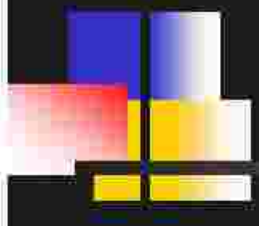
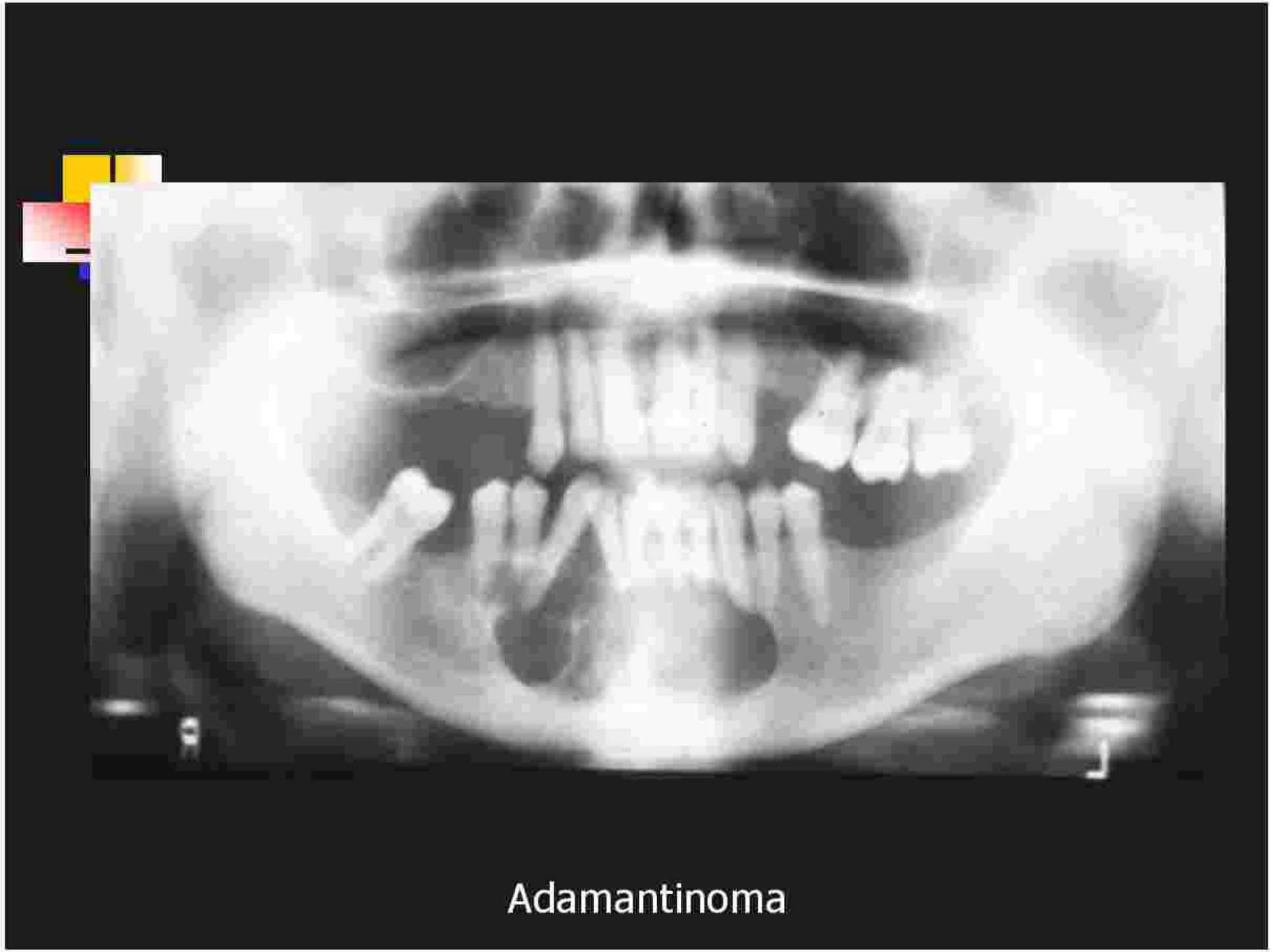


