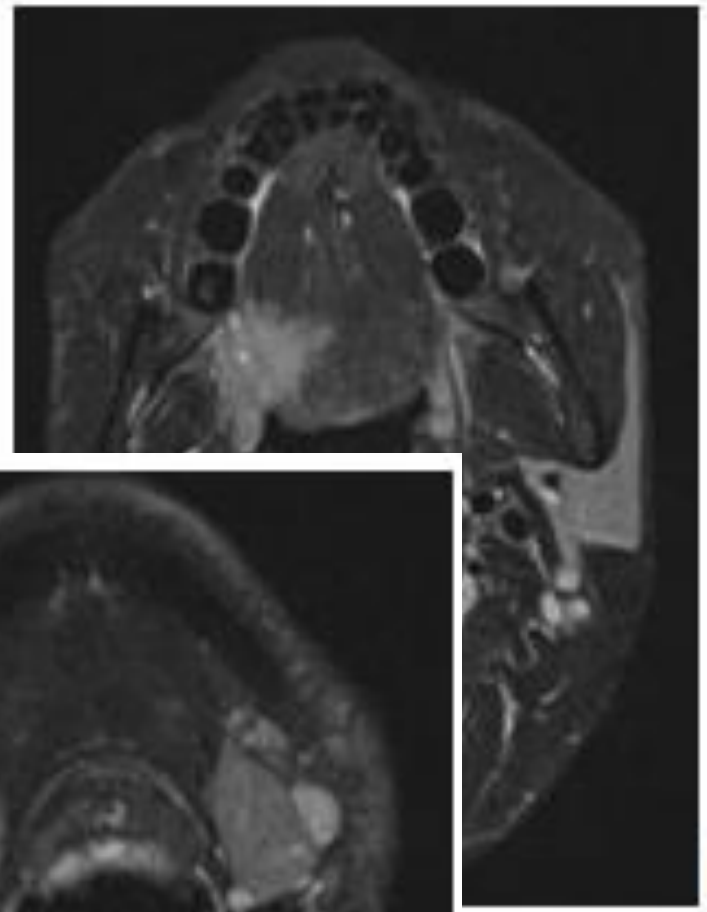


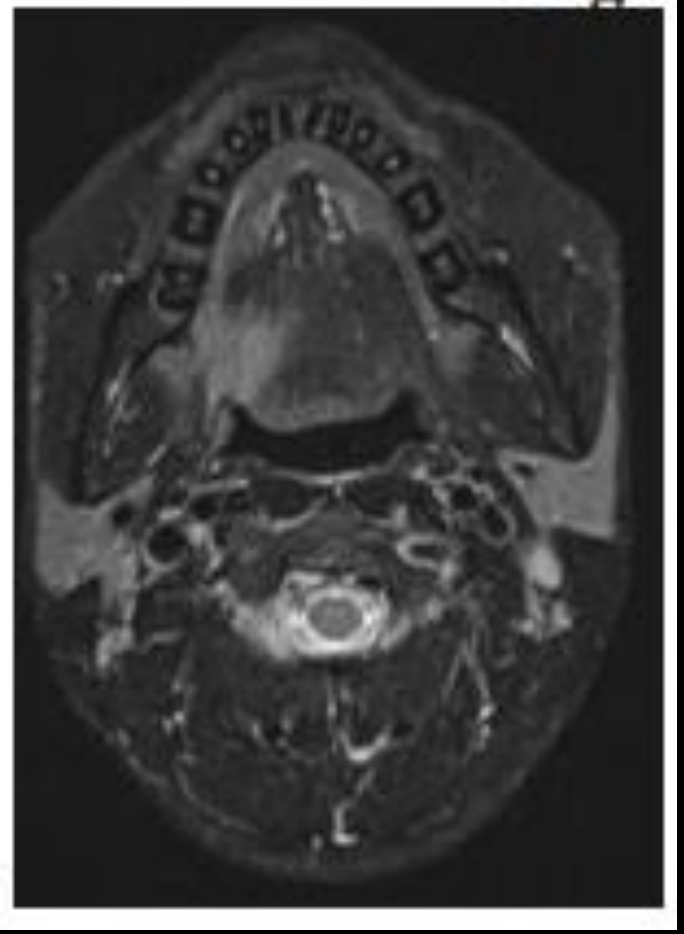


d.

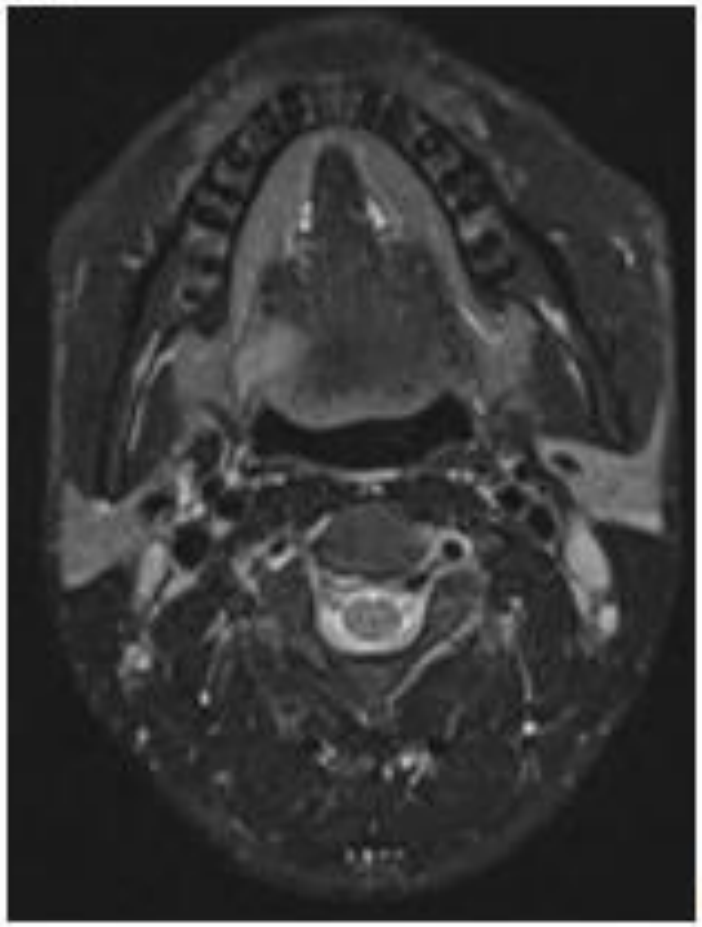


CASE - 4

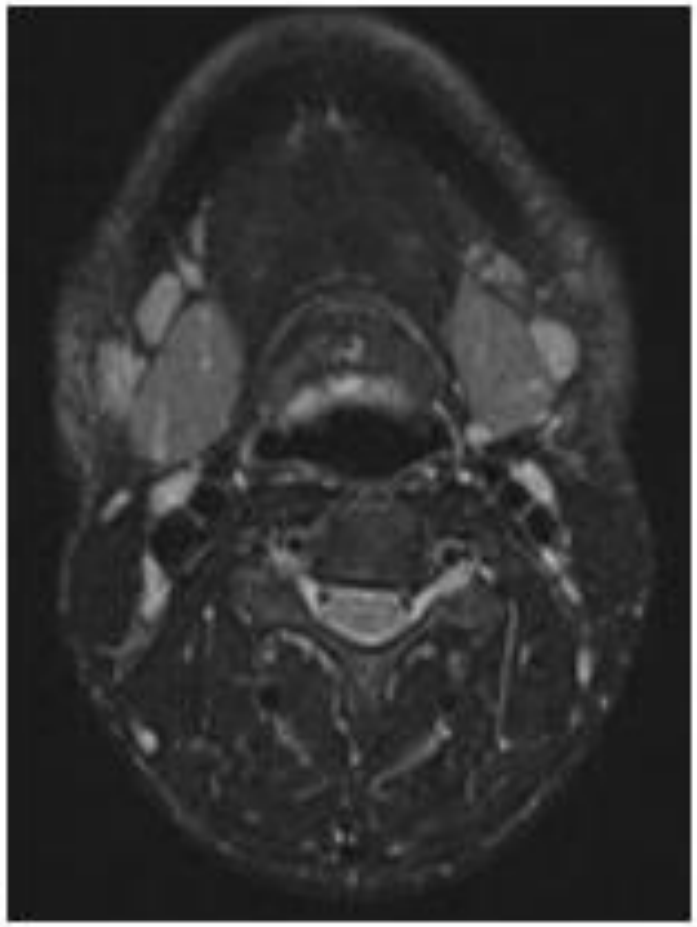




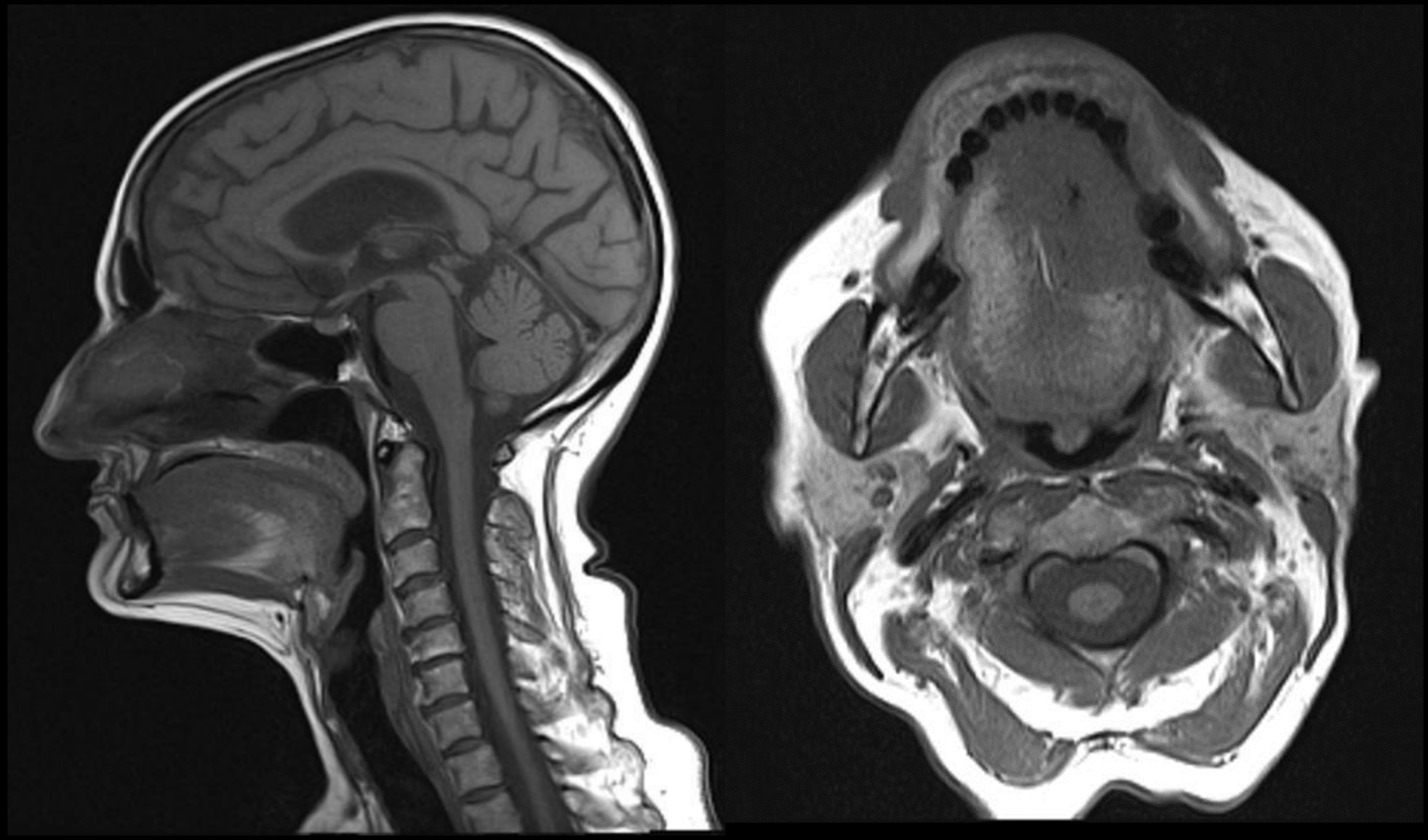
b.

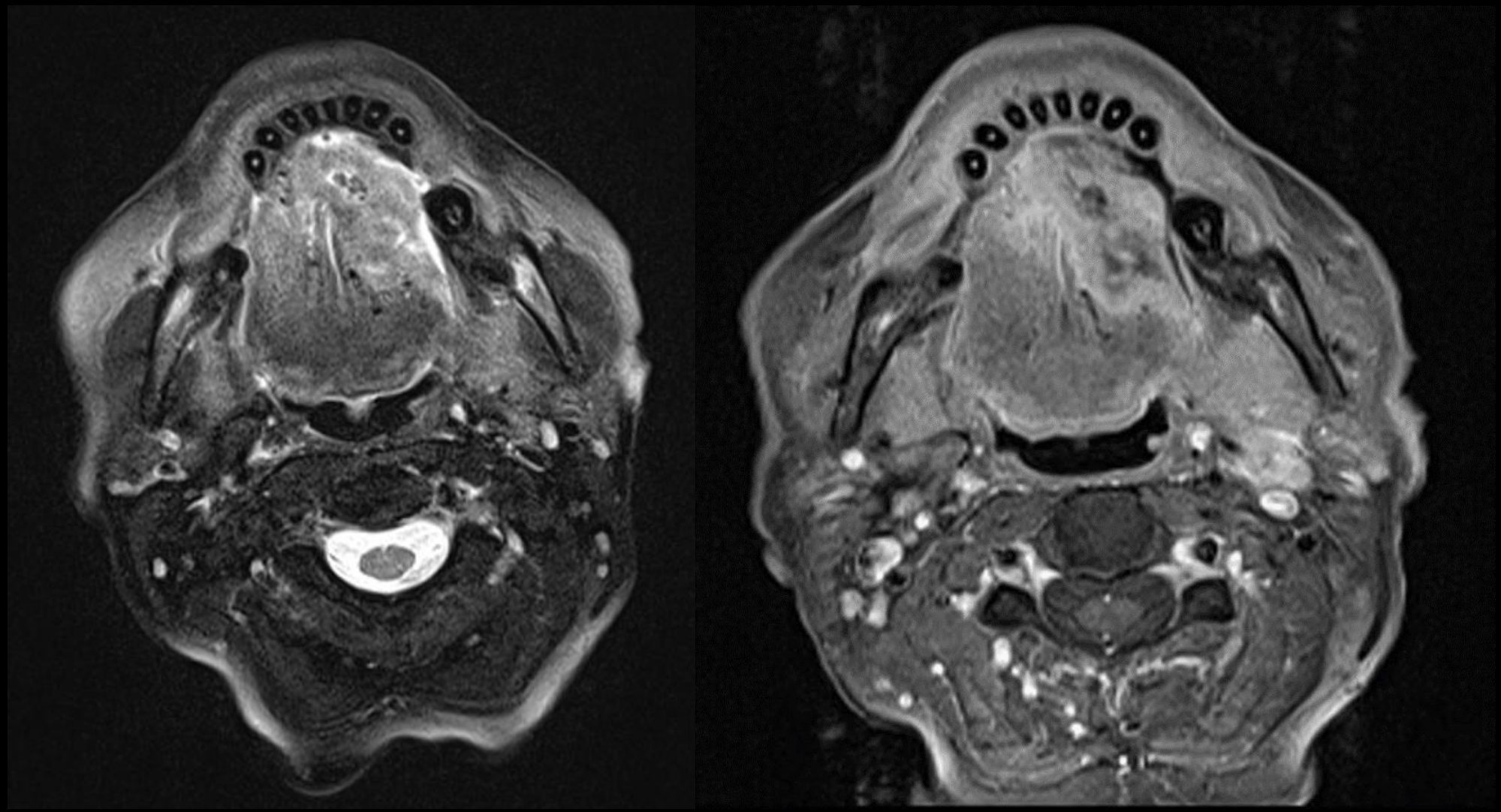


d.