Oncoradiology of head and neck

Dr. Tapan Dhibar

Modalities

- X-ray
  - Limited use in staging
  - Useful in planning for radiotherapy
  - Ba-swallow is useful in early phase of pharyngeal surgery to access for fistula formation and to access functional disorders
- USG
  - With FNAC is comparable with CT for neck nodal staging

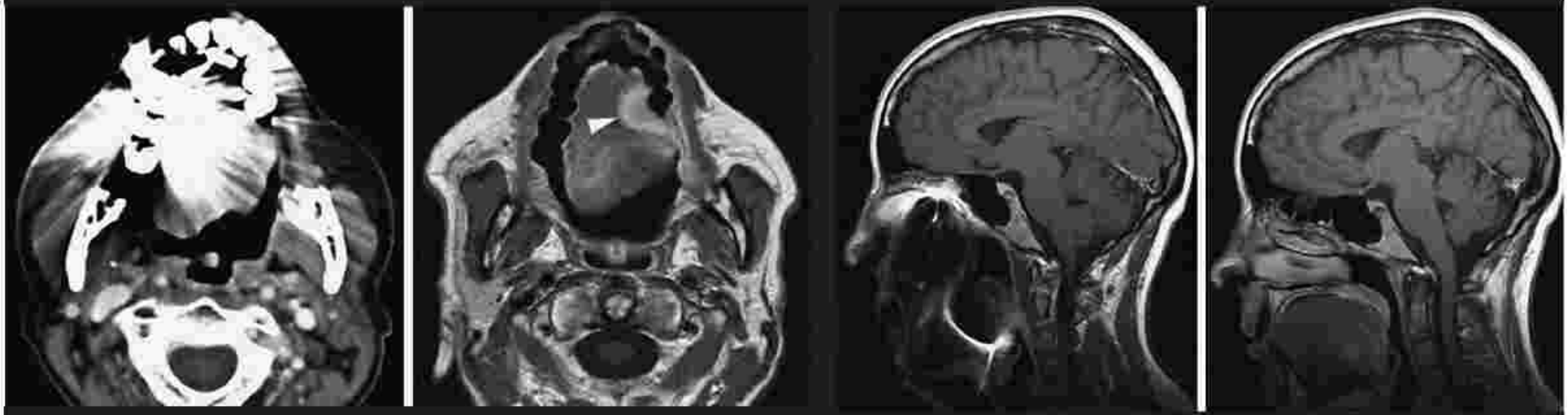


Adamantinoma

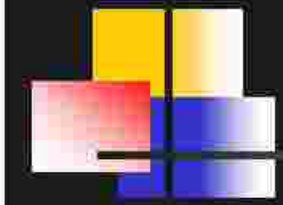
Histiocytosis X

Multiple myeloma

- CT/MRI
  - Both are equally good in head and neck
  - Choice of modality depends on the patient and pathology
  - Generally MDCT is preferred over MRI



- PET-CT
  - Upcoming modality for functional imaging

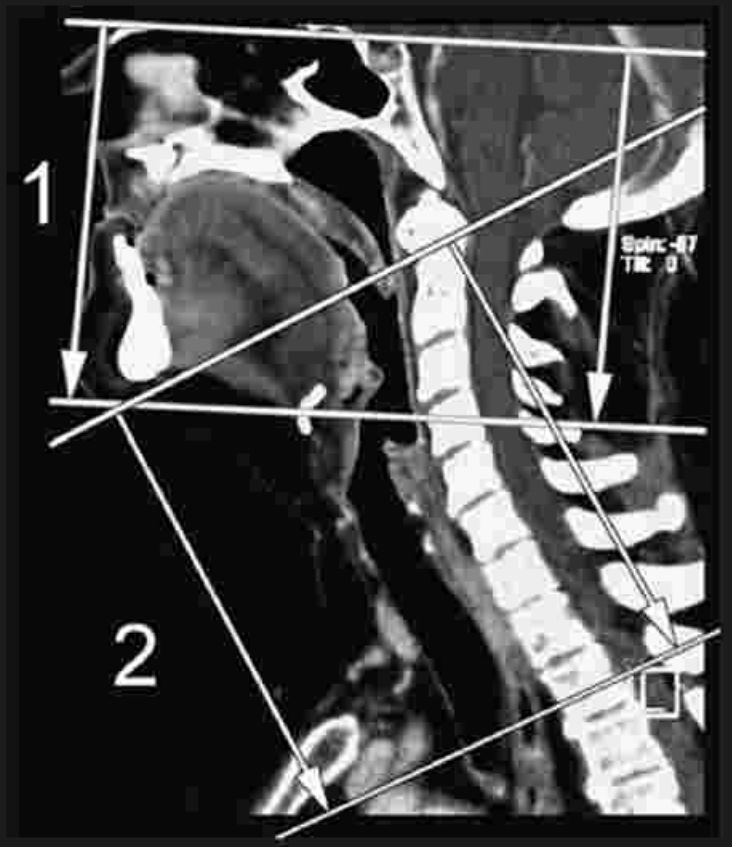


CT tech. - Neck

- For axial scanning pt supine, quiet respiration, neck in slight extension
- From upper border of sphenoid sinus to lower border of sternoclavicular joints, craniocaudally
- FOV as small as possible
- 3mm slice thickness for neck, 2mm for facial bones and sino-nasal cavities. For single slice scanners - pitch of 1-1.6
- Contrast
  - 100cc for MDCT scanners, 2.5cc/s first 45-50ml. Rest - 1cc/s, scanning to begin 25s after the administration
  - Upto 150cc for single slice scanners, 1cc/s, 60s scan delay
  - Non-ionic contrast is preferred

tech…

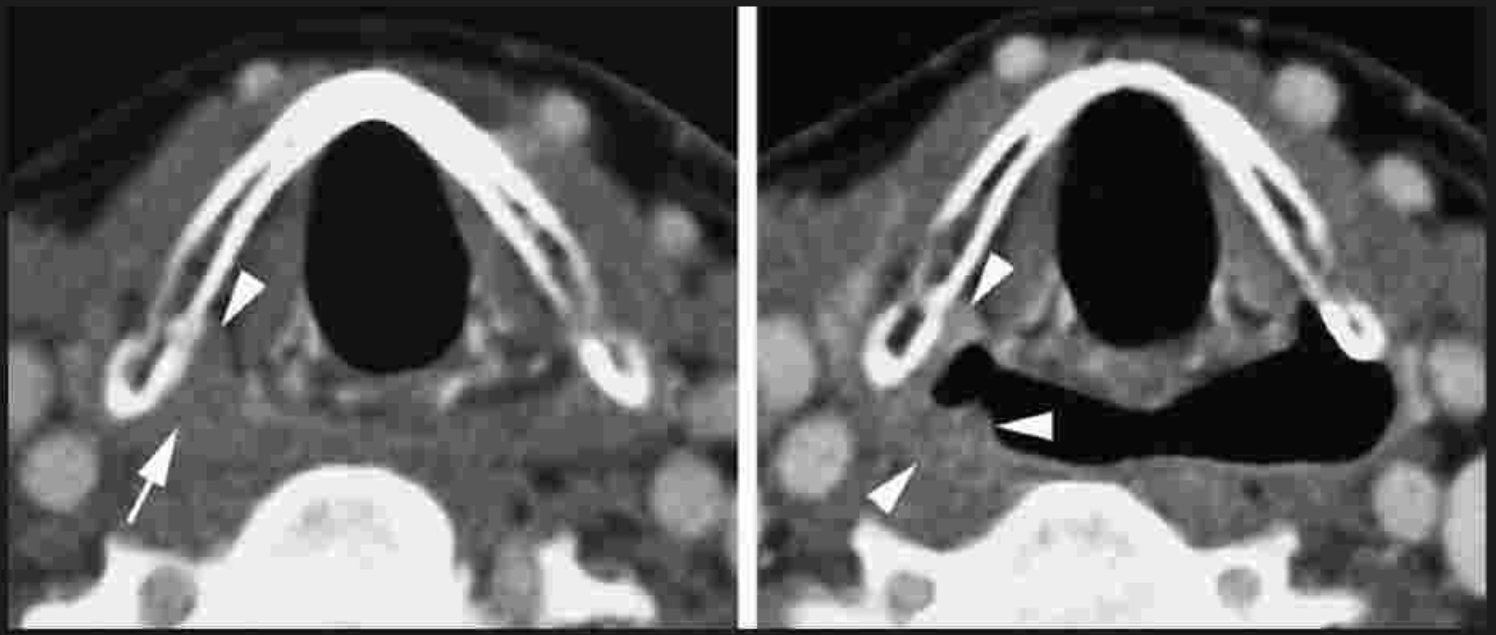
- Gantry tilt
  - Not required for MDCT
  - For single slice machines, parallel to hard palate upto the oral cavity, paralled to the vocal cords or IV discs of C4-C5 or C5-C6 vertebrae below



tech...