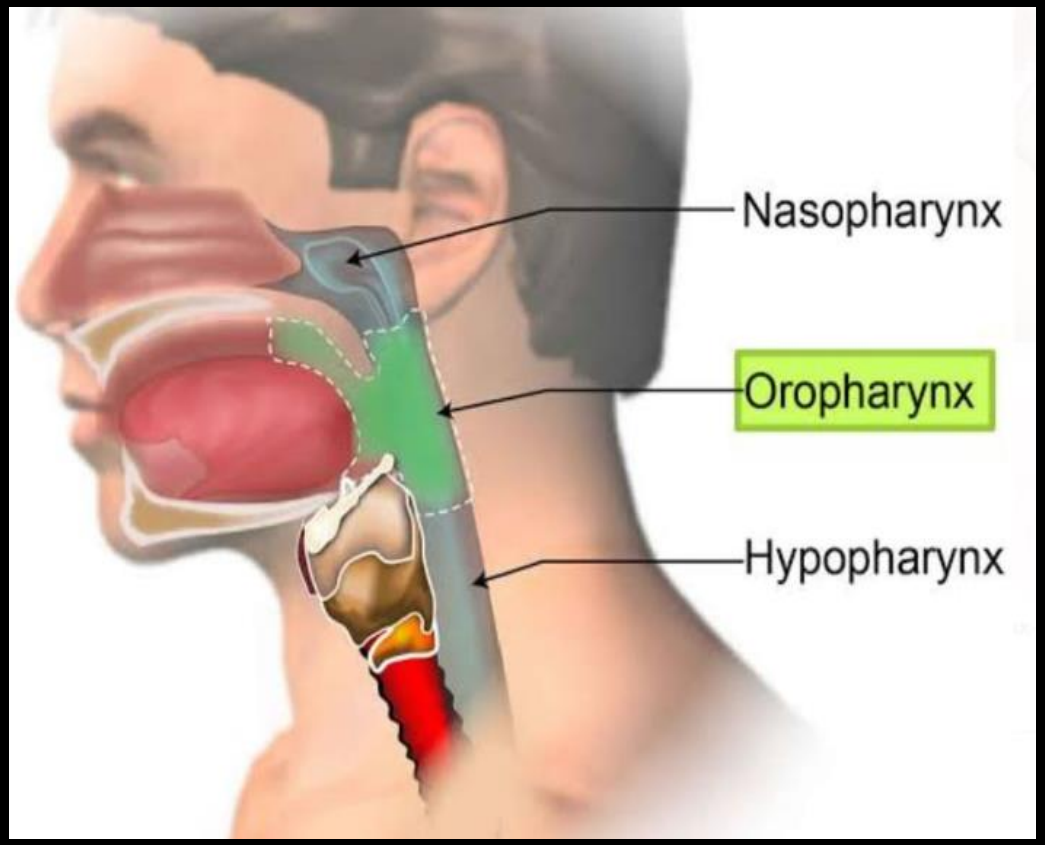


CASE - 5





OROPHARYNX



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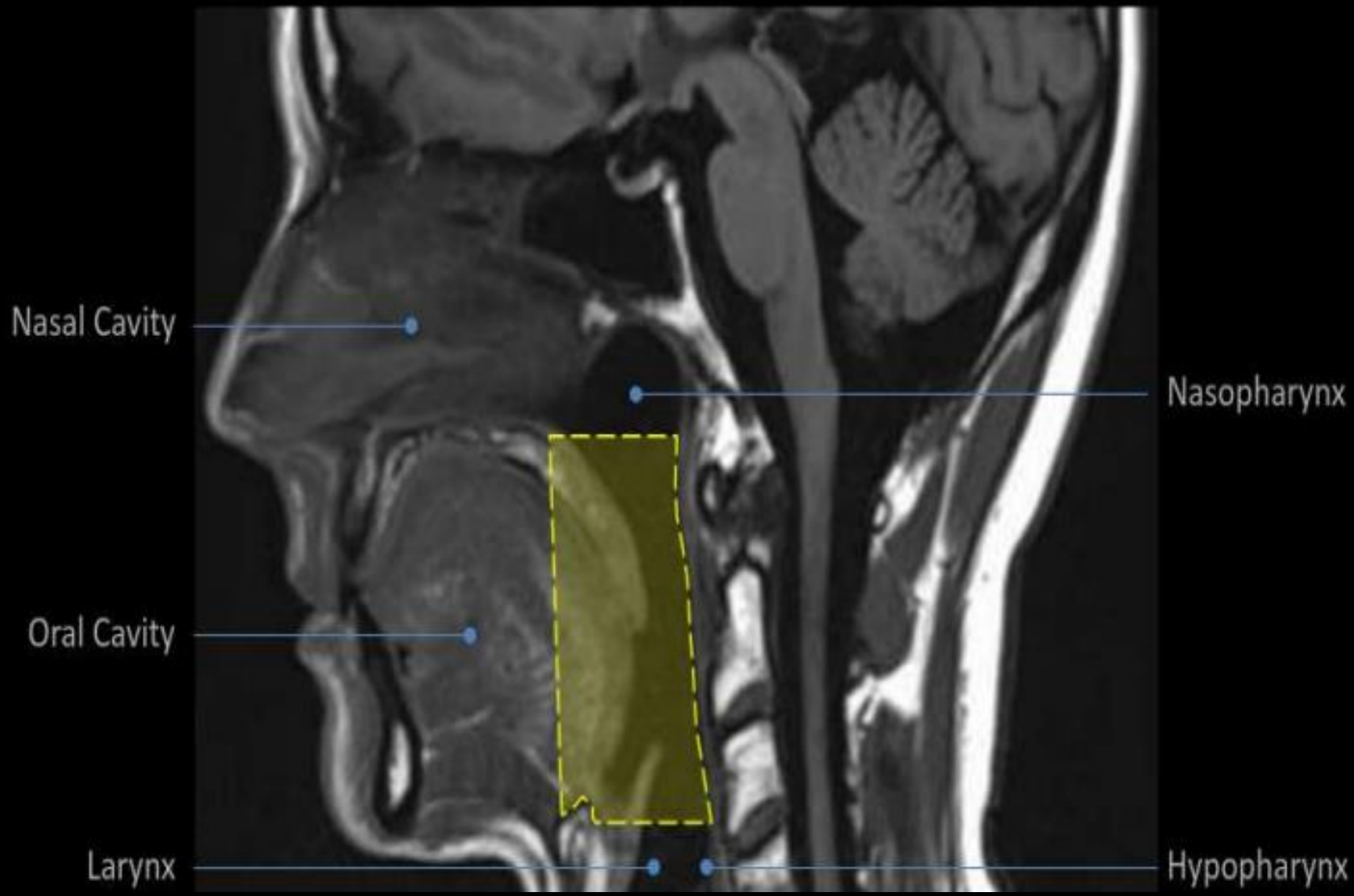
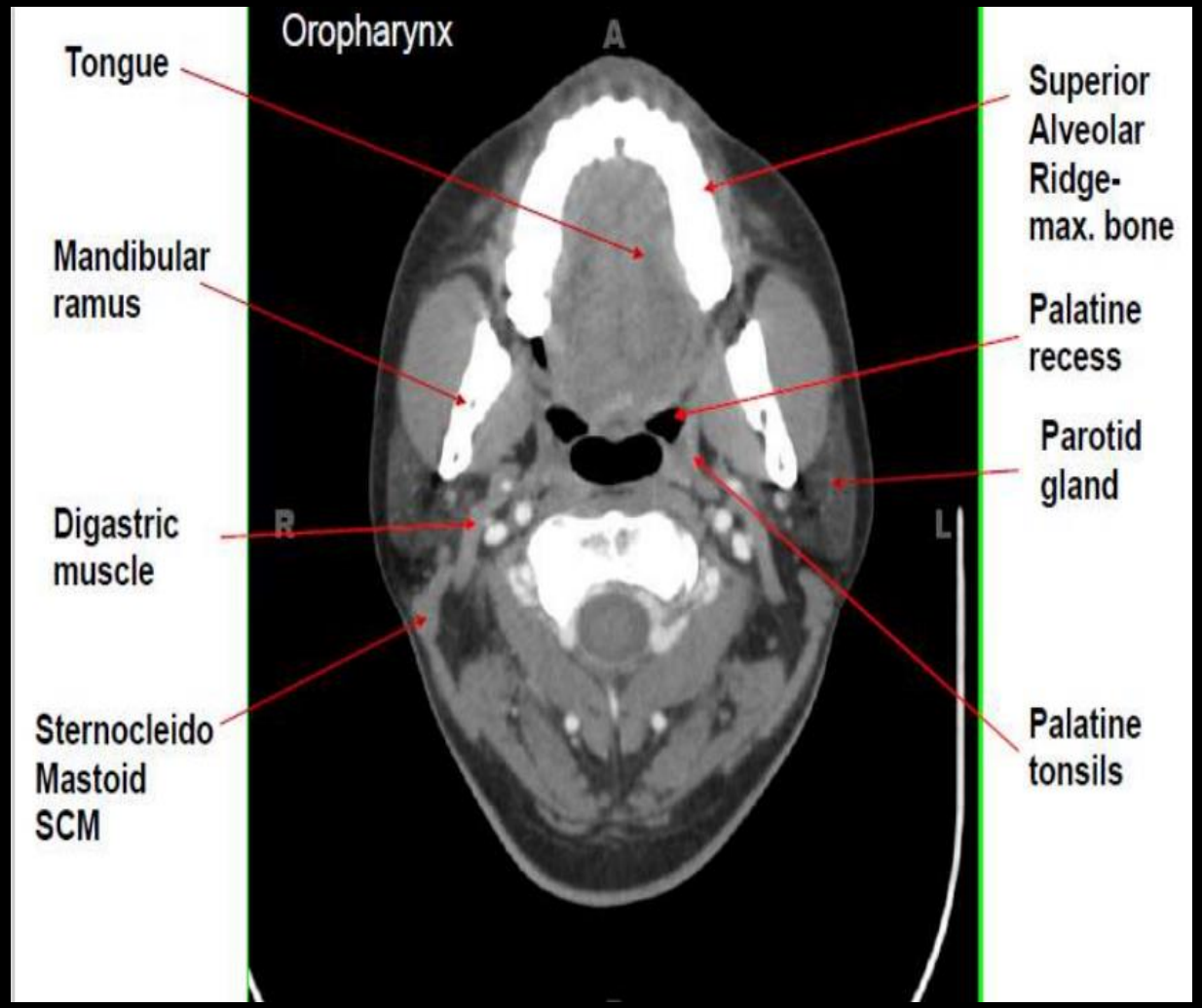
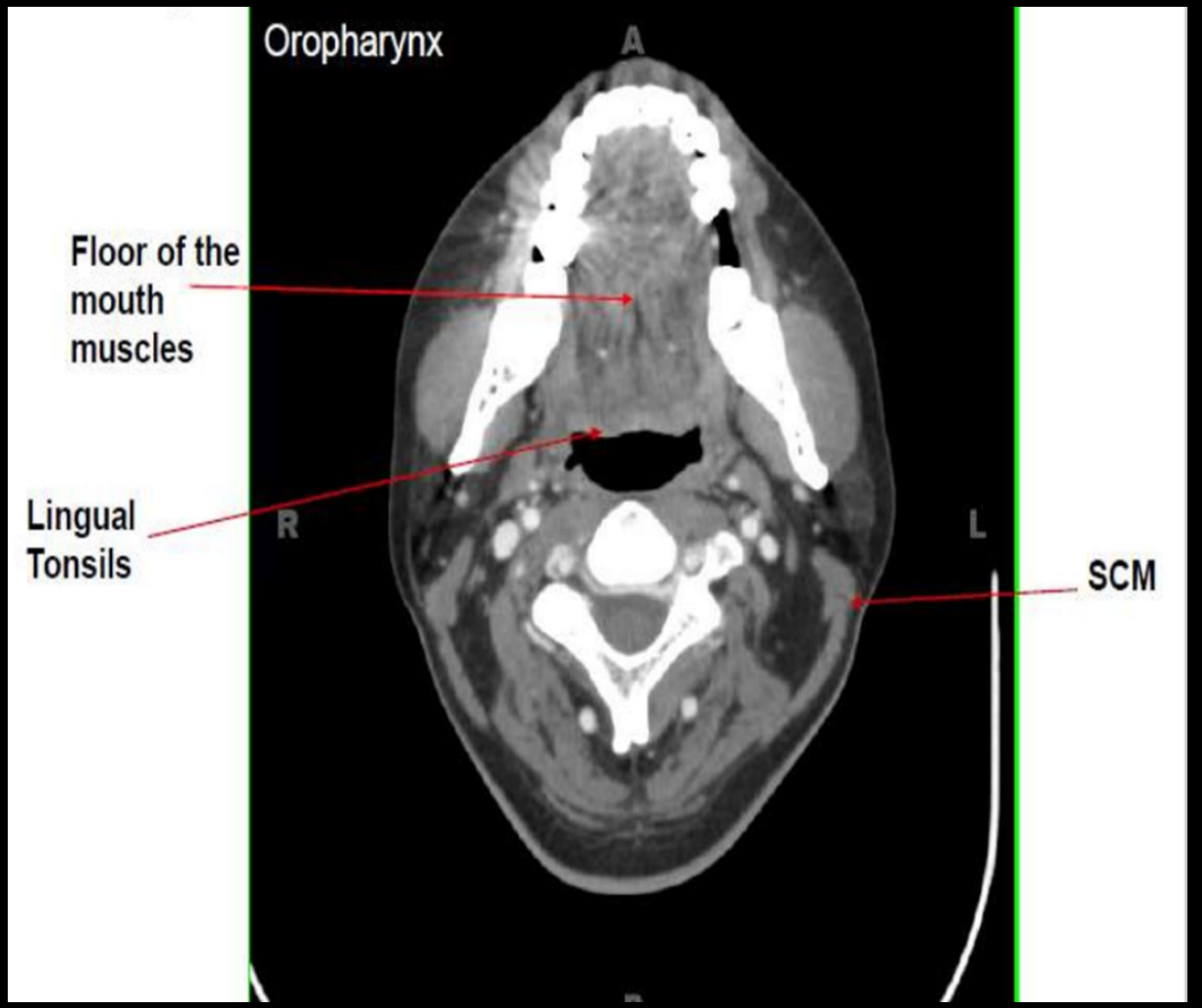
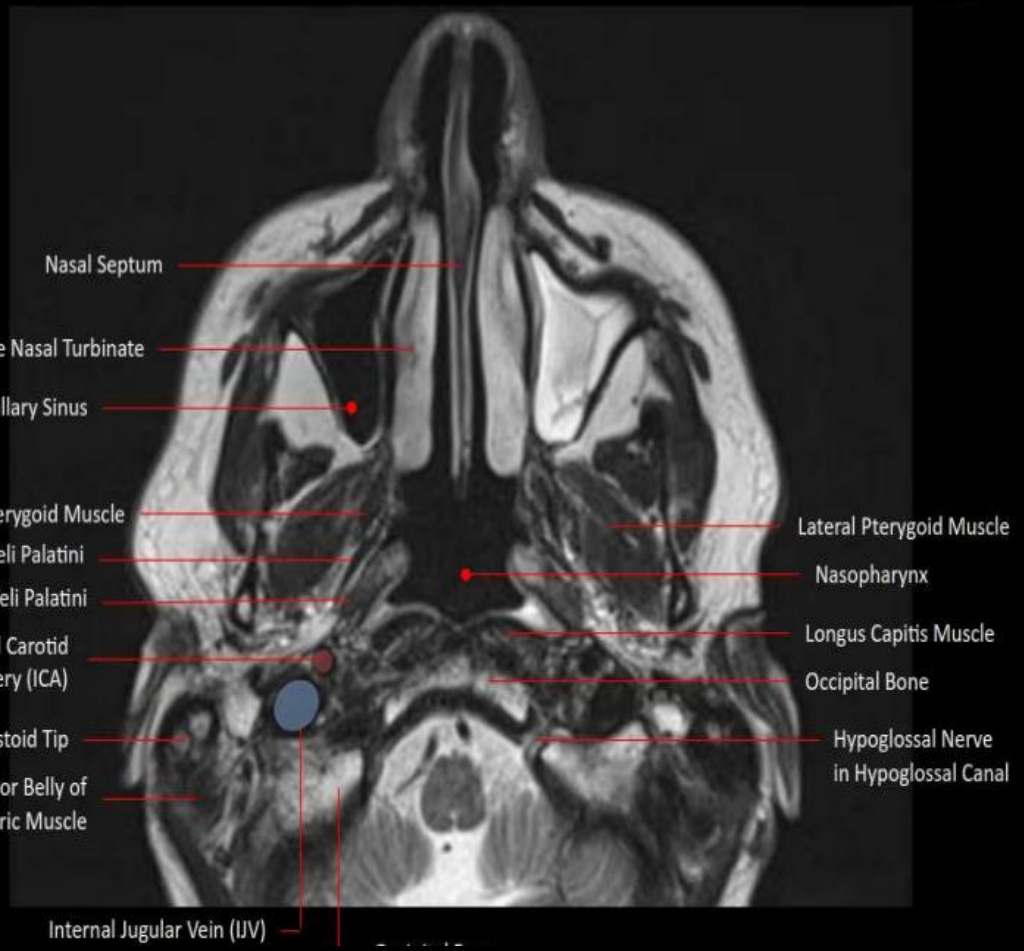
ANATOMY

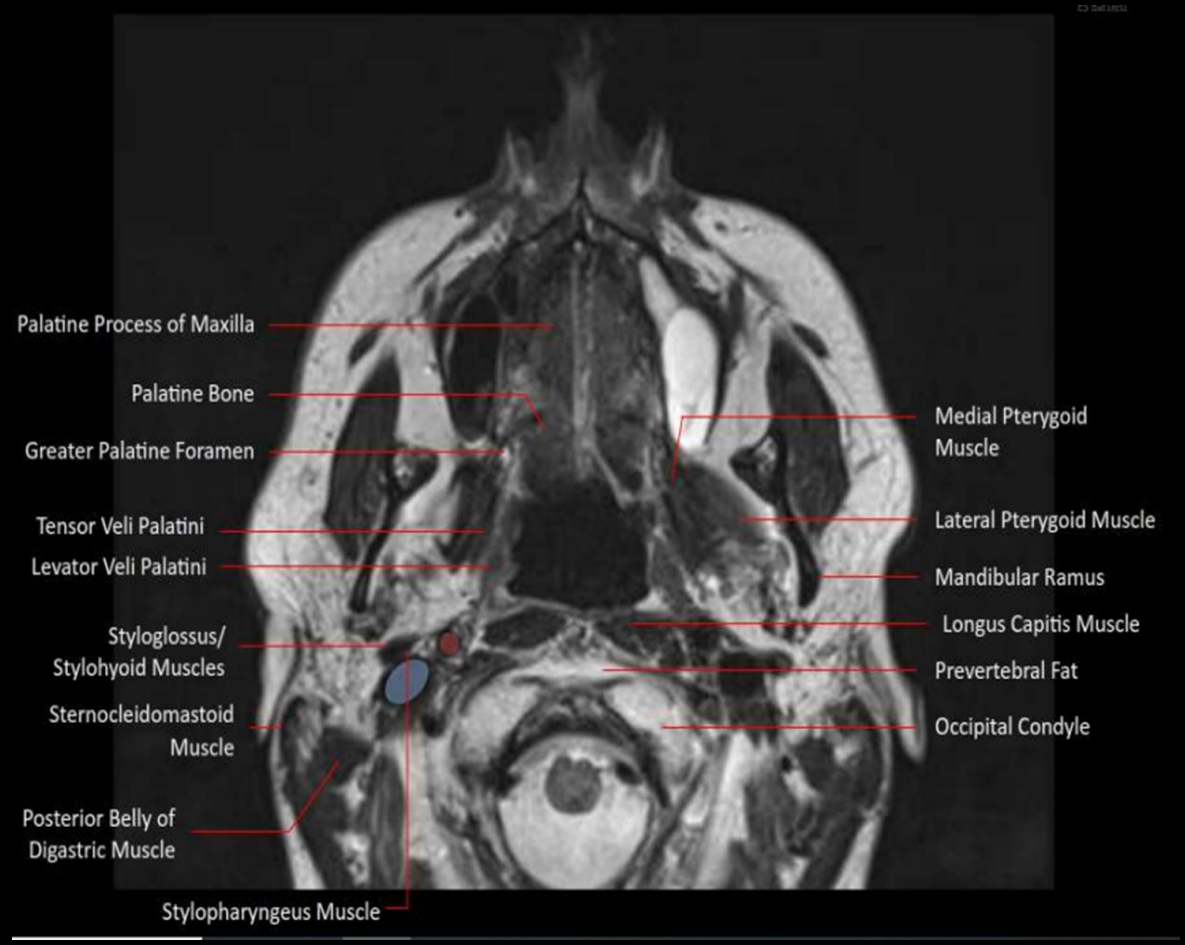
- Oropharynx is situated Posterior to the oral cavity, between Nasopharynx and Hypopharynx
- **Anterior** : plane formed by circumvallate papillae, anterior tonsillar pillars and soft palate
- **Posterior** : Posterior pharyngeal wall
- **Superior** : level formed by elevated soft palate
- **Inferior** : valleculae /plane formed by the anterior Hyoid bone


Nasal Cavity
Nasopharynx
Oral Cavity
Larynx
Hypopharynx


Oropharynx
A
R
L
Tongue
Mandibular ramus
Digastric muscle
Sternocleido Mastoid SCM
Superior Alveolar Ridge- max. bone
Palatine recess
Parotid gland
Palatine tonsils


Oropharynx
A
R
L
Floor of the mouth muscles
Lingual Tonsils
SCM


Nasal Septum
Middle Nasal Turbinate
Maxillary Sinus
Medial Pterygoid Muscle
Tensor Veli Palatini
Levator Veli Palatini
Internal Carotid Artery (ICA)
Mastoid Tip
Posterior Belly of Digastric Muscle
Internal Jugular Vein (IJV)
Lateral Pterygoid Muscle
Nasopharynx
Longus Capitis Muscle
Occipital Bone
Hypoglossal Nerve in Hypoglossal Canal


Palatine Process of Maxilla
Palatine Bone
Greater Palatine Foramen
Tensor Veli Palatini
Levator Veli Palatini
Styloglossus/ Stylohyoid Muscles
Sternocleidomastoid Muscle
Posterior Belly of Digastric Muscle
Stylopharyngeus Muscle
Medial Pterygoid Muscle
Lateral Pterygoid Muscle
Mandibular Ramus
Longus Capitis Muscle
Prevertebral Fat
Occipital Condyle

NEOPLASMS OF THE OROPHARYNX

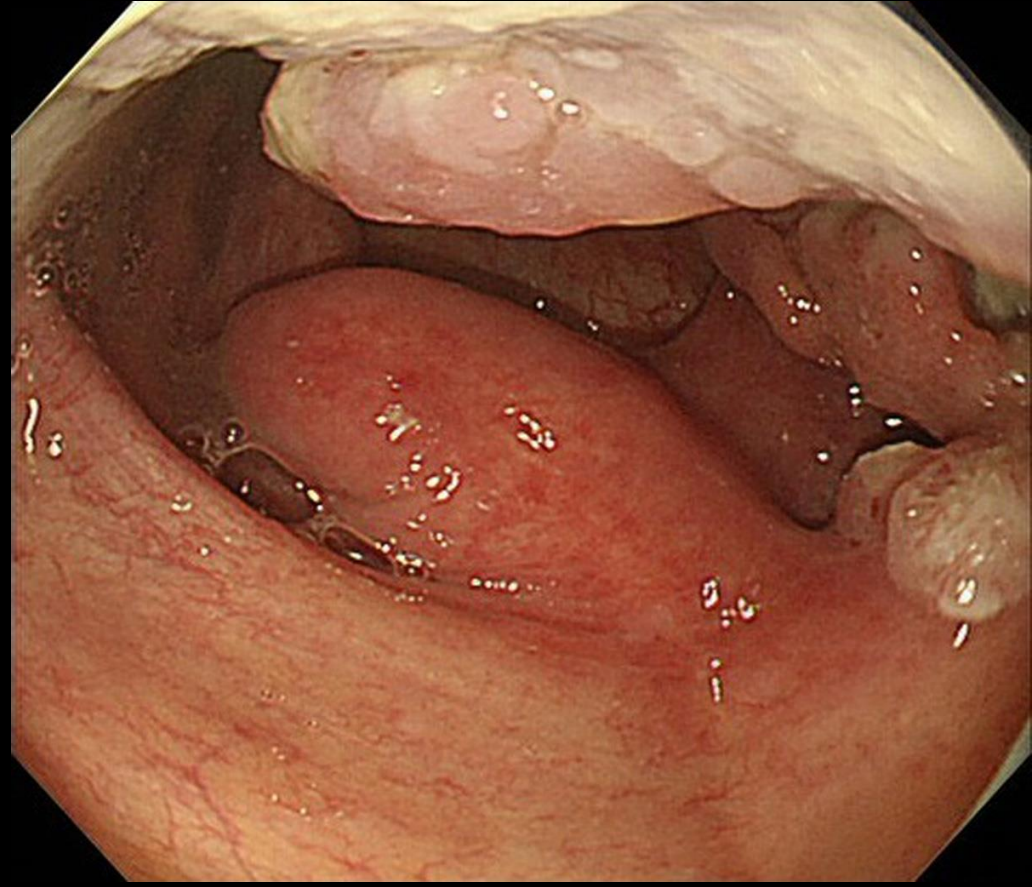
- Squamous cell cancer – most common type of oropharyngeal cancer.
- Risk factors - Cigarette smoking , excessive alcohol consumption, human papillomavirus (HPV)
- HPV-induced oropharyngeal cancer -smaller primary mass lesion, but more advanced nodal involvement is seen has better prognosis than tobacco- or alcohol-induced cancers.
- Imaging-
- Treatment Planning
- Monitoring tumour response
- Detect recurrent or persistent disease

SQUAMOUS CELL CARCINOMA

- Squamous cell carcinoma- most common type of oropharyngeal carcinoma (90%).
-
- Anterior tonsillar pillar – Most common site

- Sore throat, otalgia or dysphagia, pain and trismus.

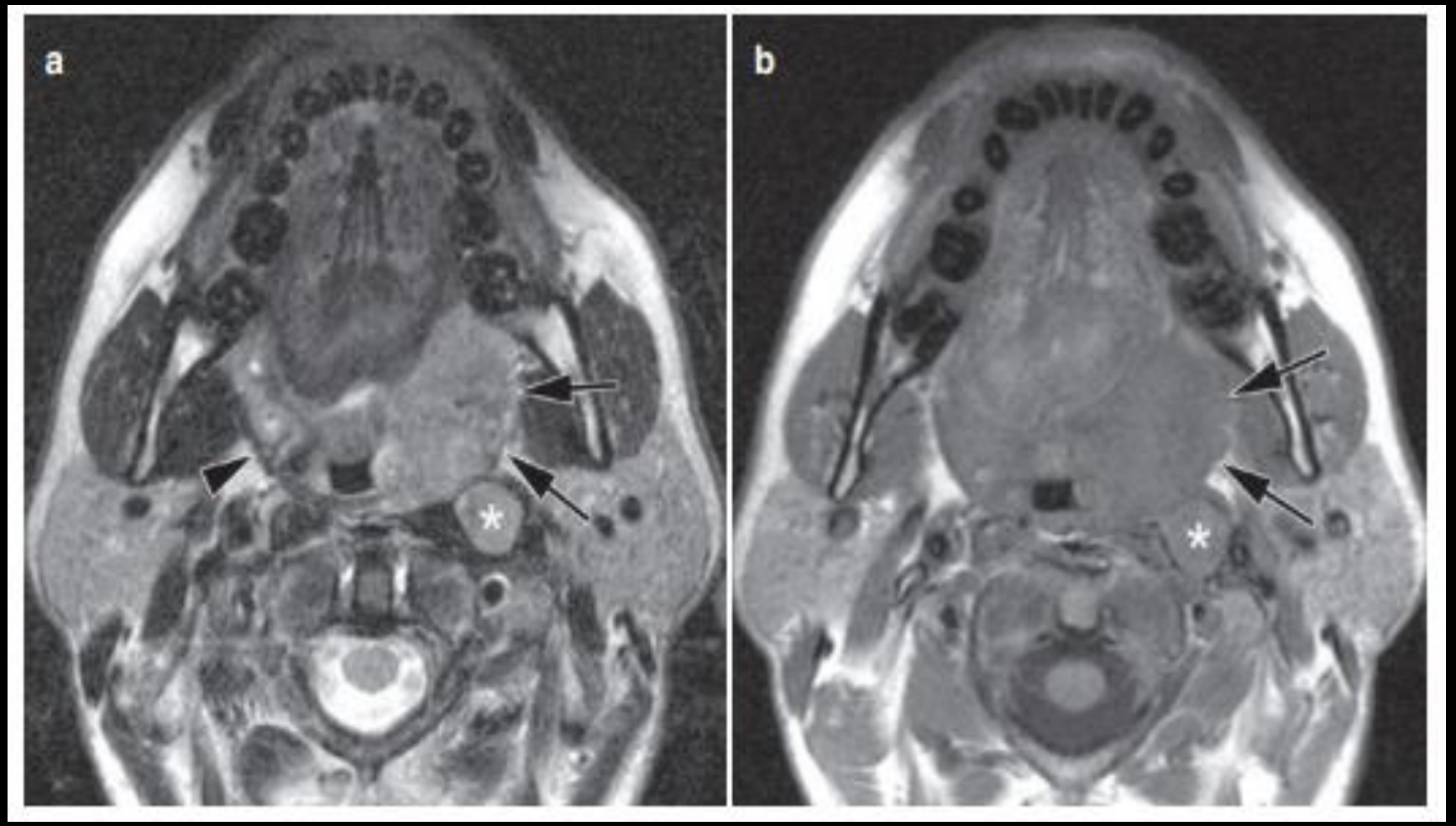
- p16 (a tumour-suppressor protein) overexpression in biopsy samples - surrogate test for HPV status.



TONSILLAR CANCER

- Nearly all tonsillar cancers originate from the anterior tonsillar pillar.
- Invasion :
- Superomedially - soft palate, both along the palatoglossal muscle.
- Anteroinferiorly - tongue base
- Anterolateral spread - along the pharyngeal constrictor muscle to the pterygomandibular raphe and retromolar trigone

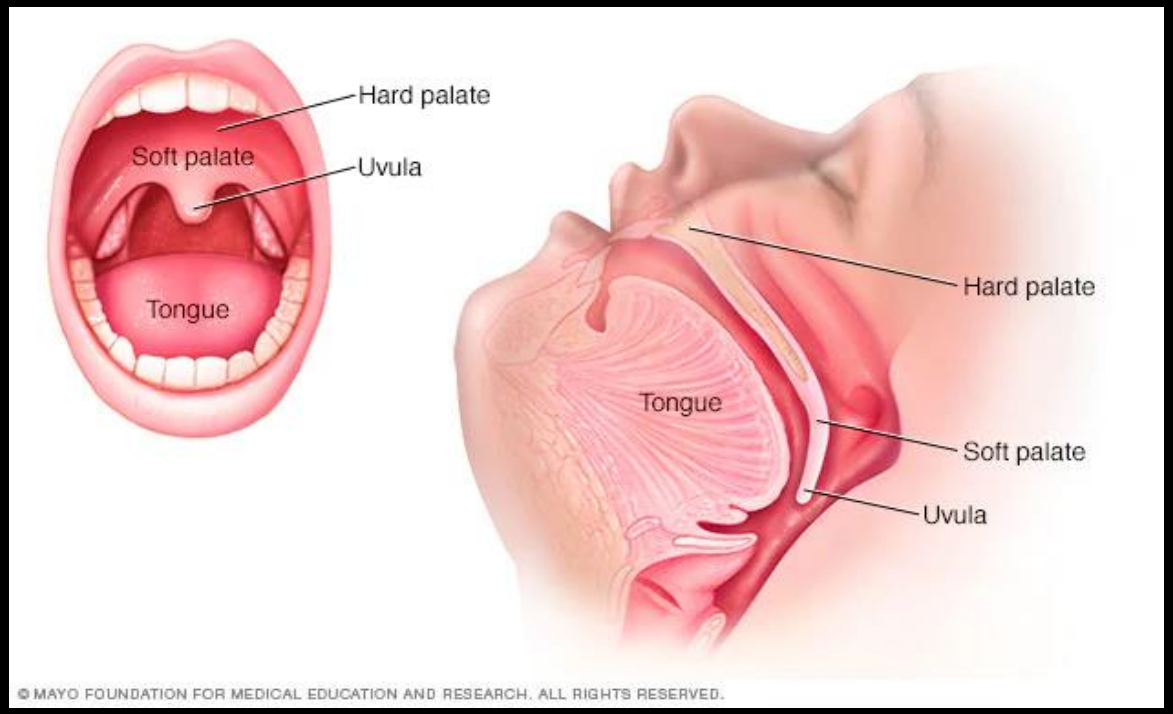
- Advanced cases –
- Mandible
- Along the pharyngeal wall to the hypo and/or nasopharynx, parapharyngeal space
- Infratemporal Fossa – Muscles of mastication, neurovascular structures.

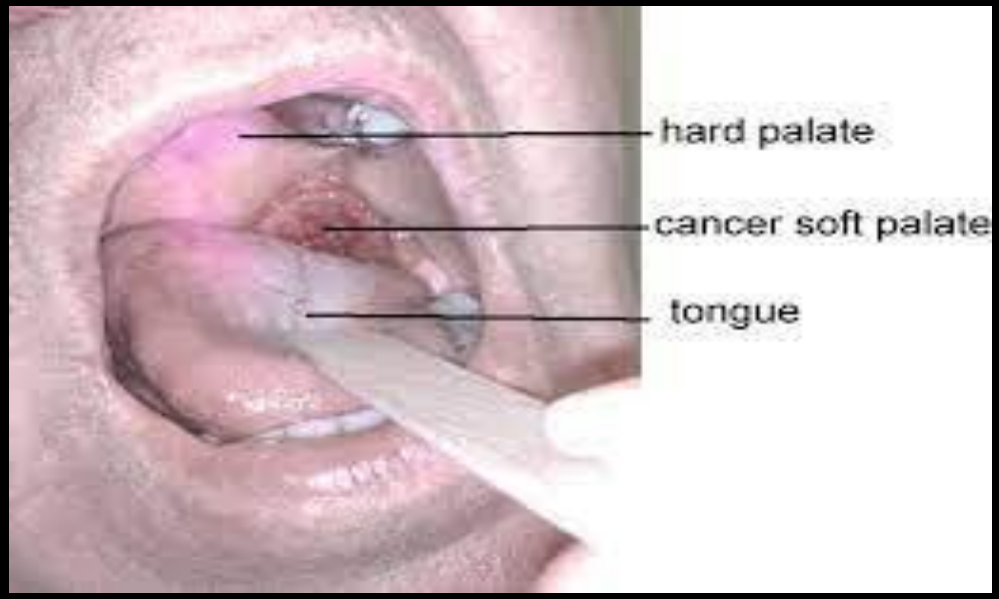

a
b

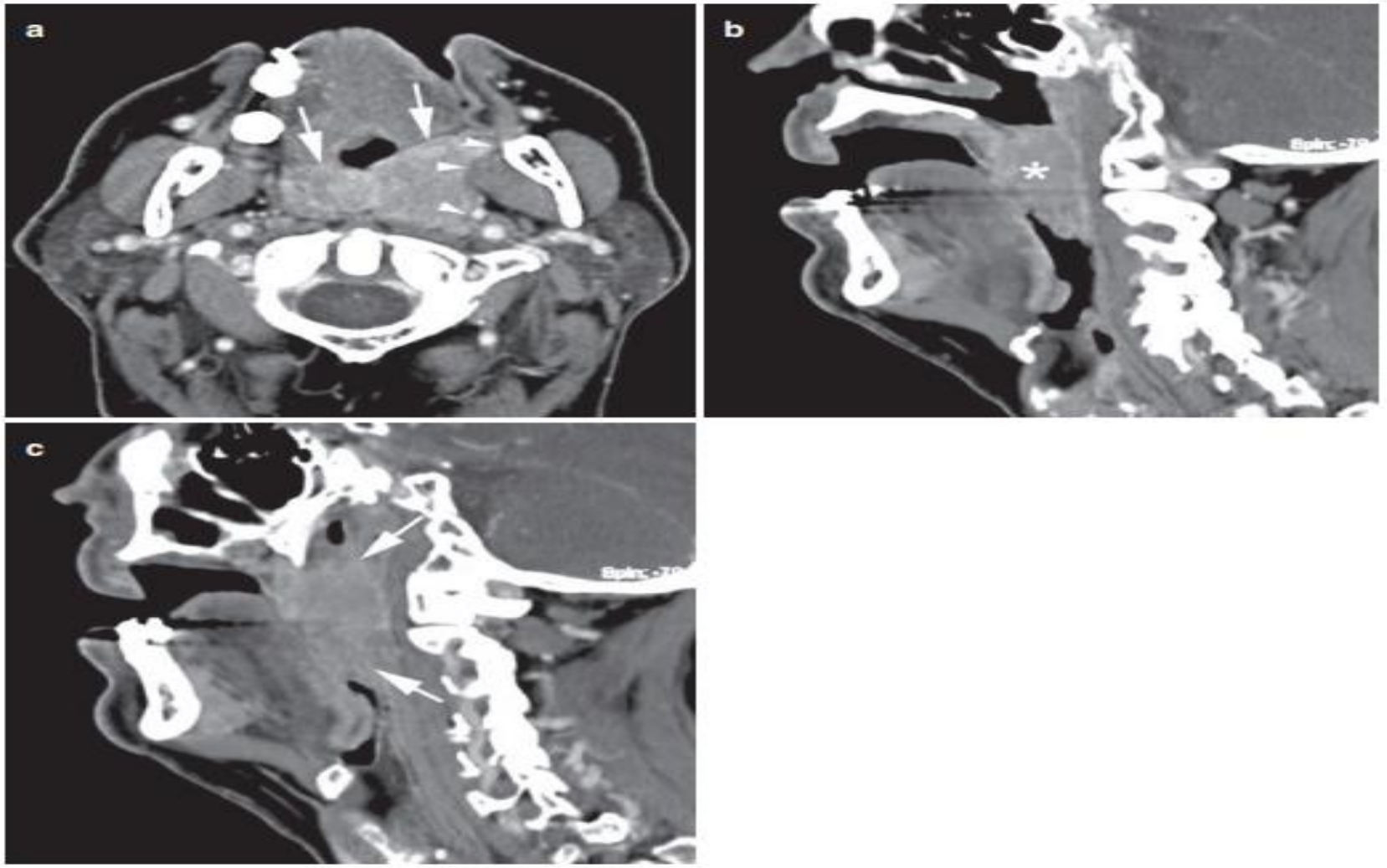
SOFT PALATE CANCER

Invasion

- Superior spread – Nasopharynx
- Laterally and inferiorly – Tonsillar pillars
- Perineural spread - Palatine branches of maxillary nerve

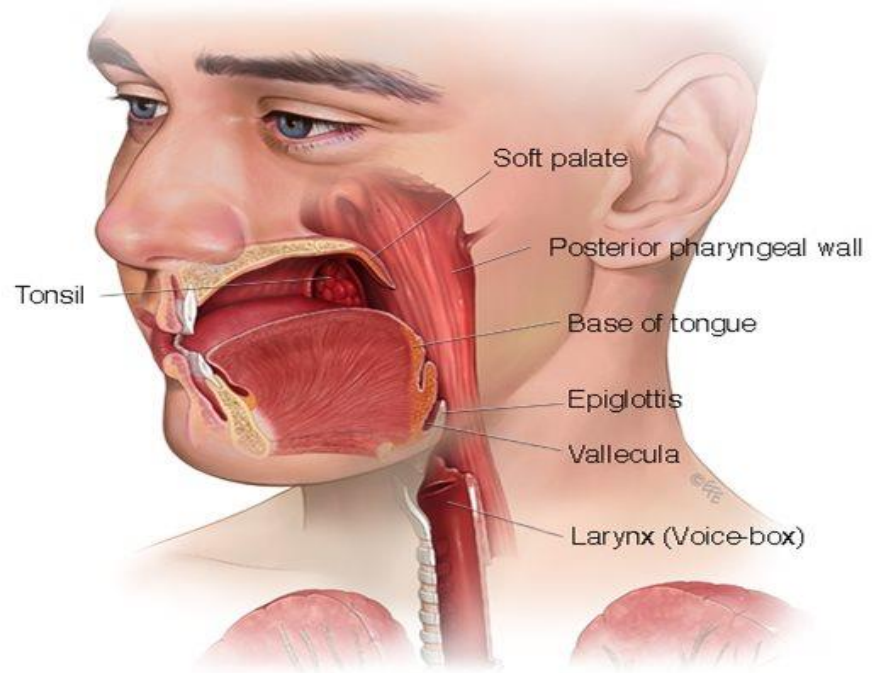


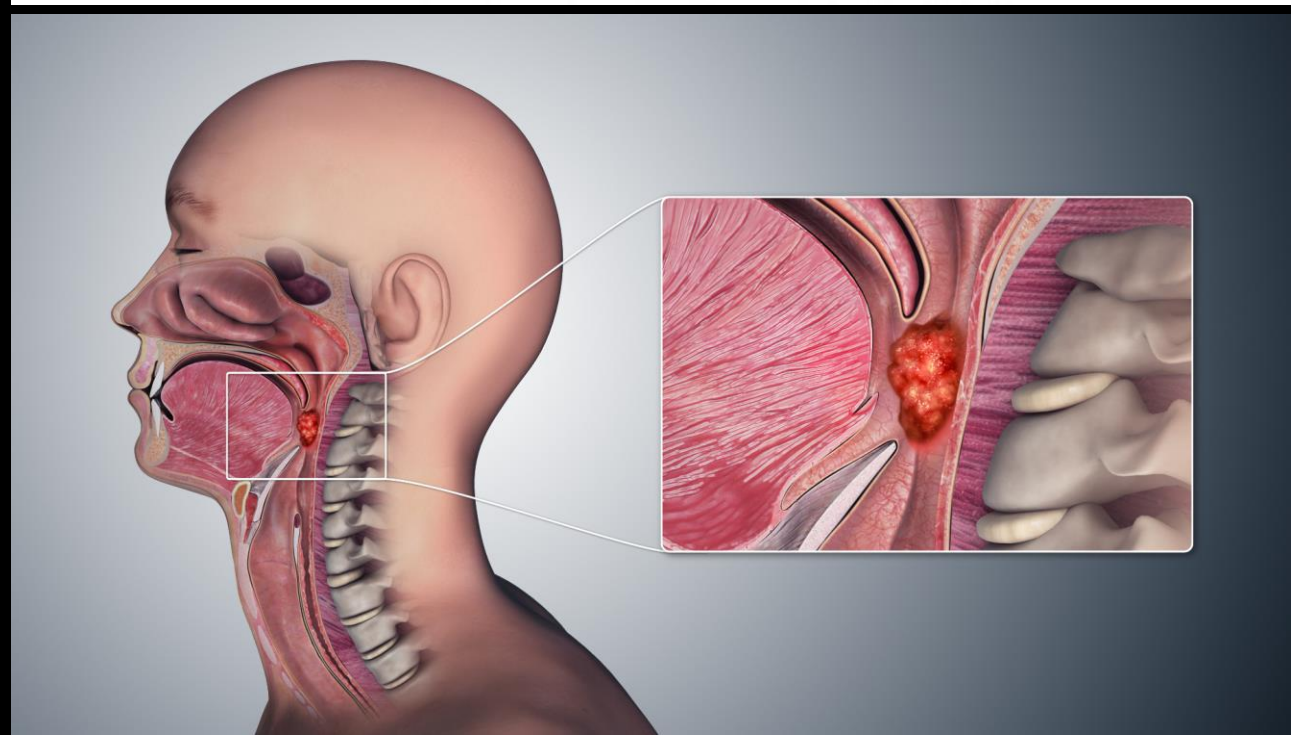


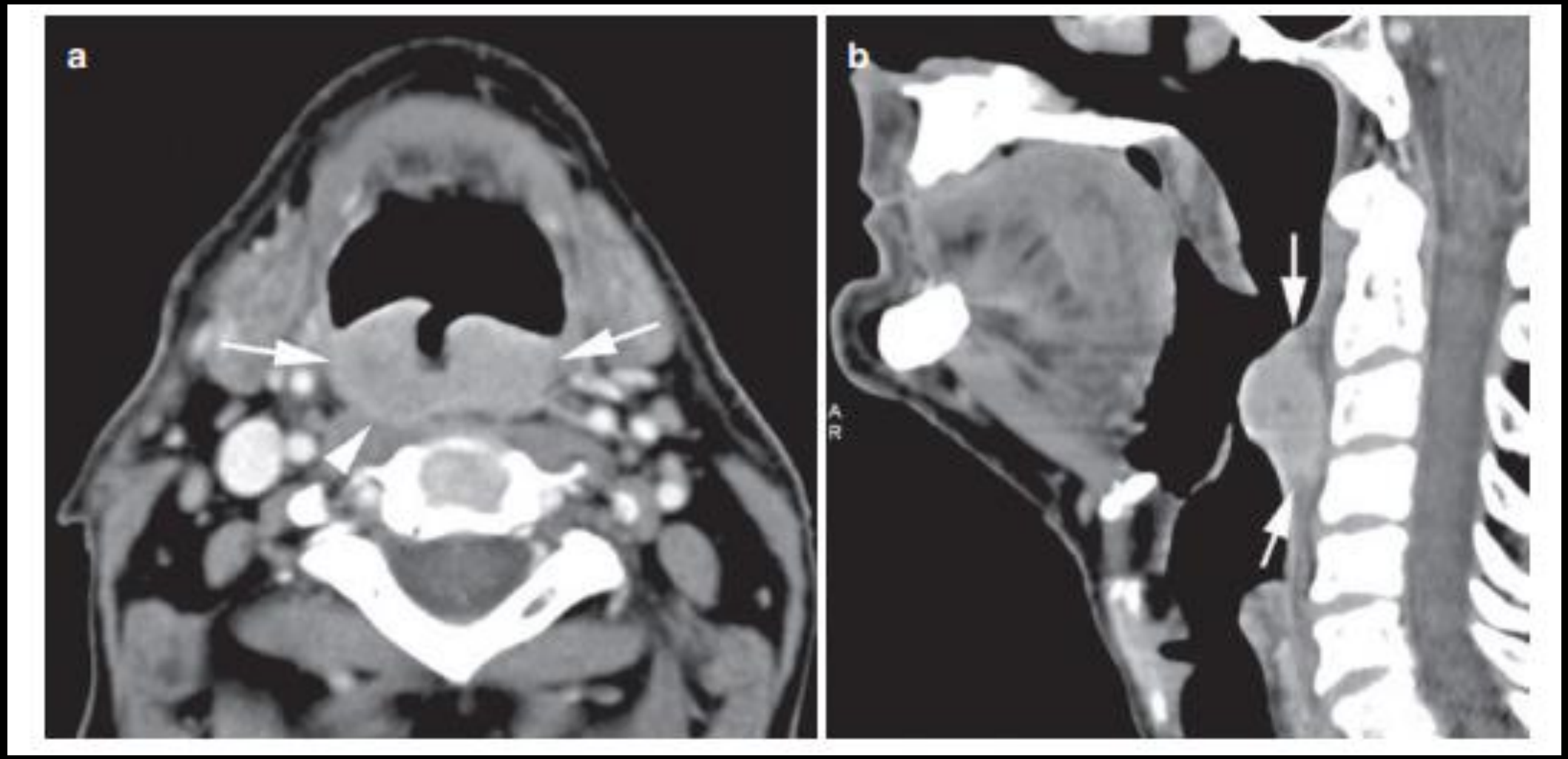

a
b
c

POSTERIOR OROPHARYNGEAL WALL CANCER

- Isolated cancer in the posterior oropharyngeal wall is rare .
- More commonly, this wall is invaded by cancers originating from the lateral oropharyngeal wall.
- Along the posterior wall, mucosal or submucosal spread to the hypopharynx and/or nasopharynx is possible.