- Direct coronal scan - neck extended, gantry perpendicular to hard palate
- 3D reconstructions are useful

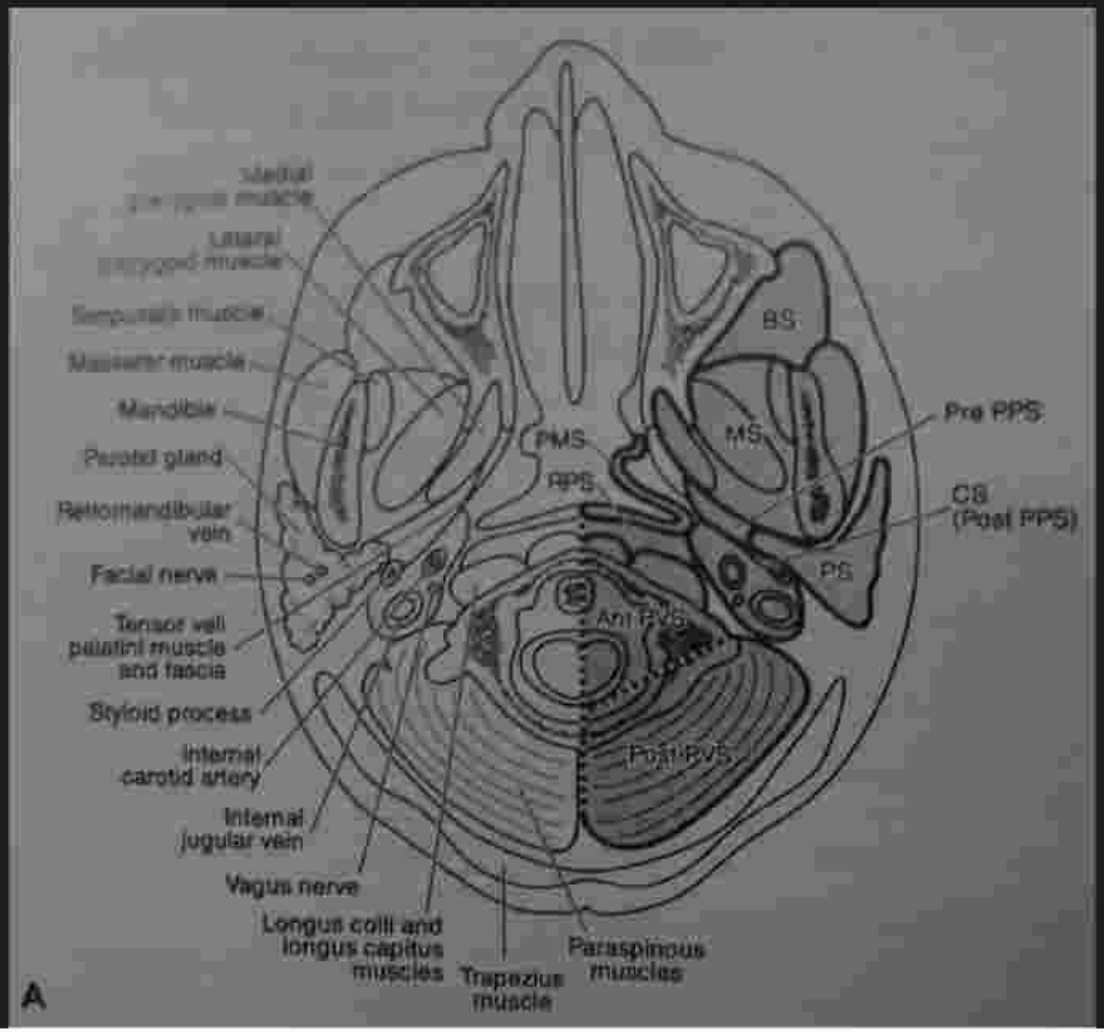
- Dynamic maneuvers - modified valsalva or phonation to distend pyriform sinuses
- Neck to be shifted to the opposite side for opening up of pyriform sinuses