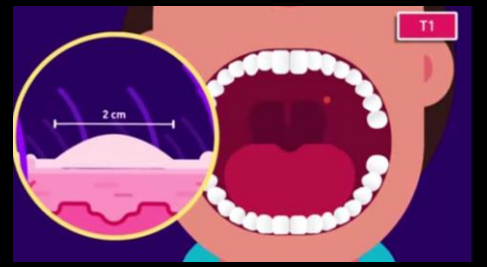


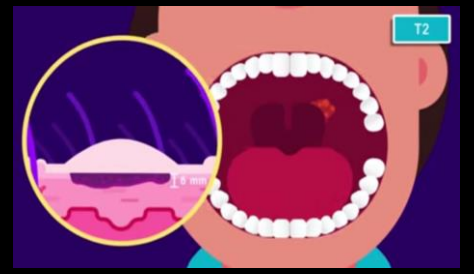


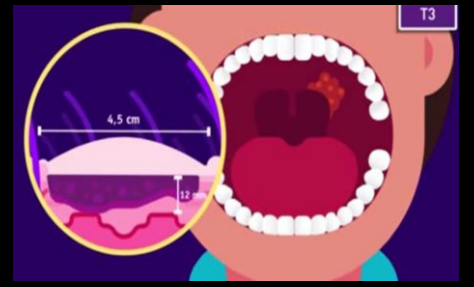

a
b
A
R

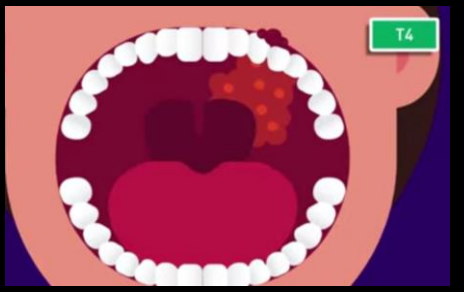
PRIMARY TUMOUR STAGING

T – PRIMARY TUMOUR	
TX	Primary tumour cannot be assessed
T0	No evidence of primary tumour
Tis	Carcinoma in situ
T1	Tumour 2 cm or less in greatest dimension
T2	Tumour more than 2 cm but not more than 4 cm in greatest dimension
T3	Tumour more than 4 cm in greatest dimension
T4a	Tumour invades any of the following: larynx, deep/extrinsic muscle of the tongue (genioglossus, hyoglossus, palatoglossus and styloglossus), medial pterygoid, hard palate and mandible
T4b	Tumour invades any of the following: lateral pterygoid muscle, pterygoid plates, lateral nasopharynx or skull base, or encases the carotid artery



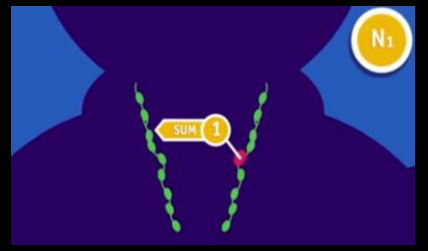


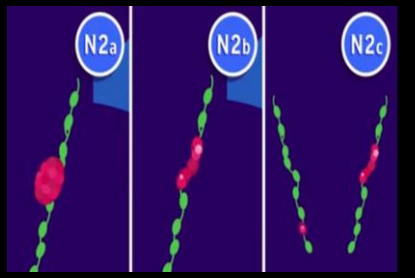


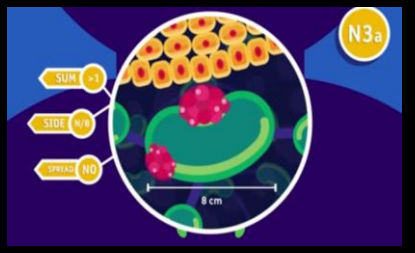


NODAL STAGING

N – REGIONAL LYMPH NODES	
NX	Regional lymph nodes cannot be assessed
N0	No regional lymph node metastasis
N1	Metastasis in a single ipsilateral lymph node, 3 cm or less in greatest dimension
N2a	Metastasis in a single ipsilateral lymph node, more than 3 cm but not more than 6 cm in greatest dimension
N2b	Metastasis in multiple ipsilateral lymph nodes, none more than 6 cm in greatest dimension
N2c	Metastasis in bilateral or contralateral lymph nodes, none more than 6 cm in greatest dimension
N3	Metastasis in a lymph node more than 6 cm in greatest dimension

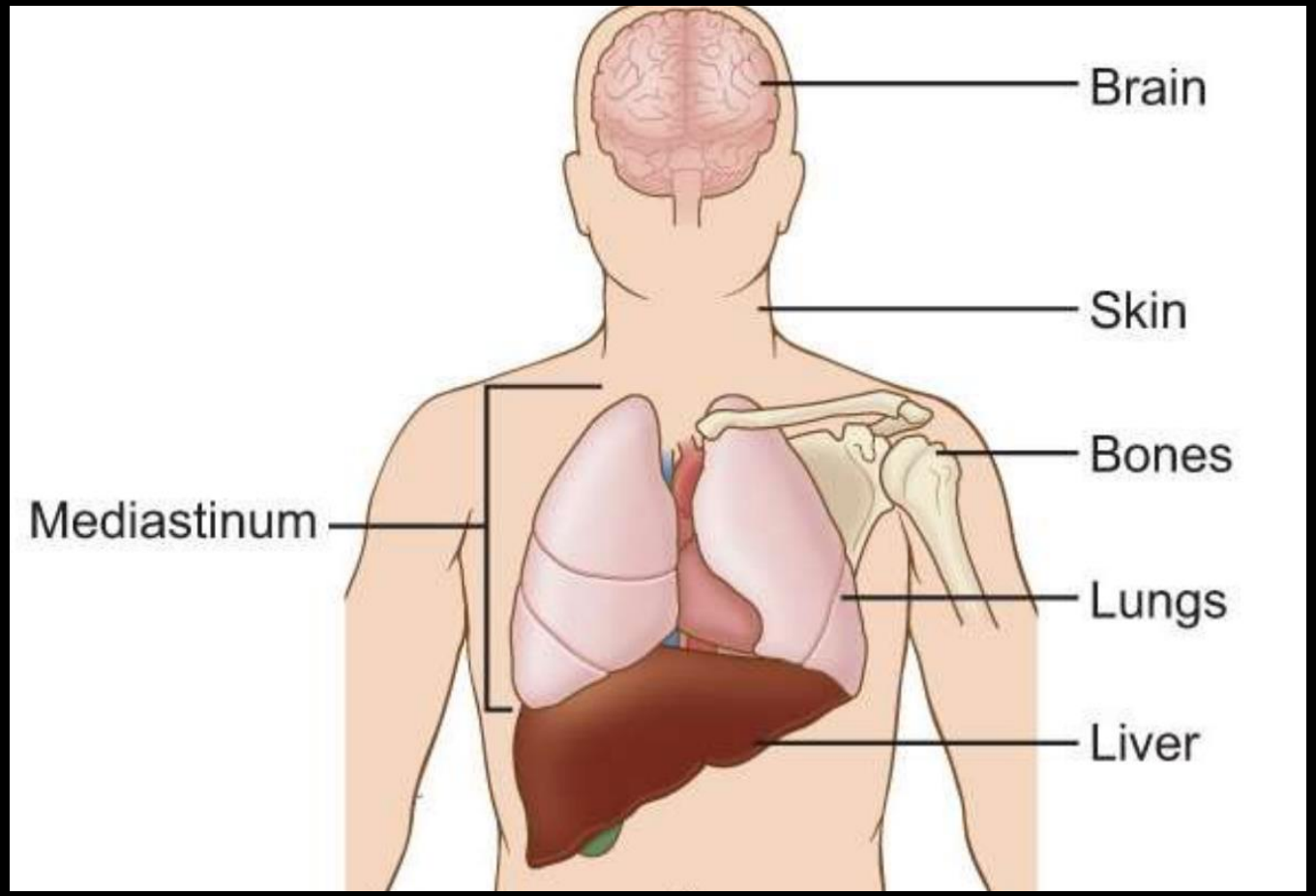






DISTANT METASTASIS

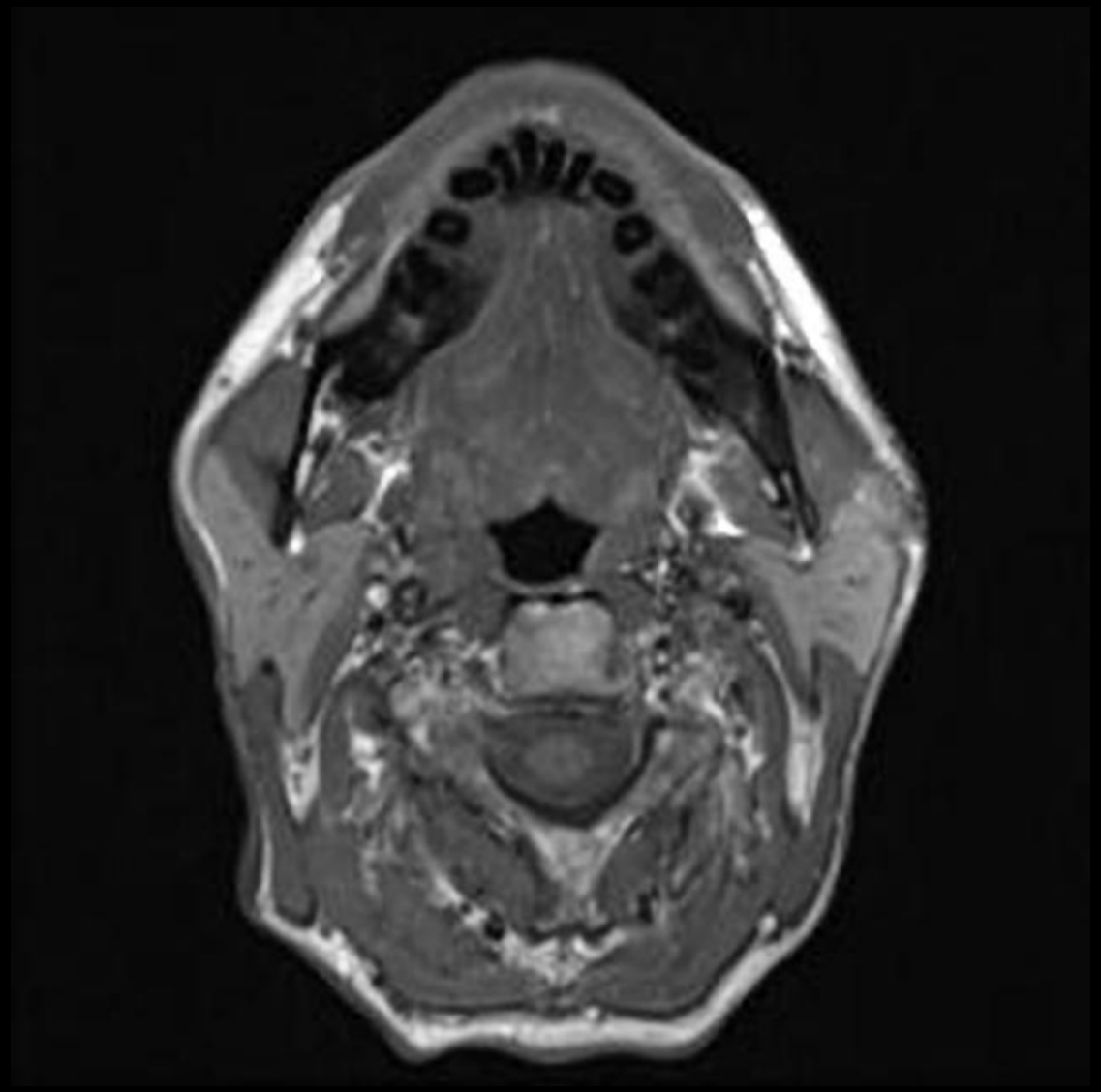
M – DISTANT METASTASIS	
MX	Distant metastasis cannot be assessed
M0	No distant metastasis
M1	Distant metastasis

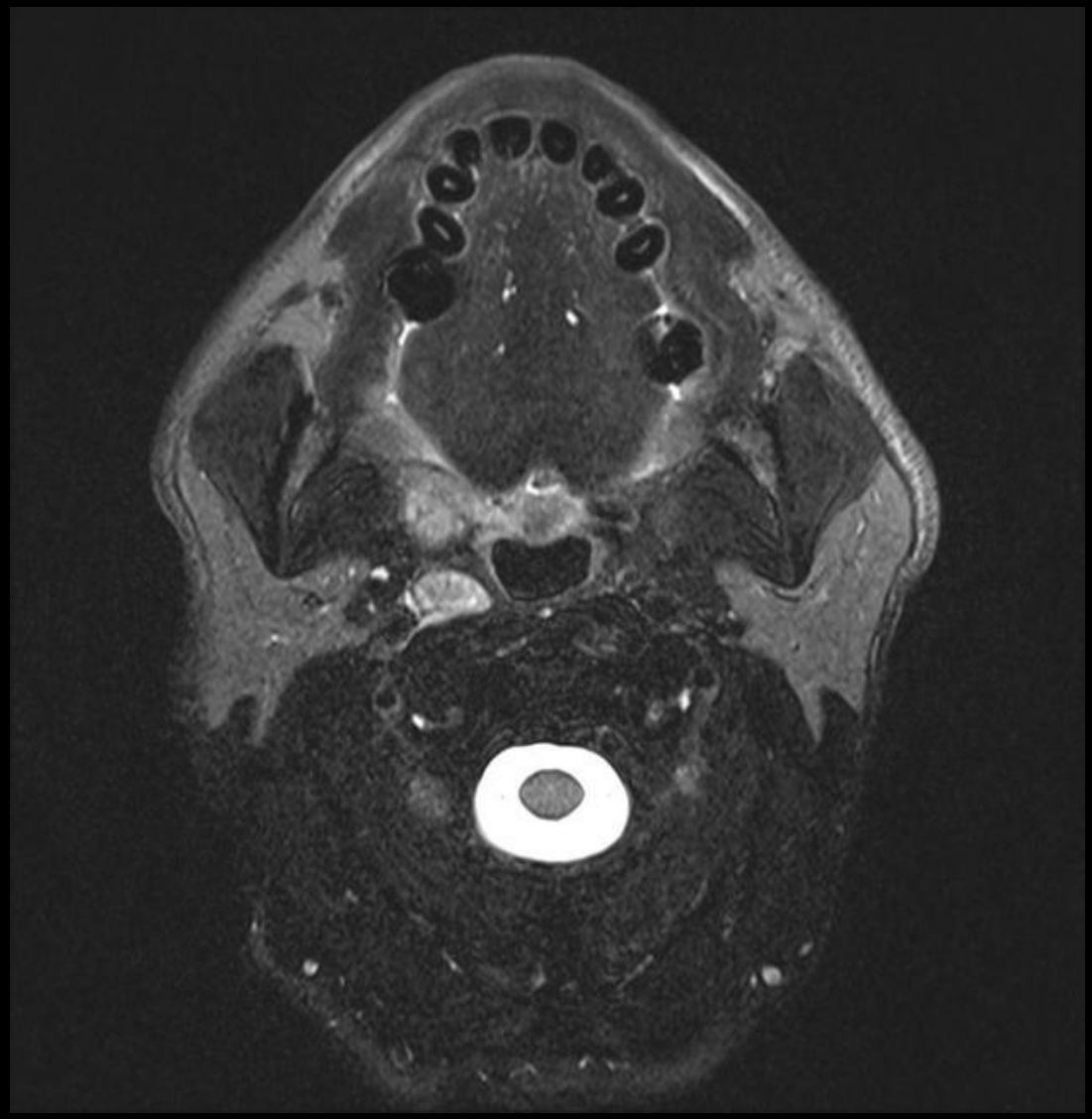


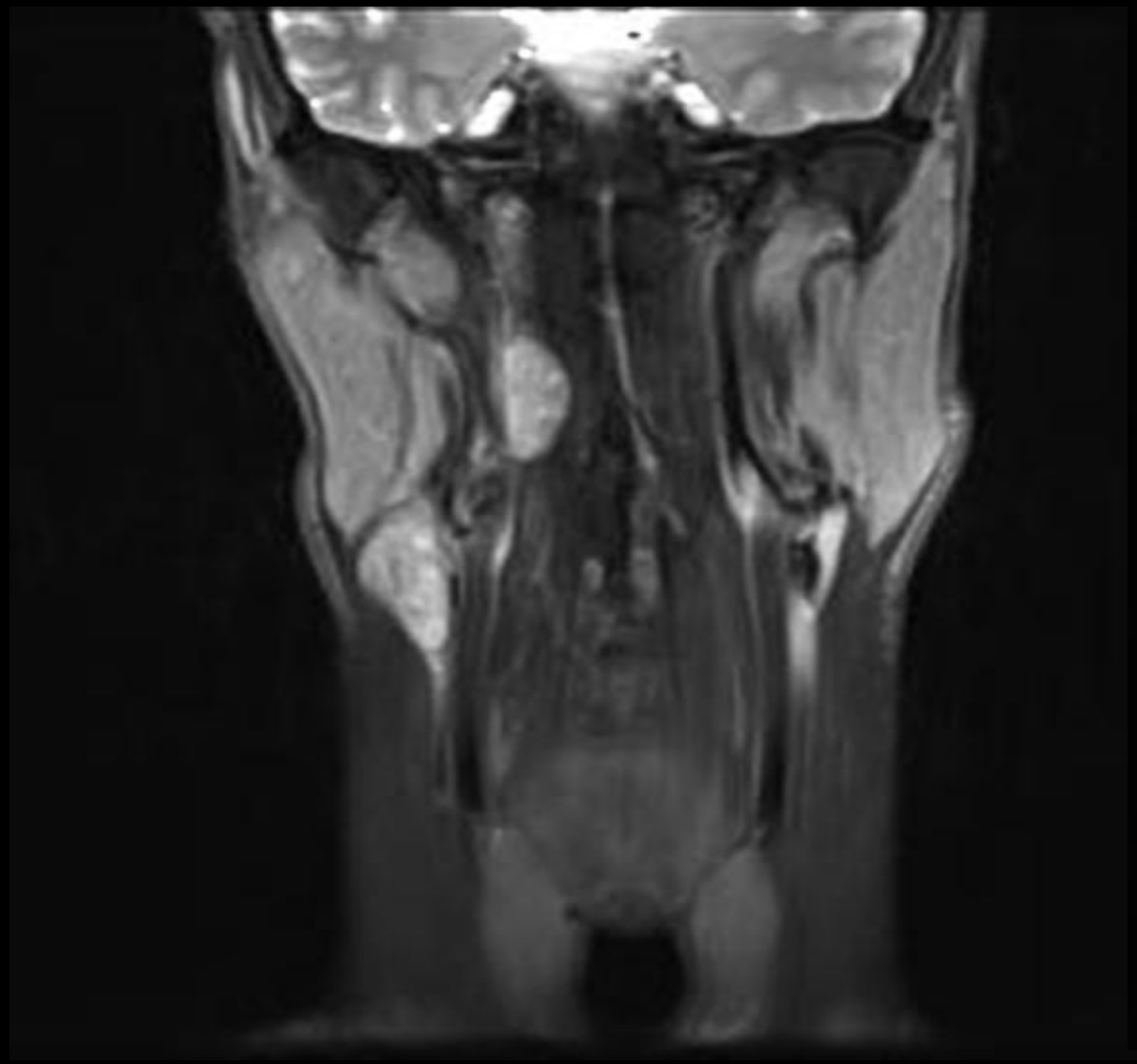
TNM CLASSIFICATION

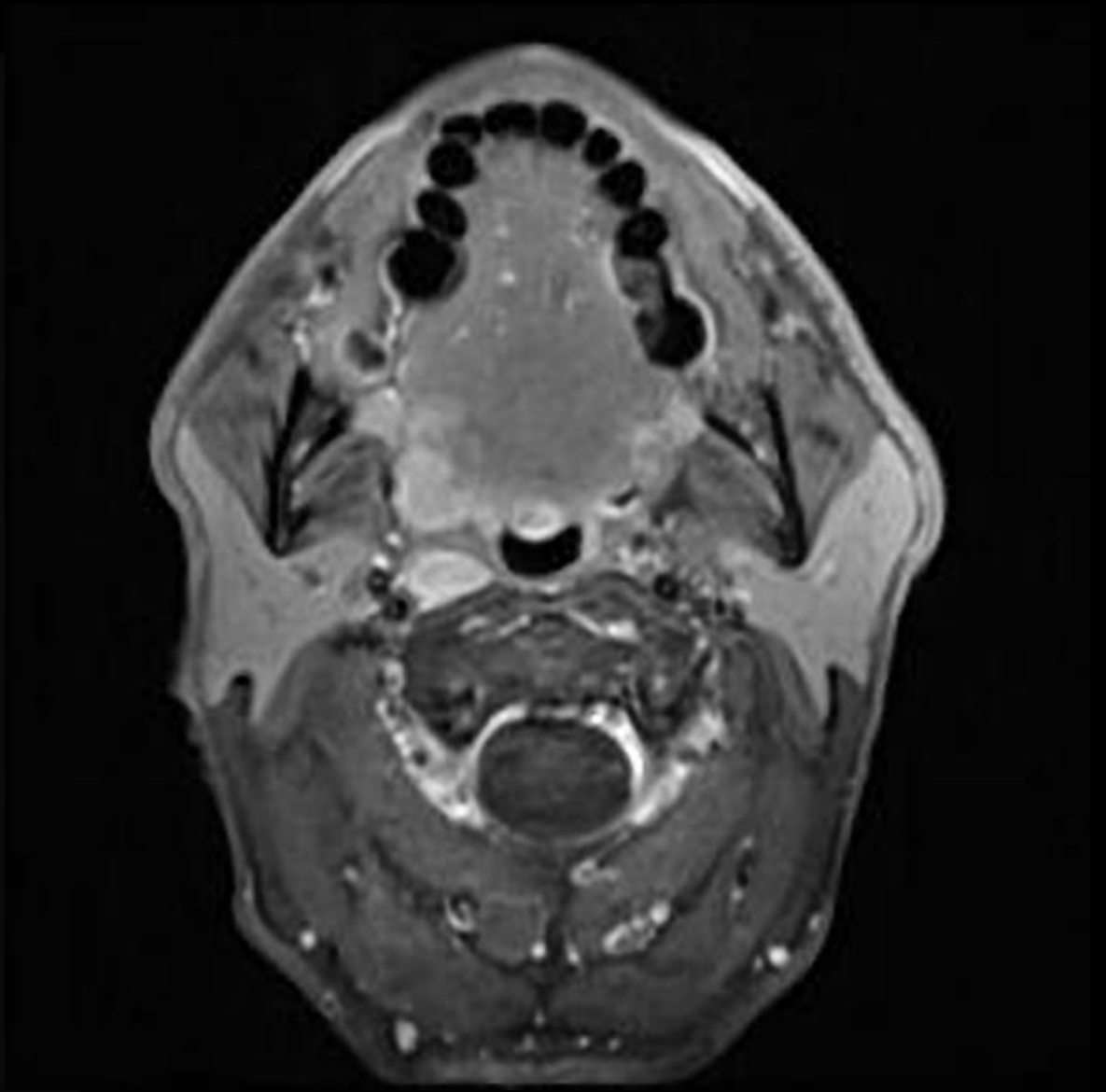
CANCER STAGE	T CATEGORY	N CATEGORY	M CATEGORY
0	Tis	N0	M0
I	T1	N0	M0
II	T2	N0	M0
III	T1, T2 T3	N1 N0, N1	M0 M0
IV A	T1, T2, T3 T4a	N2 N0, N1, N2	M0 M0
IV B	Any T4b	N3 Any	M0 M0
IV C	Any	Any	M1

CASE - 1

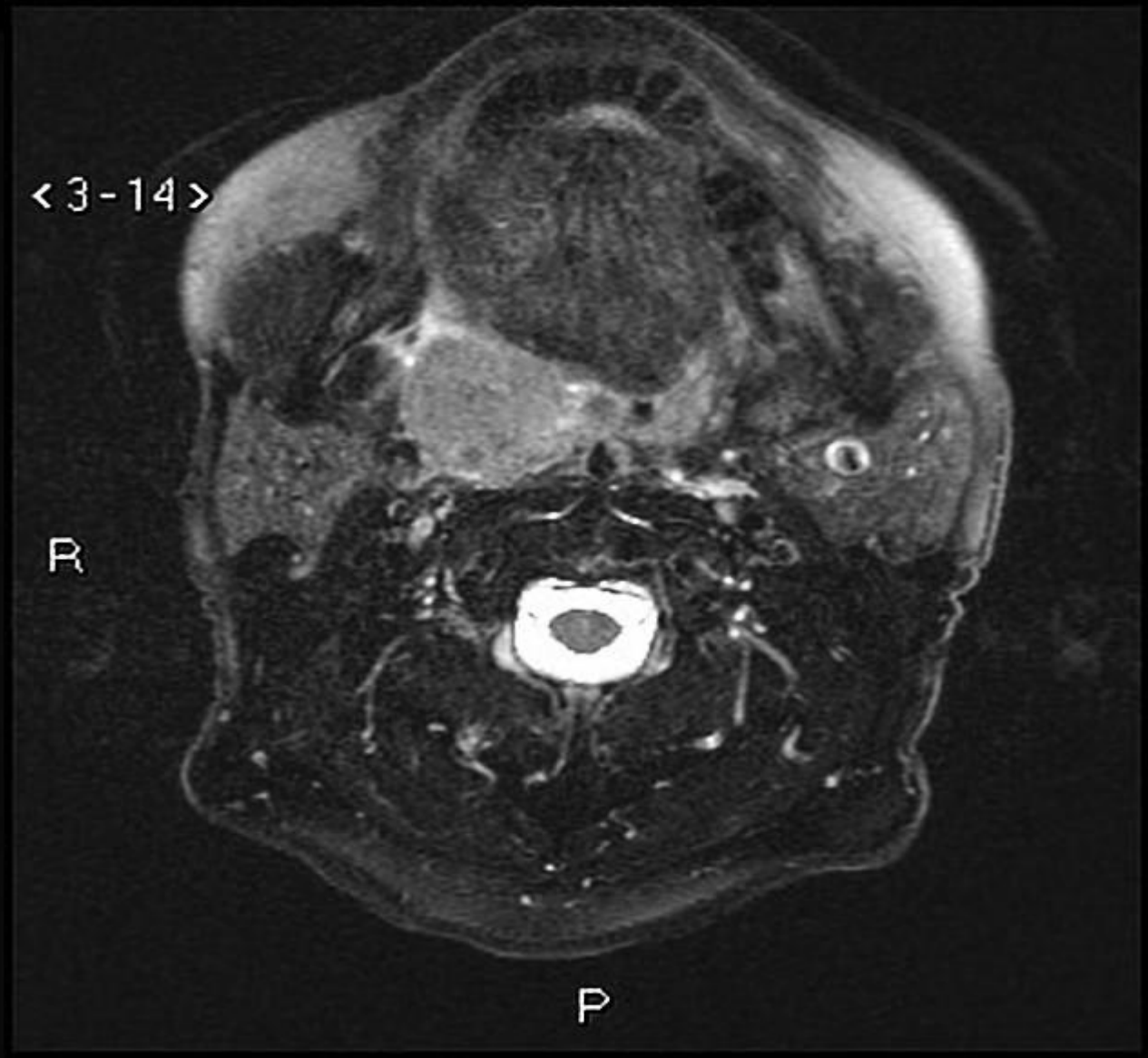








CASE - 2

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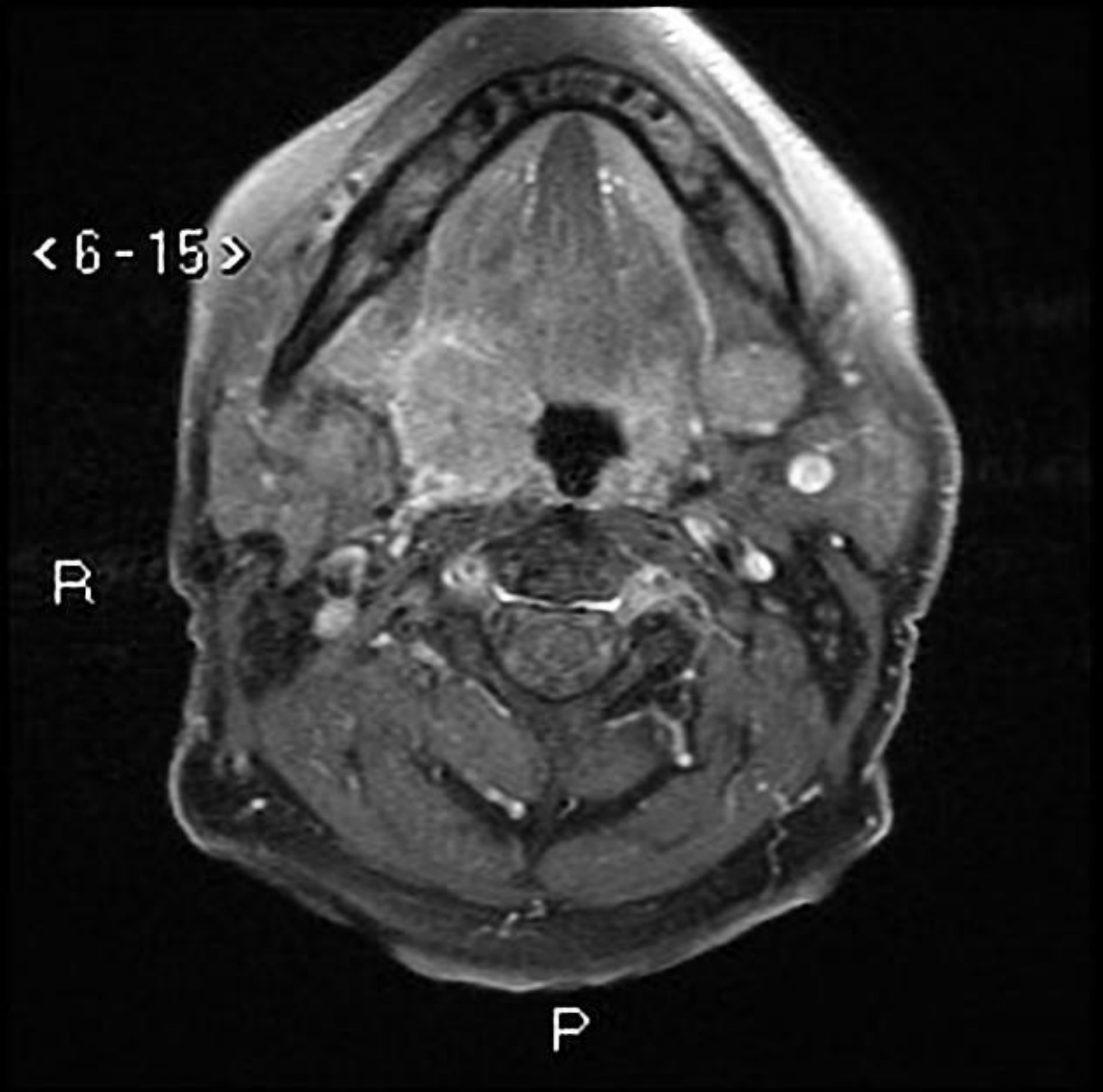
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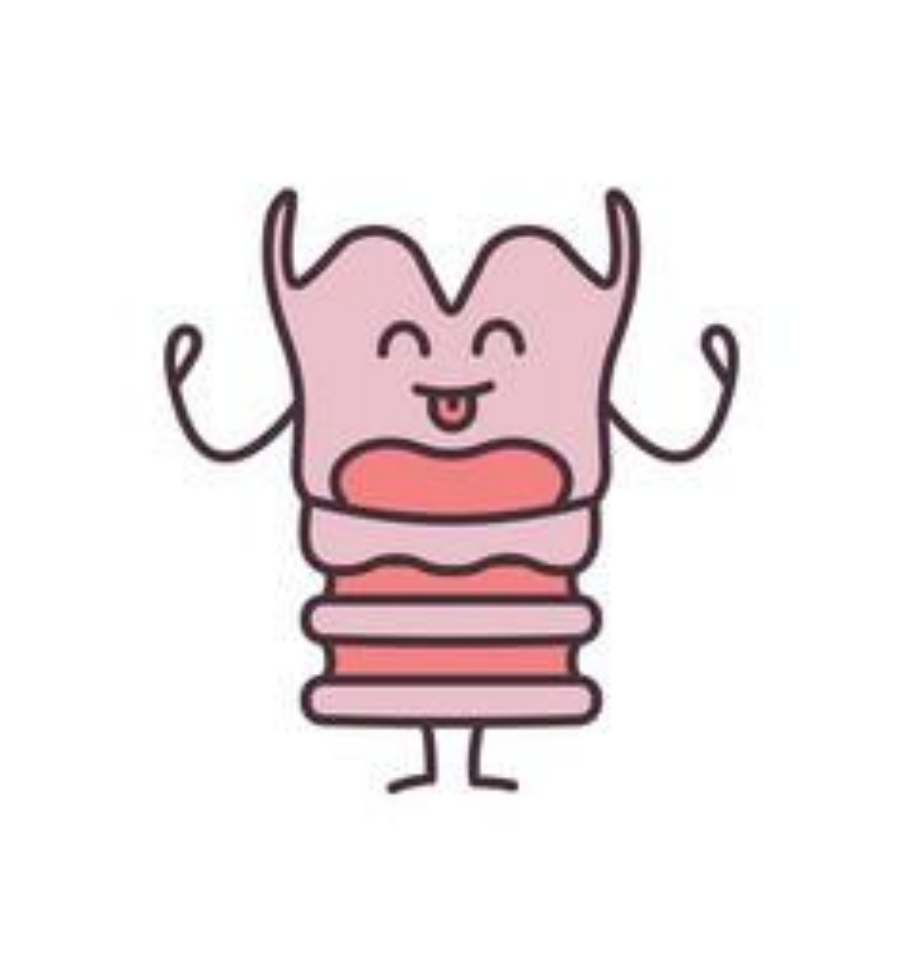
P

LARYNX



DR. GAURAV BHANDARI

ASSISTANT PROFESSOR

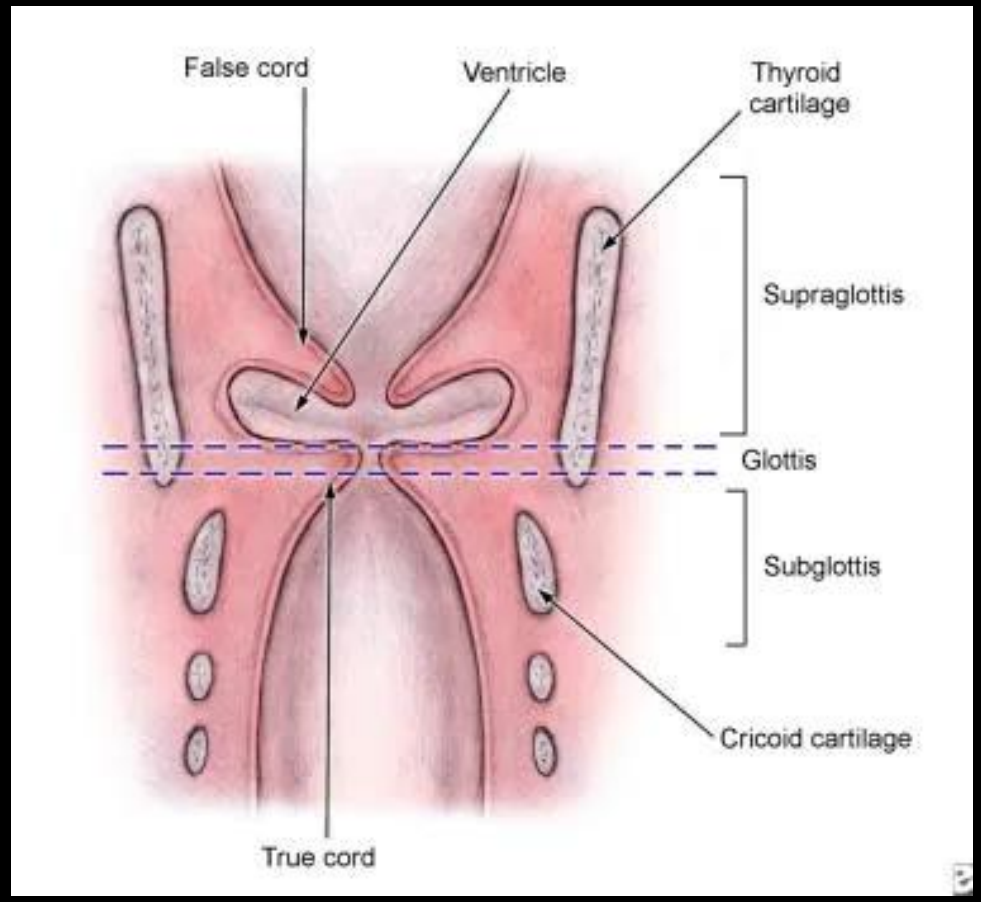
DEPARTMENT OF RADIO-DIAGNOSIS

MGM MEDICAL COLLEGE & M.Y. HOSPITAL, INDORE

- THE SUPRAGLOTTIS: From the superior-most tip of the epiglottis -to a transverse plane through the laryngeal ventricle.

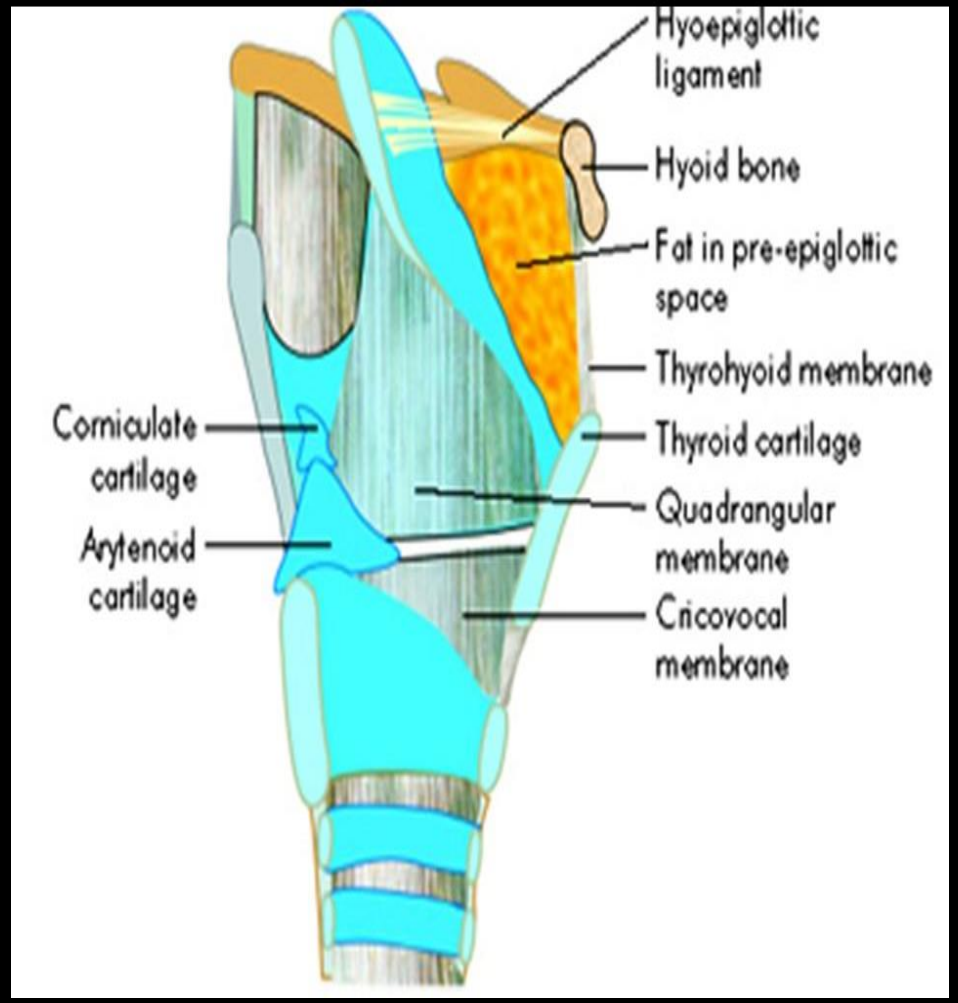
- THE GLOTTIS: From this transverse plane to 1 cm inferiorly and includes the true vocal cords.

- THE SUBGLOTTIS: From the inferior-most plane of the true cords -to the inferior portion of the cricoid cartilage



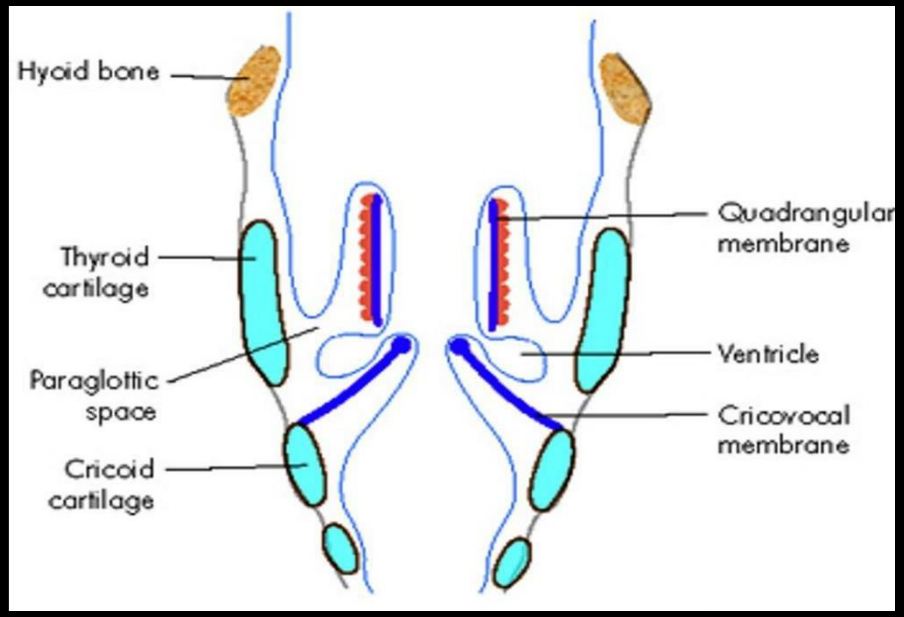
PRE-EPIGLOTTIC SPACE

- Anteriorly by thyrohyoid membrane & thyroid cartilage and hyoepiglottic ligament
- Posterior: epiglottis elastic cartilage
- Inferior: Petiole attachment to thyroid cartilage
- Filled with fat and areolar tissue
- Continous with para glottic space
- Carcinoma of laryngeal surface of epiglottis readily spreads into Pre epiglottic space



PARAGLOTTIC SPACE

- quadrangular membrane inferiorly
- conus elasticus anteriorly and medially
- thyroid cartilage laterally



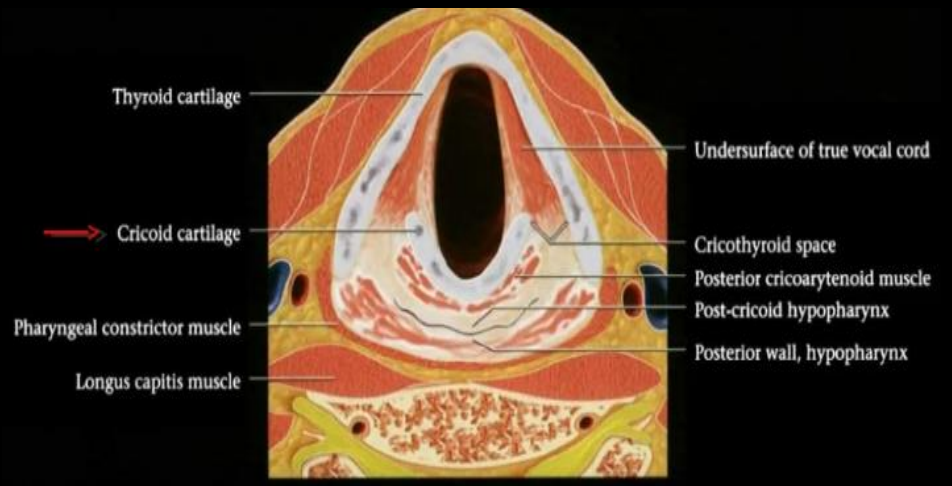
GLOTTIS

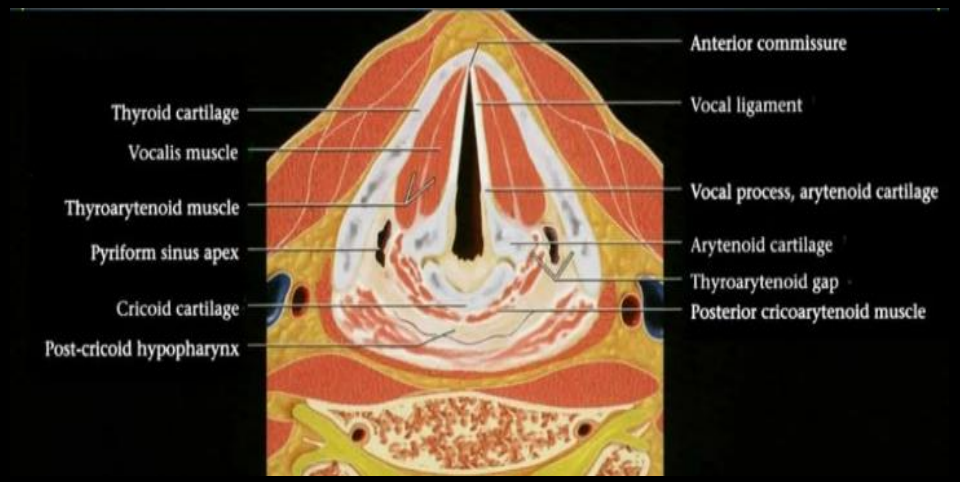
TVC

Anterior & posterior commissures.

- Comprised of thyroarytenoid muscle (medial fibers are "vocalis muscle")

- Anterior commissure: Midline, anterior meeting point of TVC.

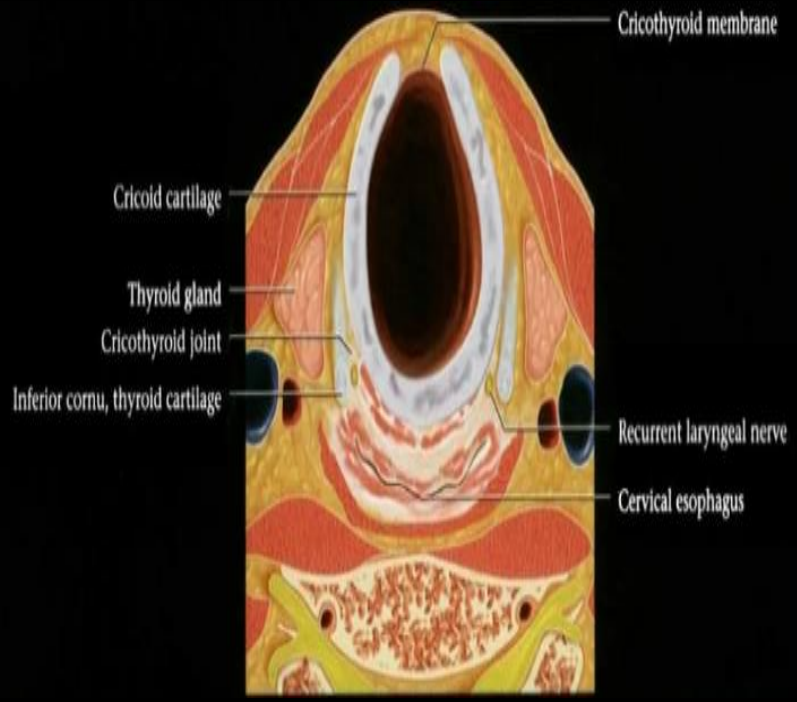




SUBGLOTTIS

- Subglottis extends from under surface of TVC to inferior surface of cricoid cartilage

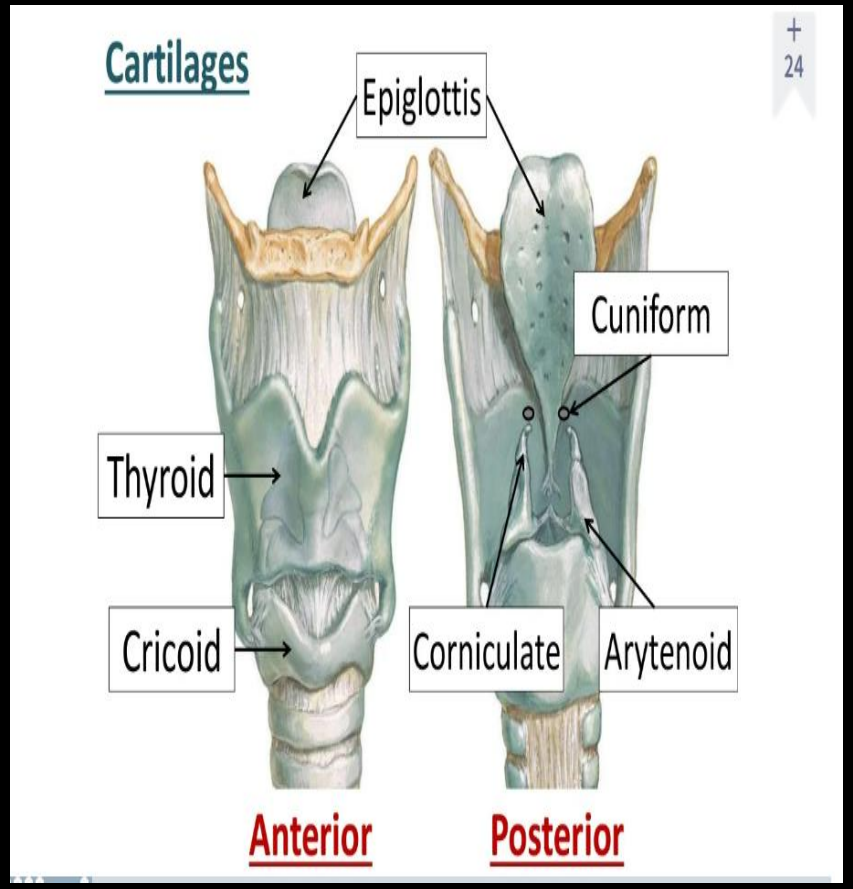
- Conus elasticus: Fibroelastic membrane extends from medial margin of TVC above to cricoid below.



- CARTILAGES

3 Unpaired: Thyroid, Cricoid, Epiglottis

3 Paired: Arytenoids, Cuneiform, Corniculate

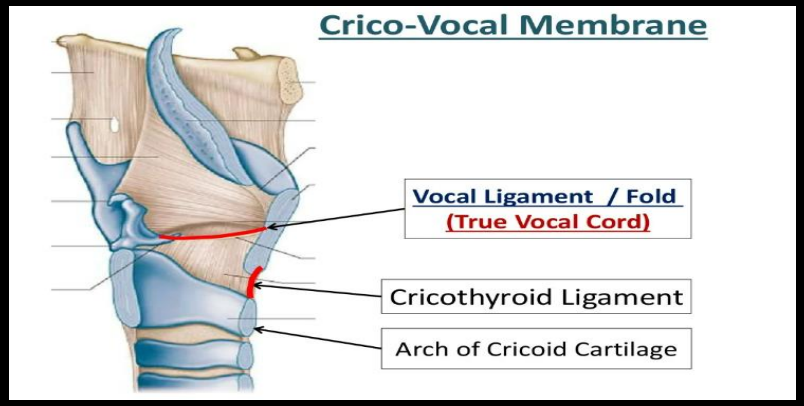


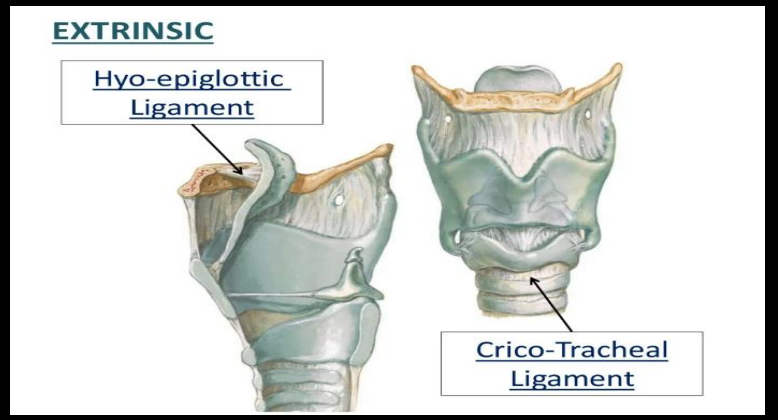
EXTRINSIC MEMBRANE

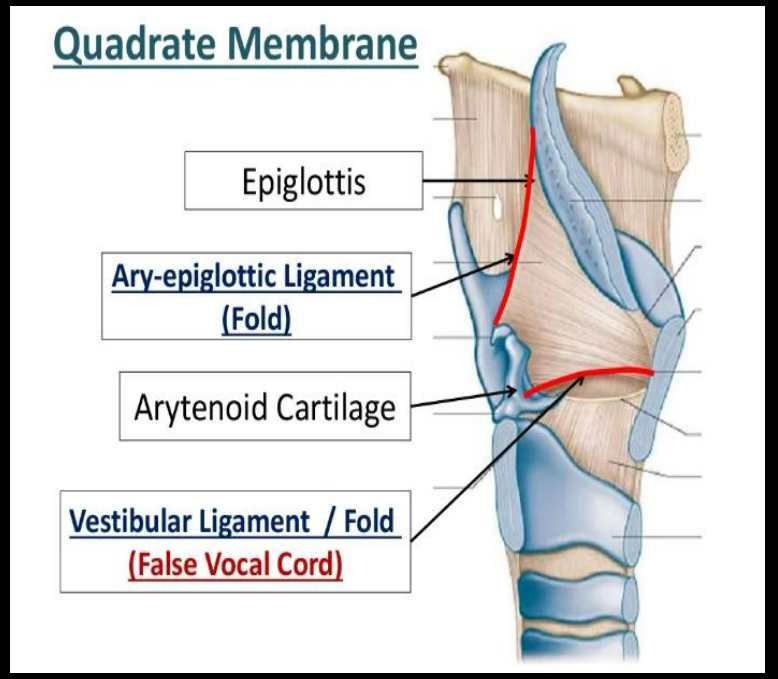
- Thyrohyoid
- Cricotracheal
- Hyoepiglottic

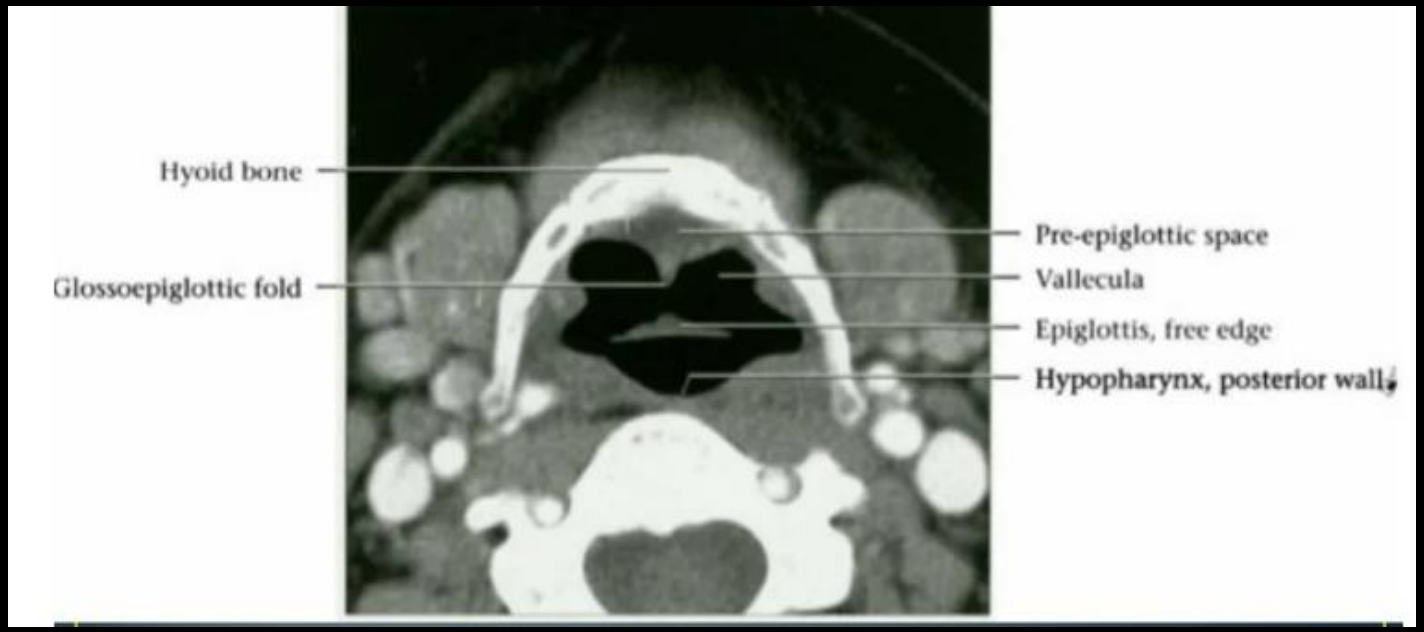
INTRINSIC MEMBRANE

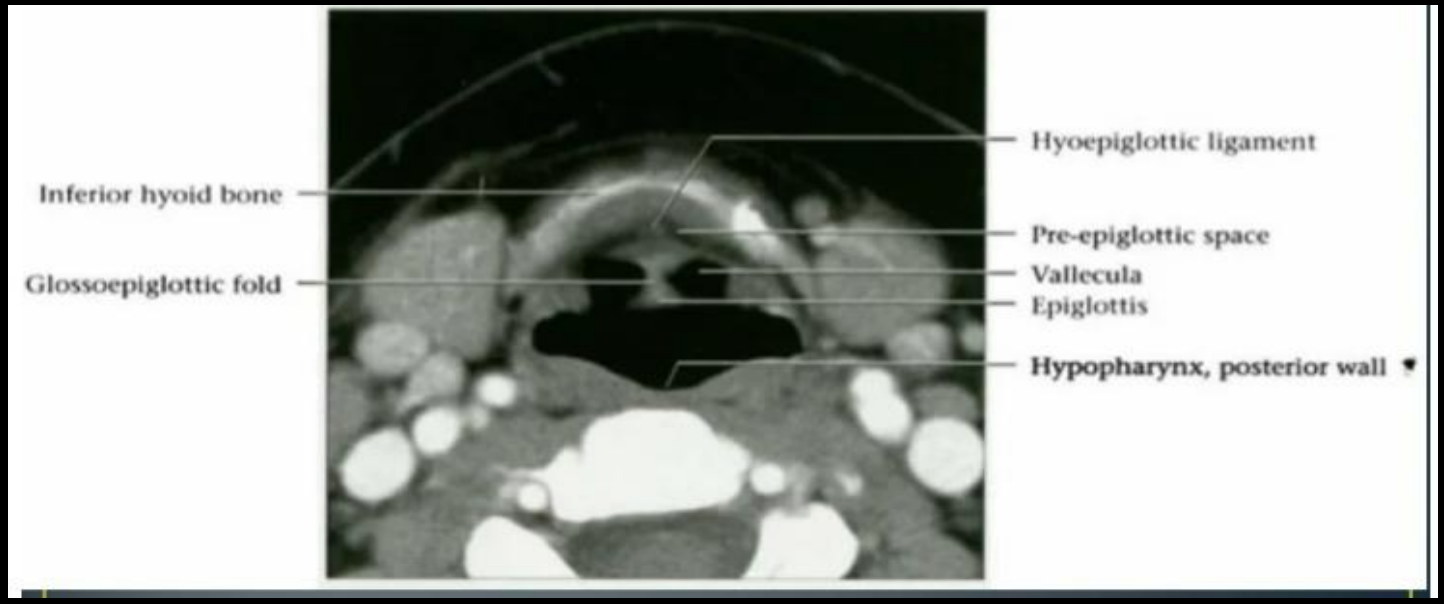
- Quadrangular membrane
- Vestibular ligament
- Cricovocal membrane
- Vocal ligament

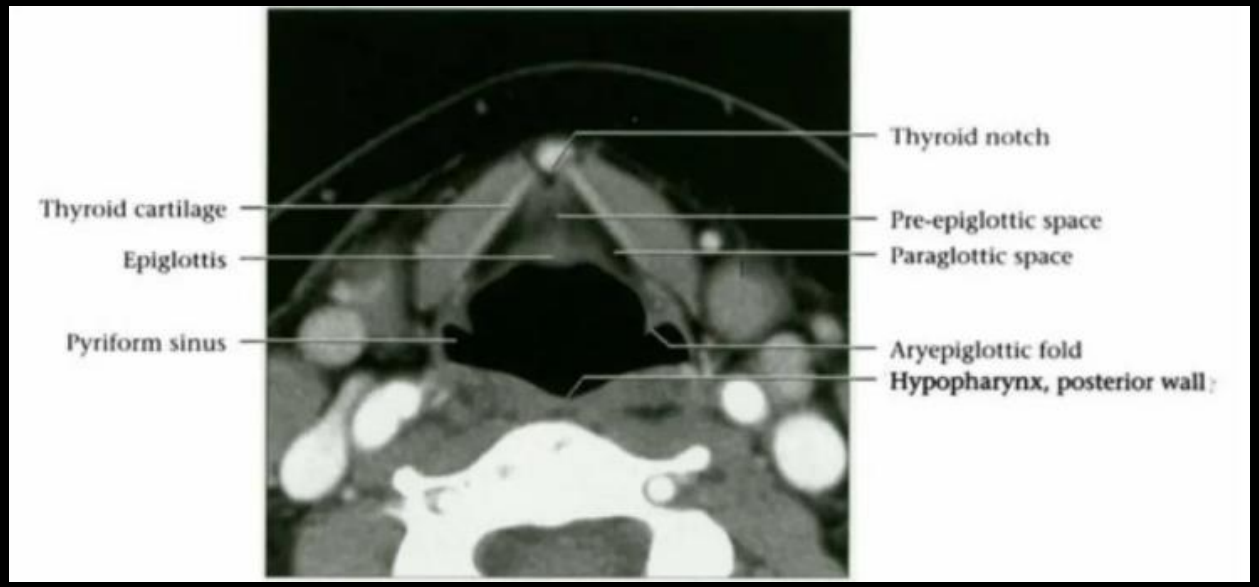


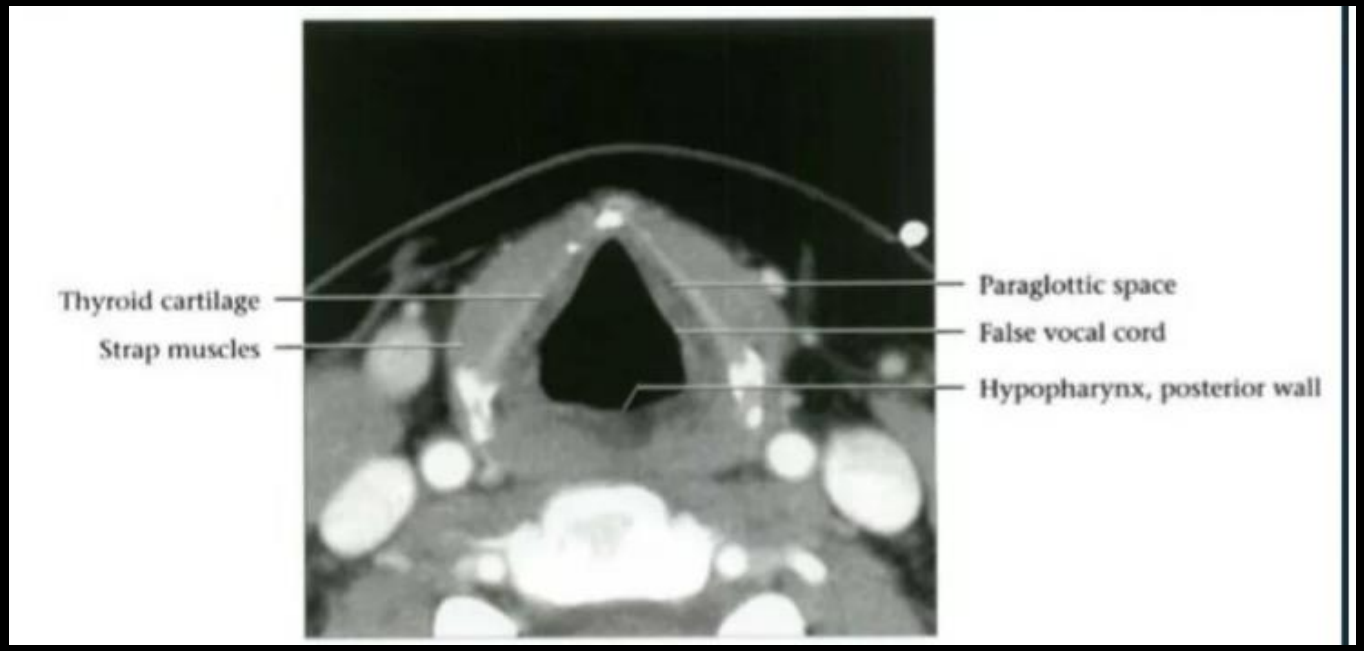


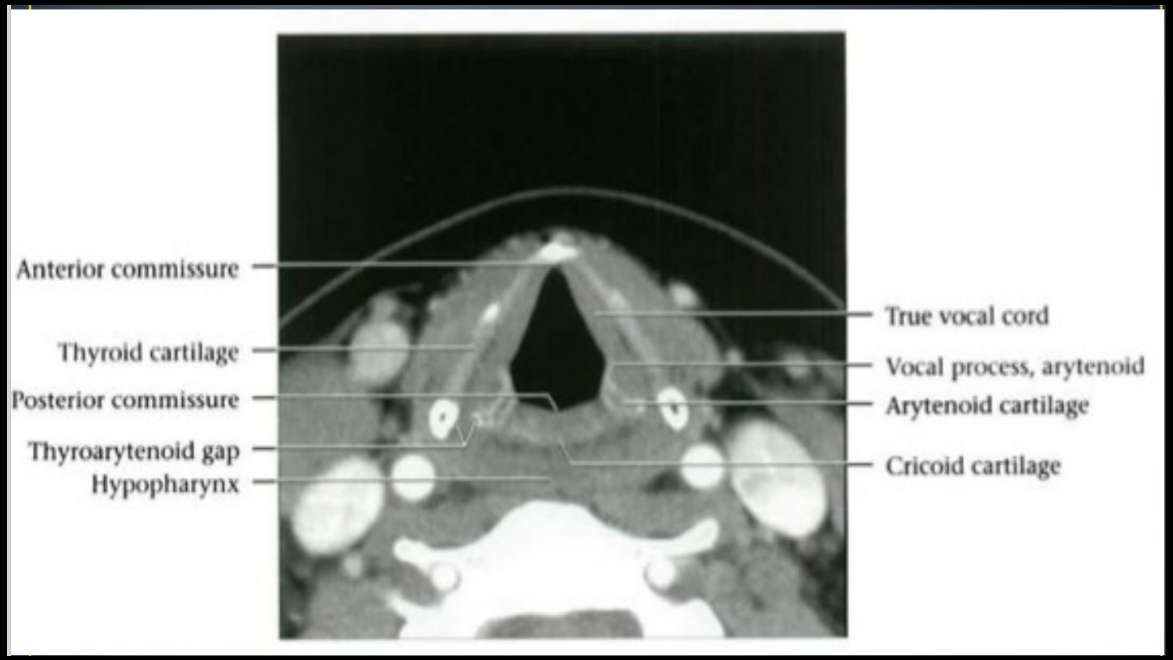


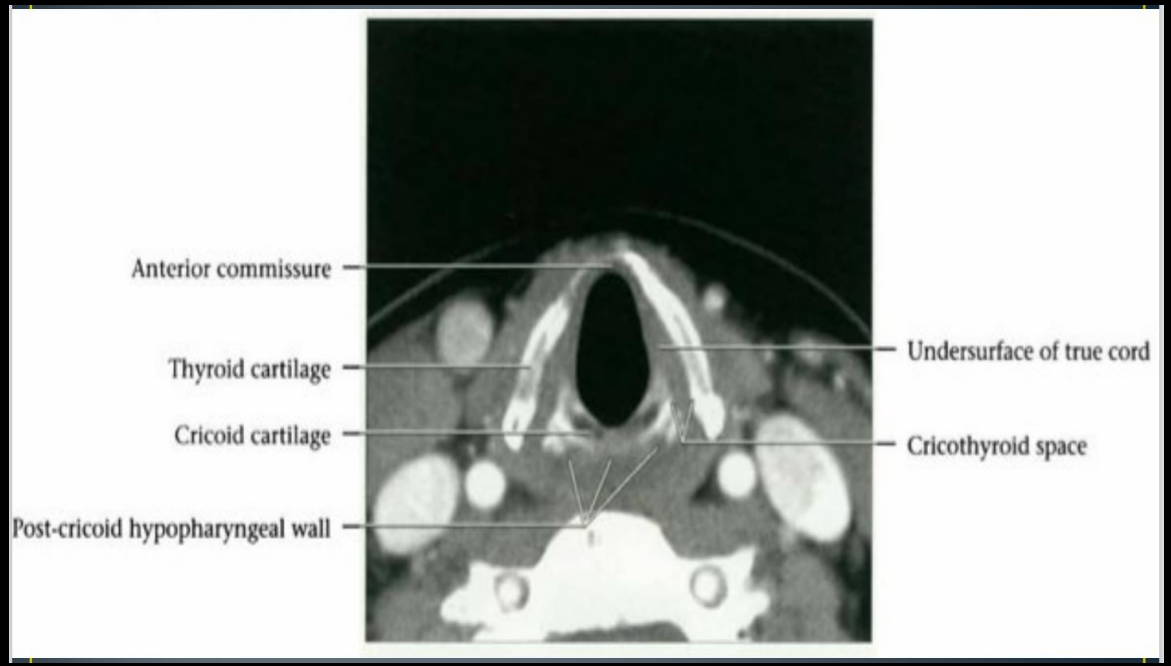

Hyoid bone
Glossoepiglottic fold
Pre-epiglottic space
Vallecula
Epiglottis, free edge
Hypopharynx, posterior wall


Inferior hyoid bone
Glossoepiglottic fold
Hyoepiglottic ligament
Pre-epiglottic space
Vallecula
Epiglottis
Hypopharynx, posterior wall

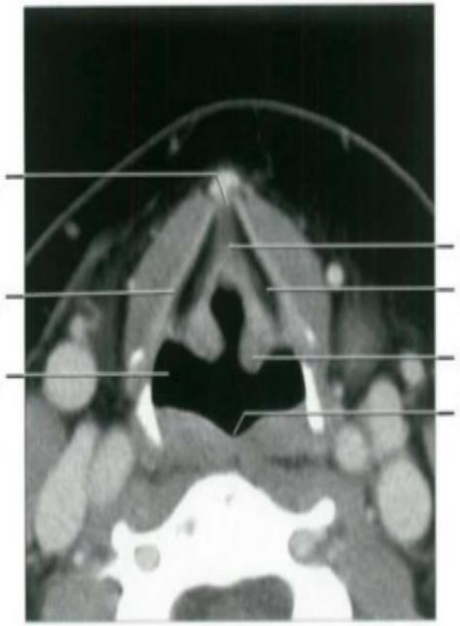

Thyroid notch
Thyroid cartilage
Pre-epiglottic space
Epiglottis
Paraglottic space
Pyriform sinus
Aryepiglottic fold
Hypopharynx, posterior wall


Thyroid cartilage
Paraglottic space
Strap muscles
False vocal cord
Hypopharynx, posterior wall


Anterior commissure
Thyroid cartilage
Posterior commissure
Thyroarytenoid gap
Hypopharynx
True vocal cord
Vocal process, arytenoid
Arytenoid cartilage
Cricoid cartilage


Anterior commissure
Thyroid cartilage
Cricoid cartilage
Post-cricoid hypopharyngeal wall
Undersurface of true cord
Cricothyroid space

AXIAL CECT CORDS ADDUCTED (TOGETHER)



SAGITTAL NECT

BARRIERS TO SPREAD

- Hyoid bone
- Laryngeal cartilages
- Hyoepiglottic ligament
- Thyrohyoid membrane
- Ventricle
- Anterior commisure
- Cricothyroid membrane
- Conus elasticus
- Quadrangular membrane

PATHWAYS TO SPREAD

- Pre epiglottic space via multiple fenestrations in epiglottis
- Paraglottic space

SUBTYPES

- Glottic Cancer: 59% (more common)
- Supraglottic Cancer: 40%
- Subglottic Cancer: 1%
- Most subglottic masses are extension from glottic carcinomas

TRANSGLOTTIC TUMORS

- Tumors crossing ventricle in vertical axis
- Usually initiate as supraglottic or glottic cancers

T STAGING

SUPRAGLOTTIC TUMOR	
T1	Limited to one subsite of supraglottis, with normal vocal cord mobility: • Suprahyoid epiglottis • Aryepiglottic folds • Infrahyoid epiglottis • False vocal cords (ventricular folds/bands) • Arytenoids
T2	Invades mucosa of more than one adjacent area, with normal vocal cord mobility: • Subsite of supraglottis • Glottis • Region outside supraglottis
T3	Limited to larynx with vocal cord fixation and/or invasion of any of the following: • inner cortex of thyroid cartilage • paraglottic space • preepiglottic space

GLOTTIS	
T1	Limited to vocal cord(s) with normal vocal cord mobility (may involve anterior or posterior commissure) T1a: limited to one vocal cord T1b: involves both vocal cords
T2	Extends to supraglottis and/or subglottis, and/or with impaired vocal cord mobility
T3	limited to larynx with vocal cord fixation and/or invasion of paraglottic space and/or inner cortex of thyroid cartilage

SUBGLOTTIS	
T1	Limited to subglottis
T2	Extends to vocal cord(s) with normal or impaired vocal cord mobility (no cord fixation)
T3	Limited to larynx with vocal cord fixation and/or invasion of paraglottic space and/or inner cortex of thyroid cartilage
	T4a: Moderately advanced local disease: invades through outer cortex of thyroid cartilage invades cricoid cartilage invades tissues beyond the larynx (e.g., trachea, deep extrinsic muscles of the tongue, strap muscles, thyroid glan, esophagus T4b: Very advanced local disease: invades the mediastinum invades the prevertebral space encases the carotid artery

REGIONAL LYMPH NODE

	REGIONAL LYMPH NODES
Nx	Regional lymph nodes cannot be assessed
N0	No regional lymph node metastasis
N1	Metastasis in a single ipsilateral lymph
N2	N2a:Metastasis in a single ipsilateral node > 3 cm but ≤ 6 cm N2b:Metastasis in multiple ipsilateral nodes ≤ 6 cm N2c:Metastasis in bilateral or contralateral nodes ≤ 6 cm
N3	Metastasis in a lymph node > 6 cm

DISTANT METASTASIS

	DISTANT METASTASIS
MX	Distant metastasis cannot be assessed
M0	No distant metastasis
M1	Distant metastasis

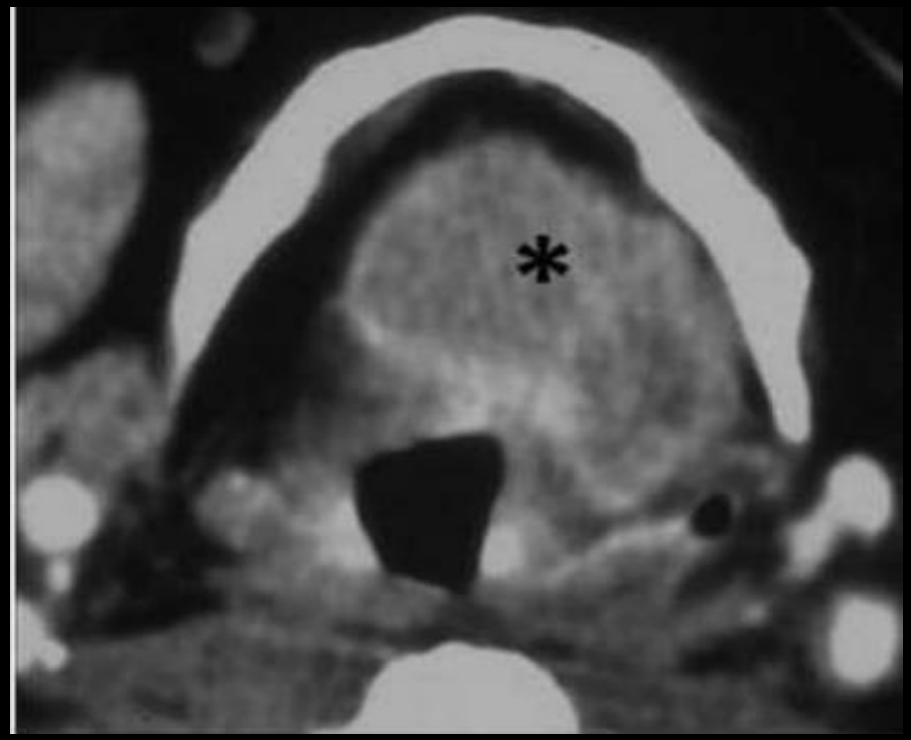
AJCC STAGE GROUPINGS

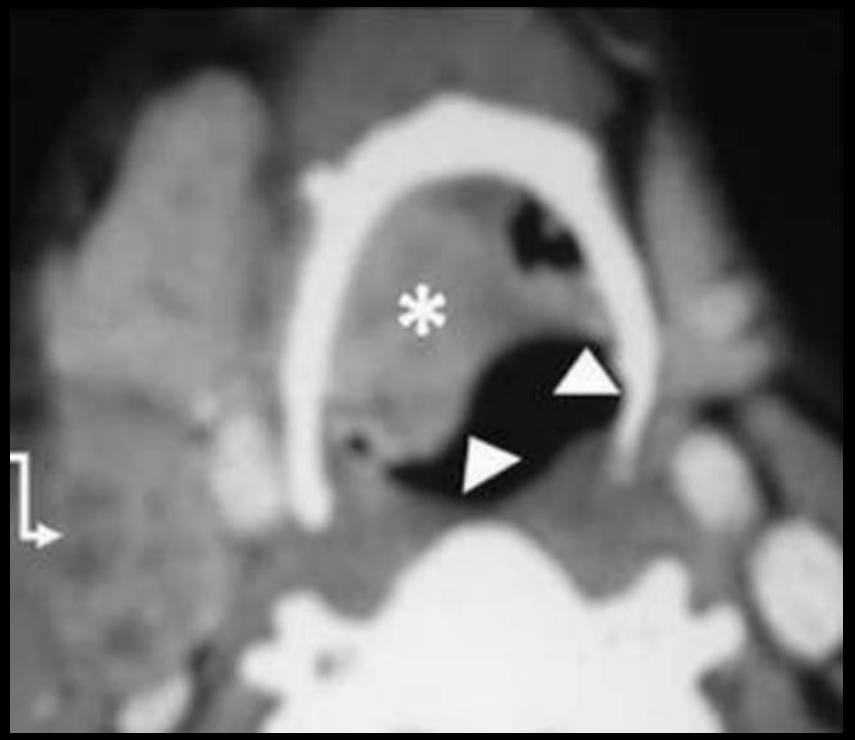
	AJCC STAGING
STAGE0	Tis, N0, M0
STAGE1	T1, N0, M0
STAGE2	T2, N0, M0
STAGE3	T3, N0, M0 T1, N1, M0 T2, N1, M0 T3, N1, M0
STAGE4A	T4a, N0, M0 T4a, N1, M0 T1, N2, M0 T2, N2, M0 T3, N2, M0 T4a, N2, M0
STAGE4B	T4b, any N, M0 Any T, N3, M0
STAGE4C	Any T, any N, M1

Supraglottic SCC

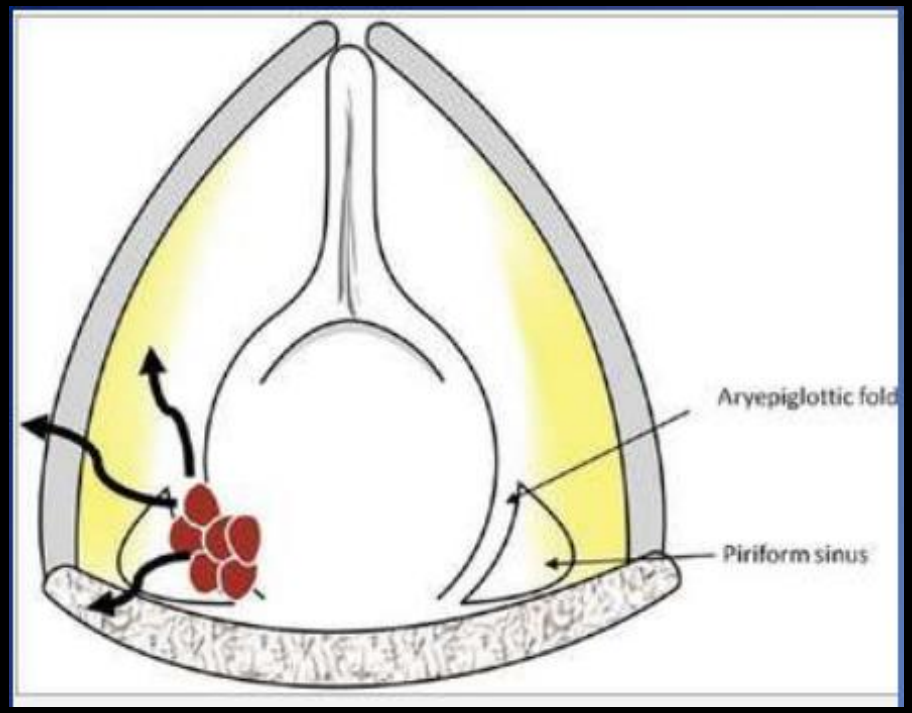
- Approximately 30% of all laryngeal cancers arise in the supraglottis.
- They often present in advanced stages.
- Nodal disease (level II and III) is a frequent finding in these patients.

- SUPRAGLOTTIC SCC-EPIGLOTTIS.

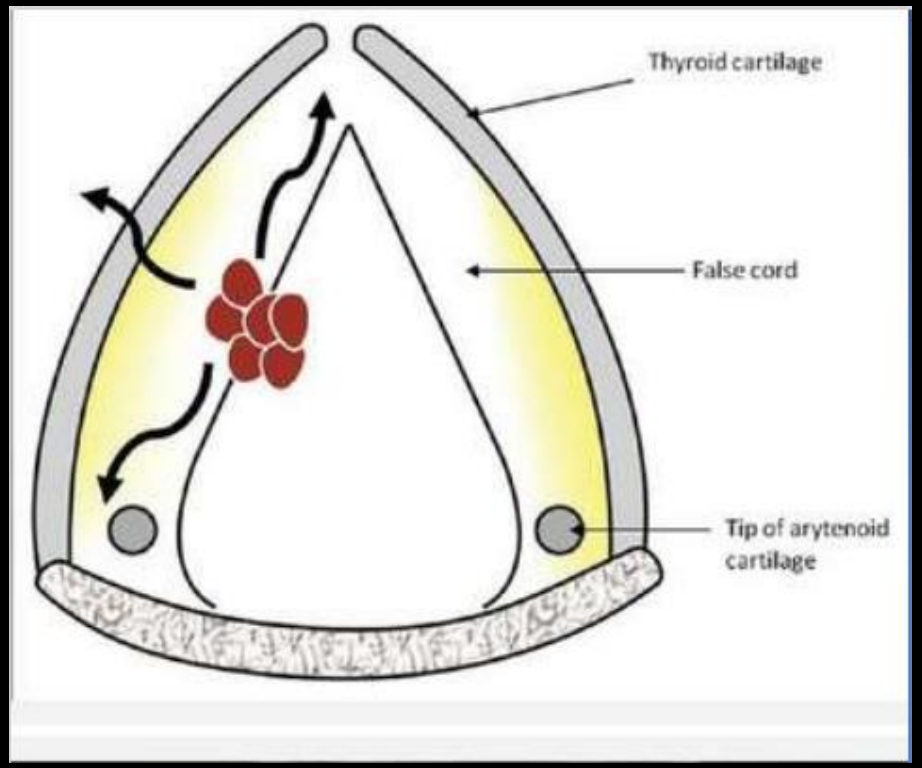




ARYEPIGLOTTIC FOLD SCC



FALSE CORD SCC

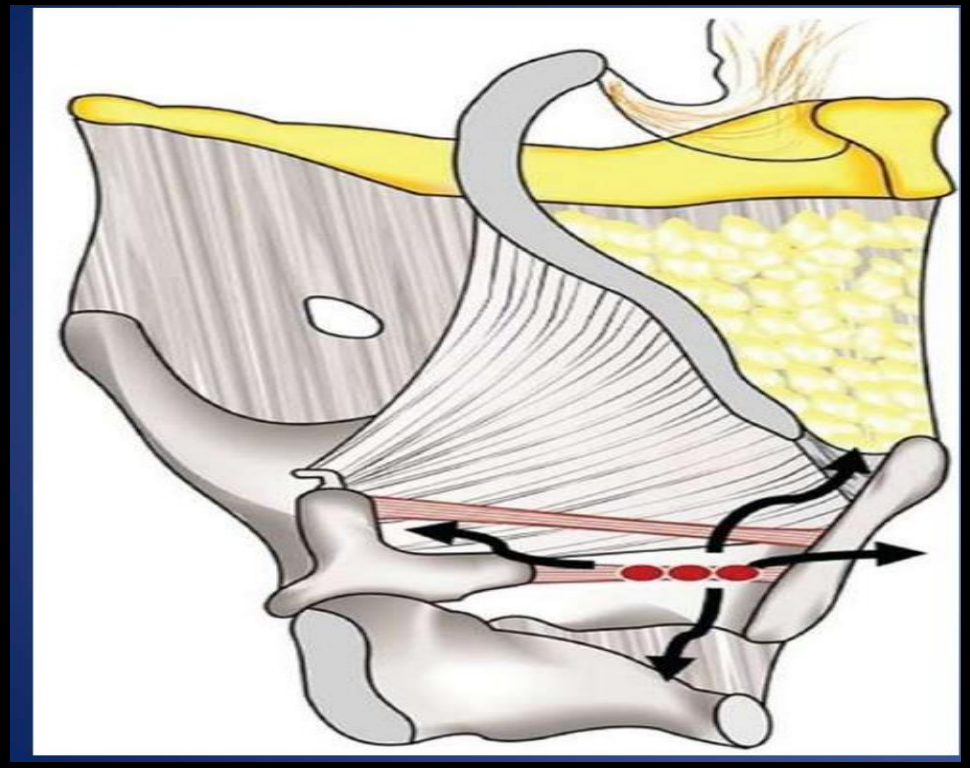


Glottic SCC

- 65% of all laryngeal cancers.
- Hoarseness of voice
- Metastatic nodal disease is rare
- Glottic SCCs commonly arise from the anterior half of the vocal cord and spread into the anterior commissure.

Spread to:

- Contralateral cord.
- Thyroid cartilage.
- Posterior commissure.
- Arytenoids.
- Cricoarytenoid joint and the cricoid cartilage

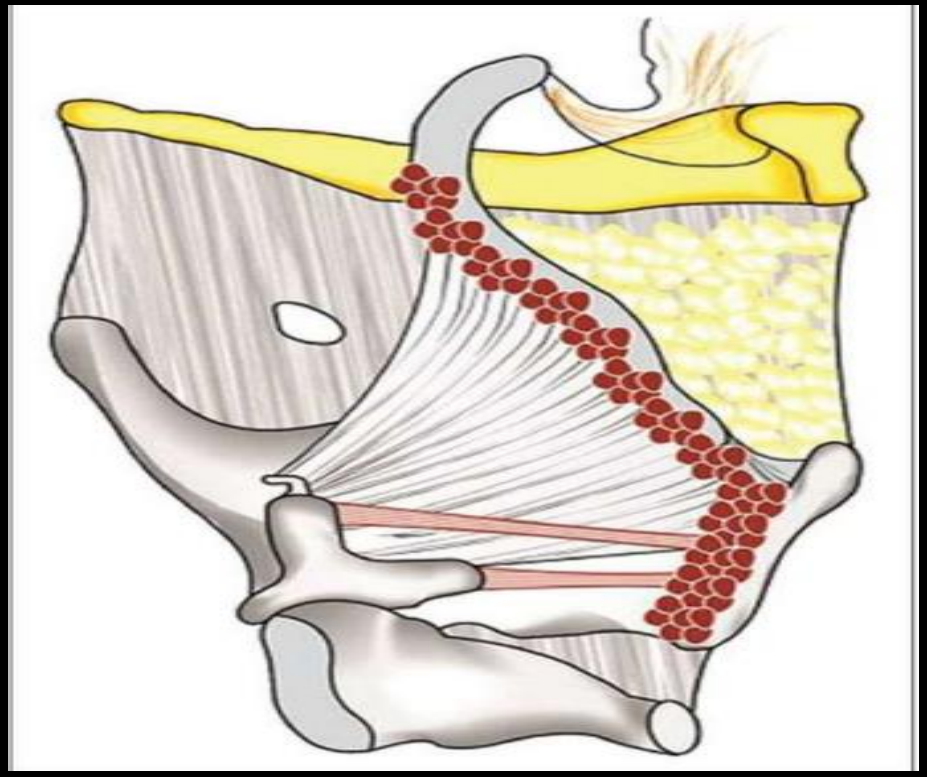


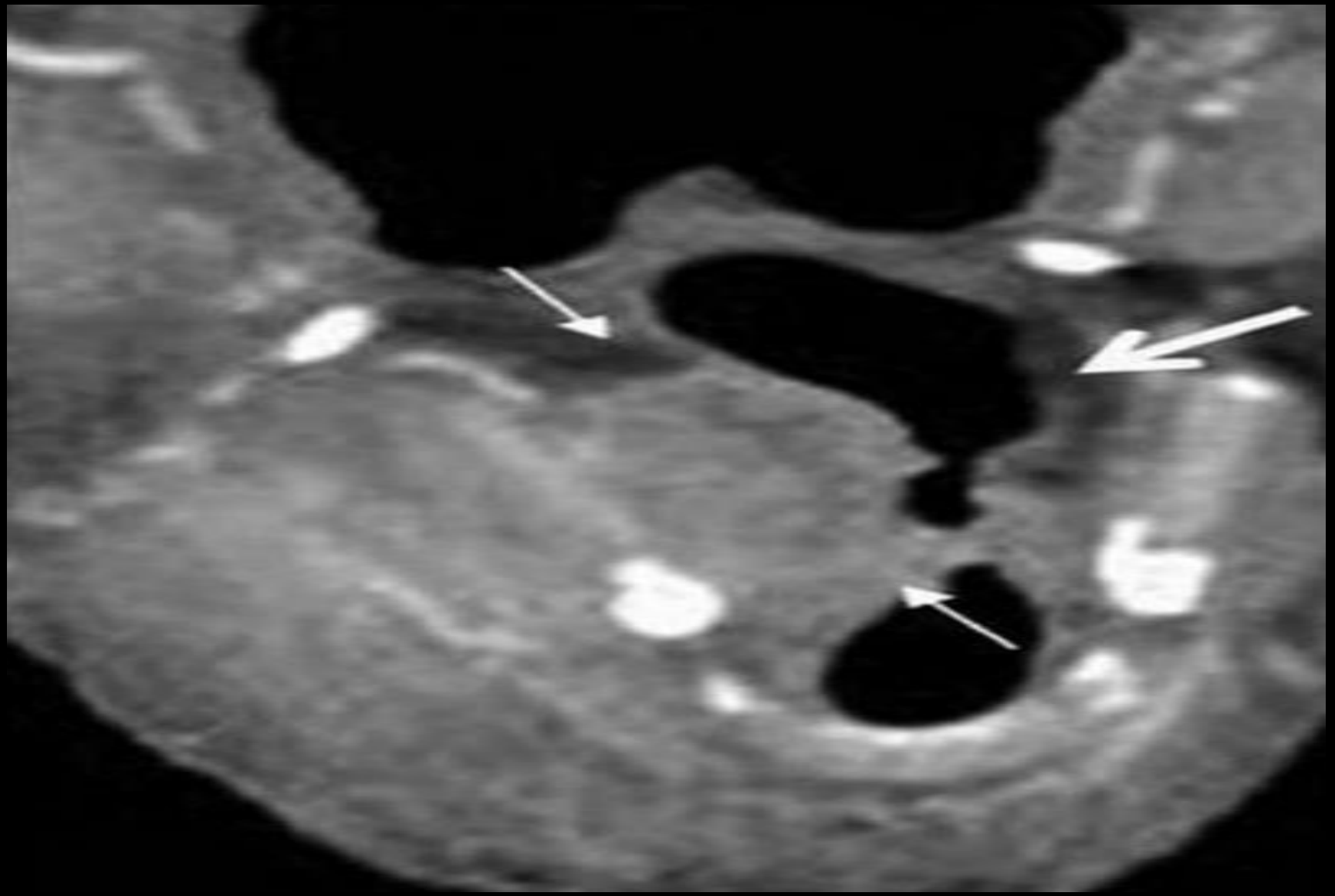
Glottic SCC:

Advanced subglottic SCC.

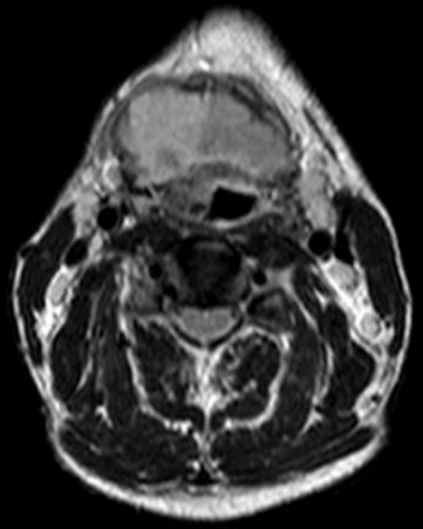
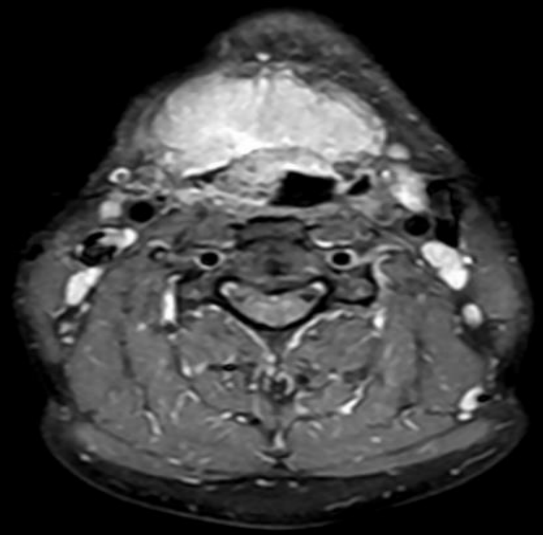
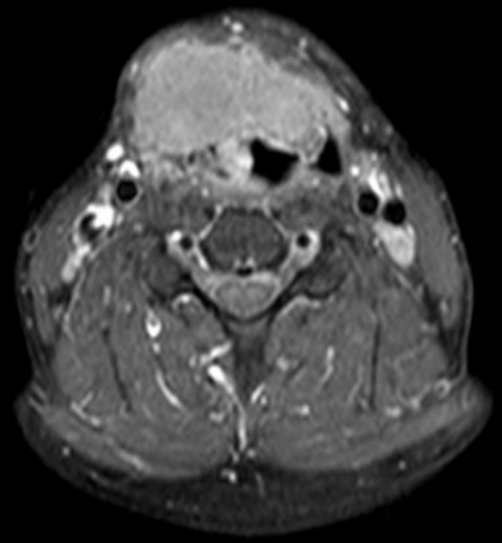
Transglottic SCC

Laryngeal SCC encroaching on both, the glottis and supraglottis, with or without subglottic component and when the site of origin is unclear, is termed as transglottic tumor.





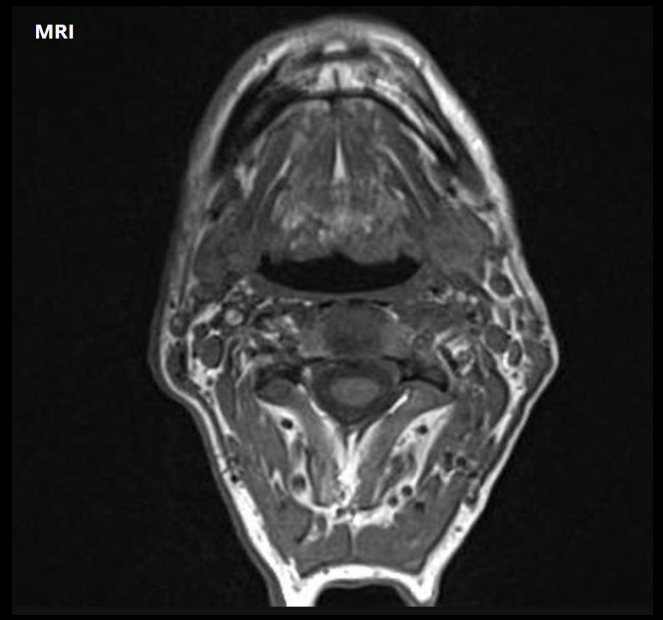
Large transglottic SCC

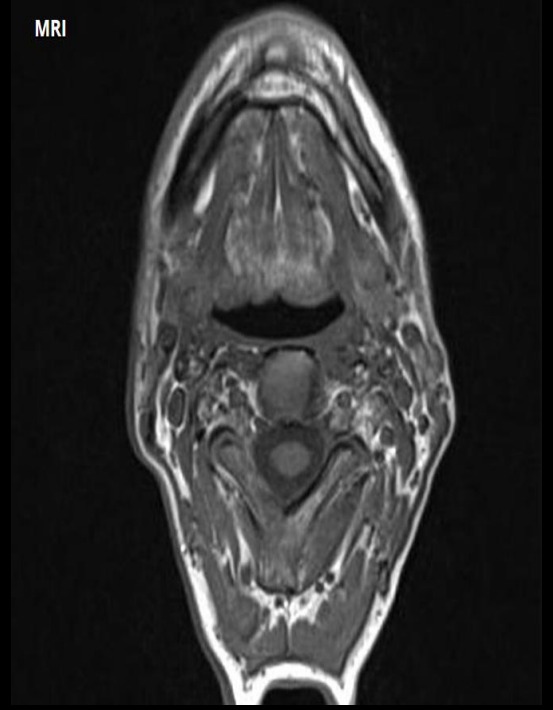
MRI

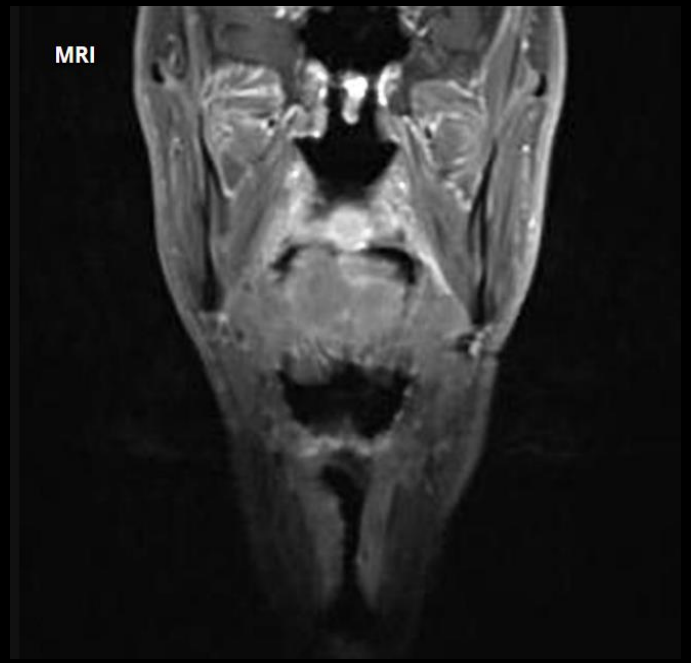
MRI

MRI


MRI


MRI


MRI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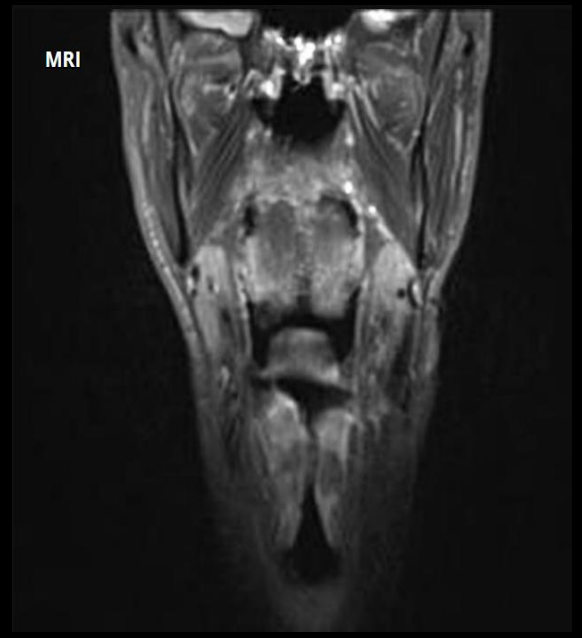
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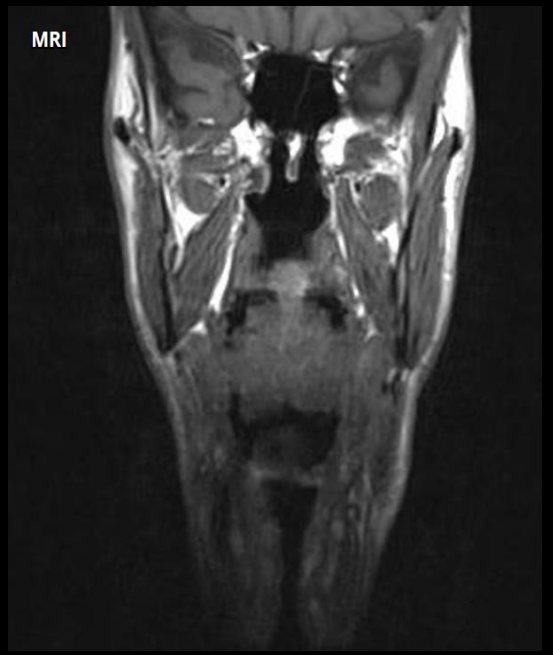
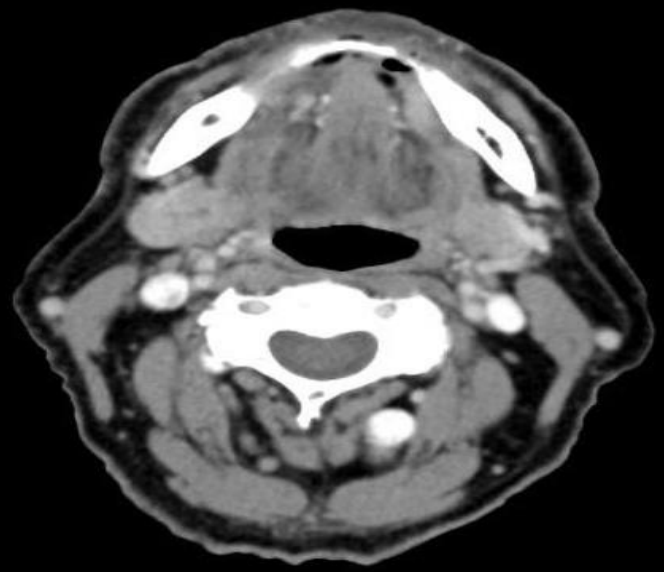
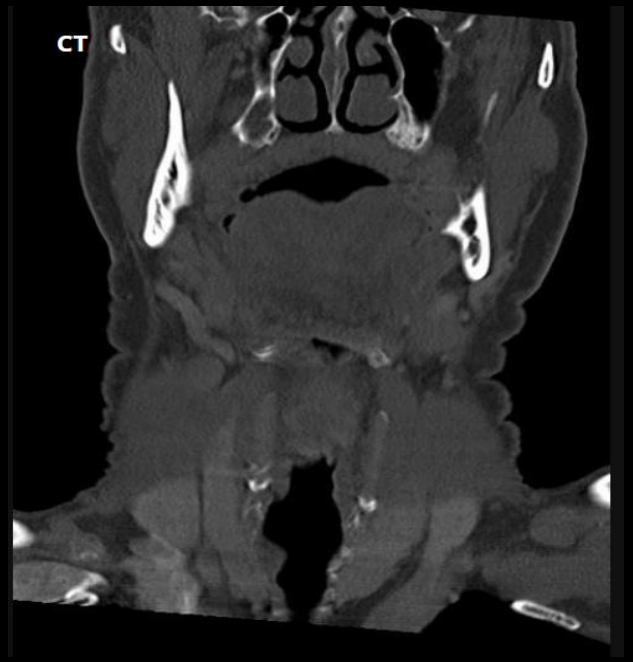

MRI


CT

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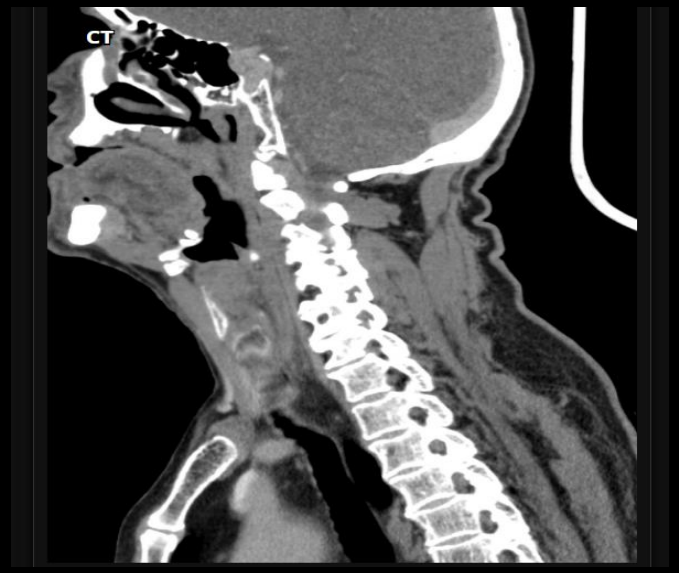
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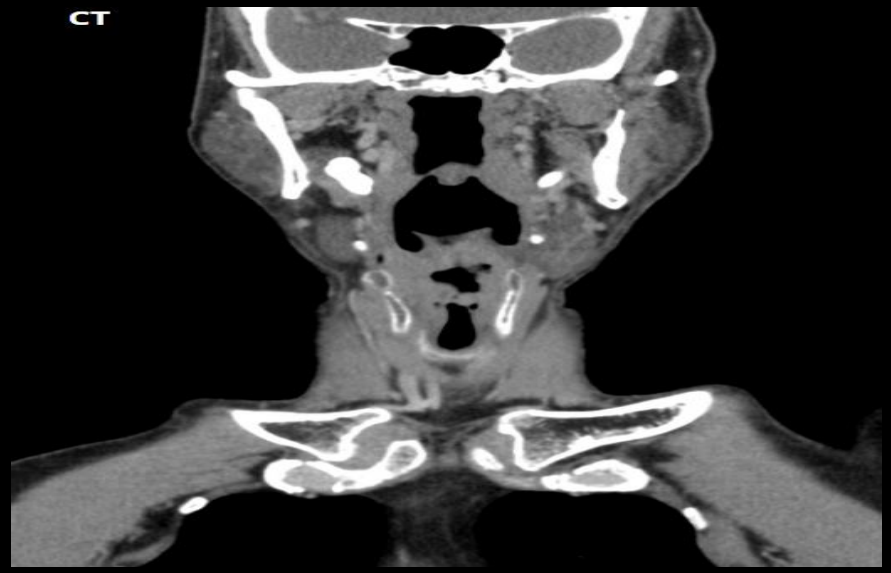
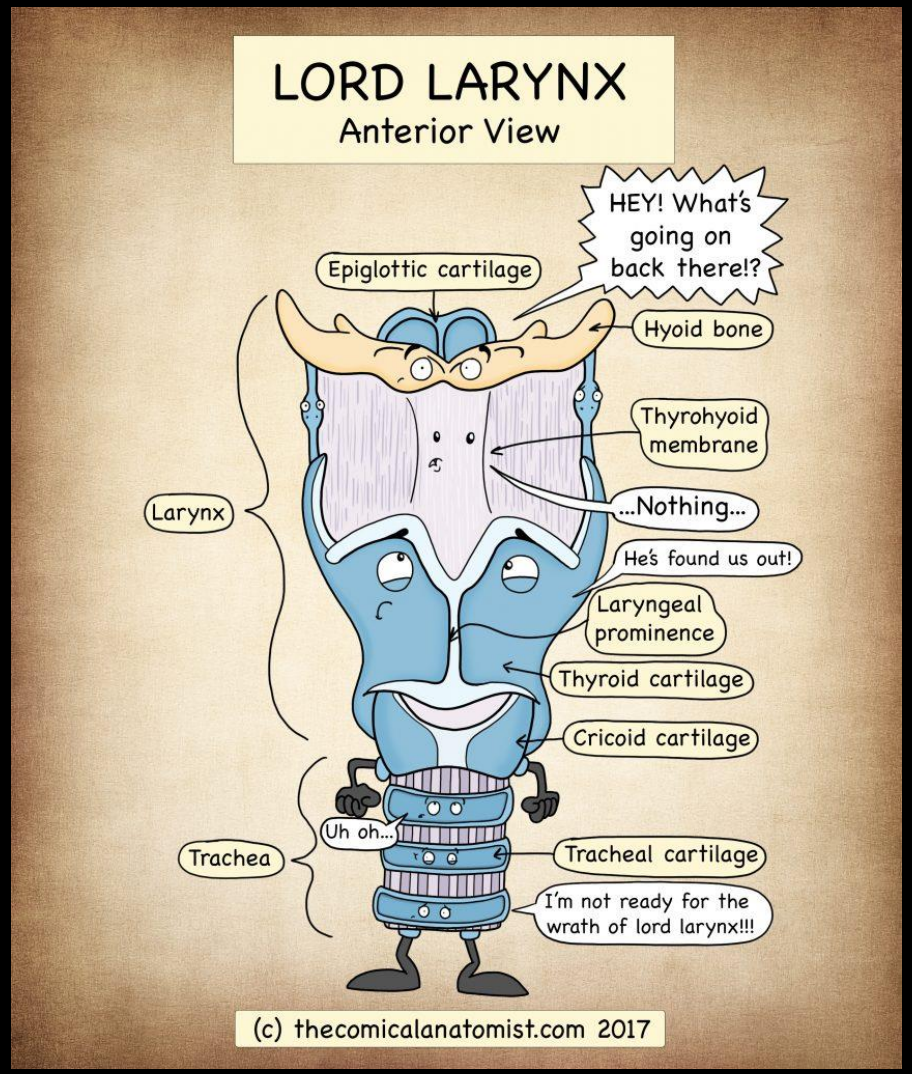
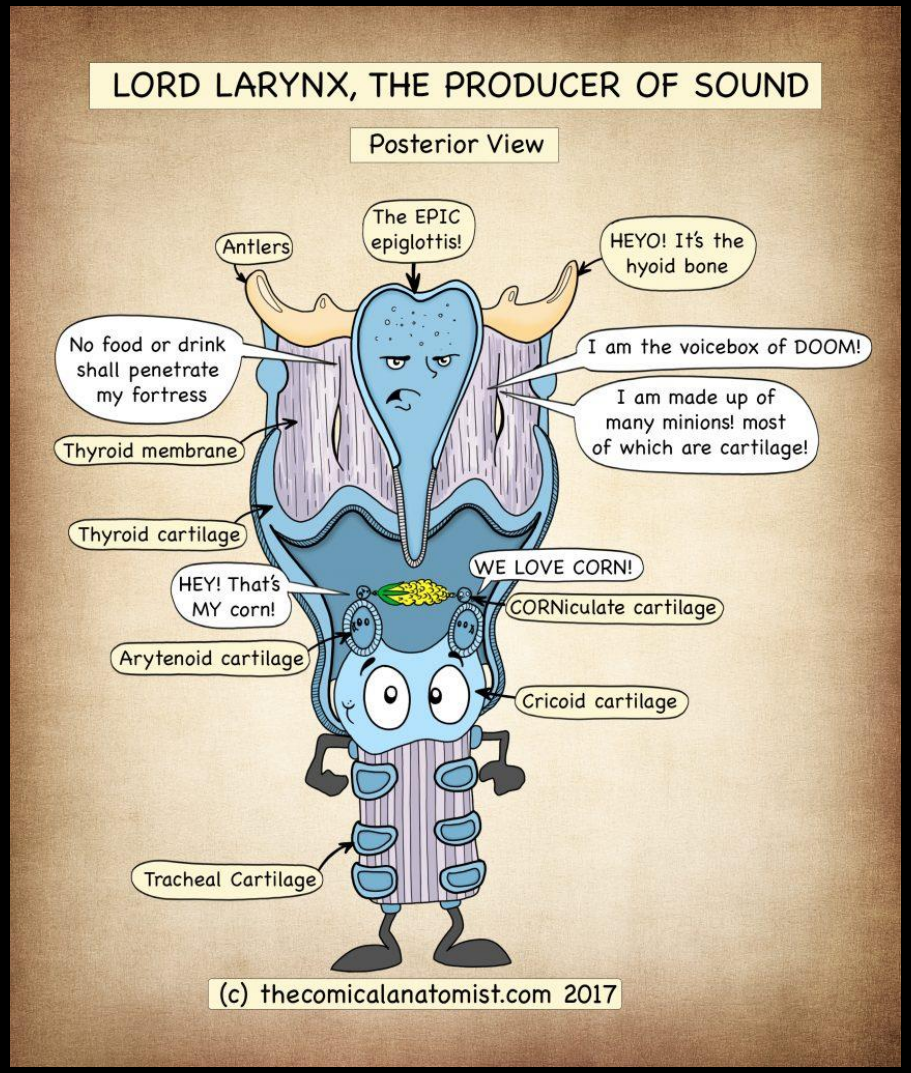

CT

THANK YOU


LORD LARYNX
Anterior View
HEY! What's going on back there!?
Epiglottic cartilage
Hyoid bone
Thyrohyoid membrane
...Nothing...
He's found us out!
Laryngeal prominence
Thyroid cartilage
Cricoid cartilage
Uh oh...
Tracheal cartilage
I'm not ready for the wrath of lord larynx!!!
Larynx
Trachea
(c) thecomicalanatomist.com 2017


LORD LARYNX, THE PRODUCER OF SOUND
Posterior View
Antlers
The EPIC epiglottis!
HEYO! It's the hyoid bone
No food or drink shall penetrate my fortress
I am the voicebox of DOOM!
I am made up of many minions! most of which are cartilage!
Thyroid membrane
Thyroid cartilage
WE LOVE CORN!
HEY! That's MY corn!
CORNiculate cartilage
Arytenoid cartilage
Cricoid cartilage
Tracheal Cartilage
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