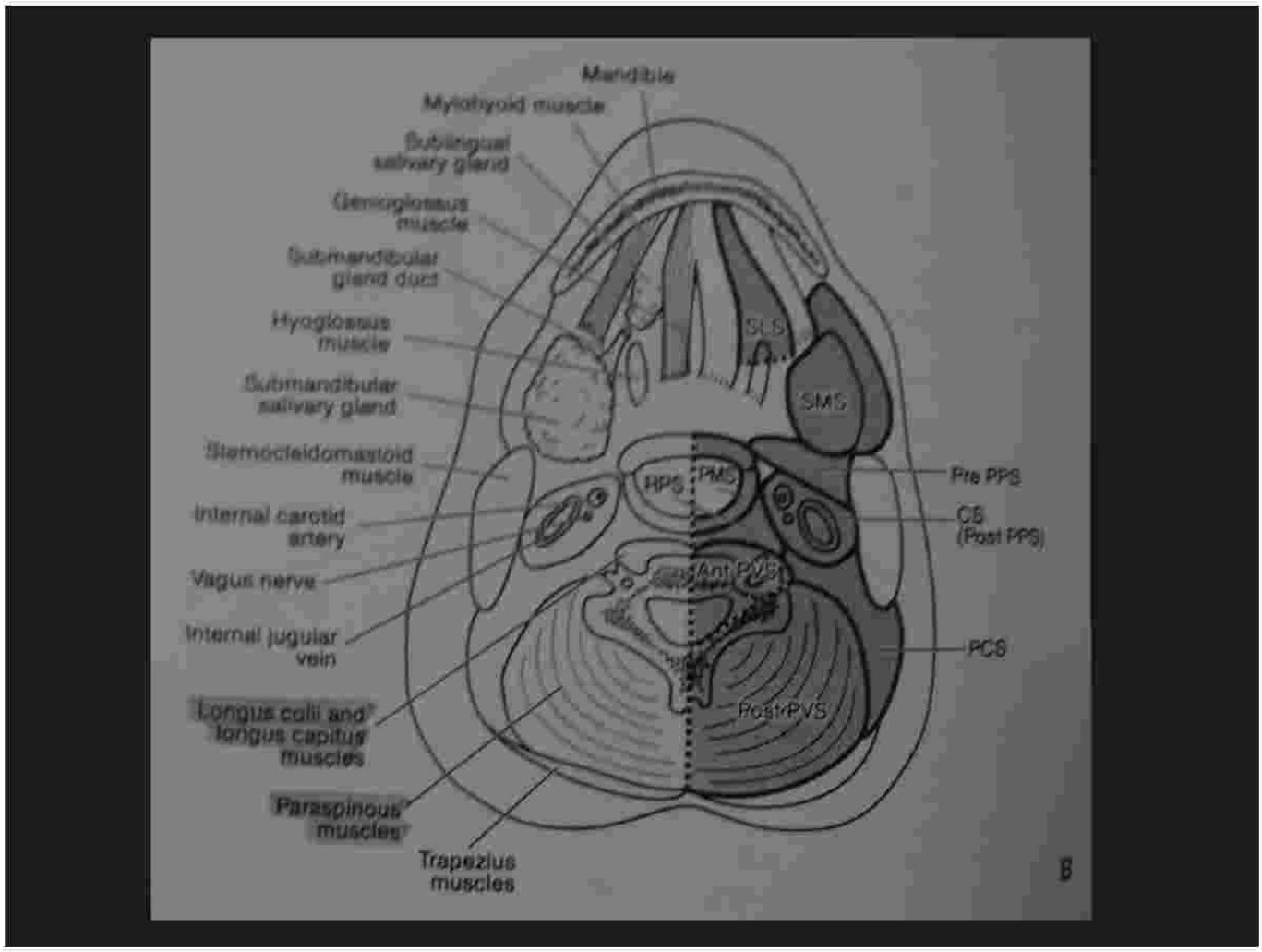


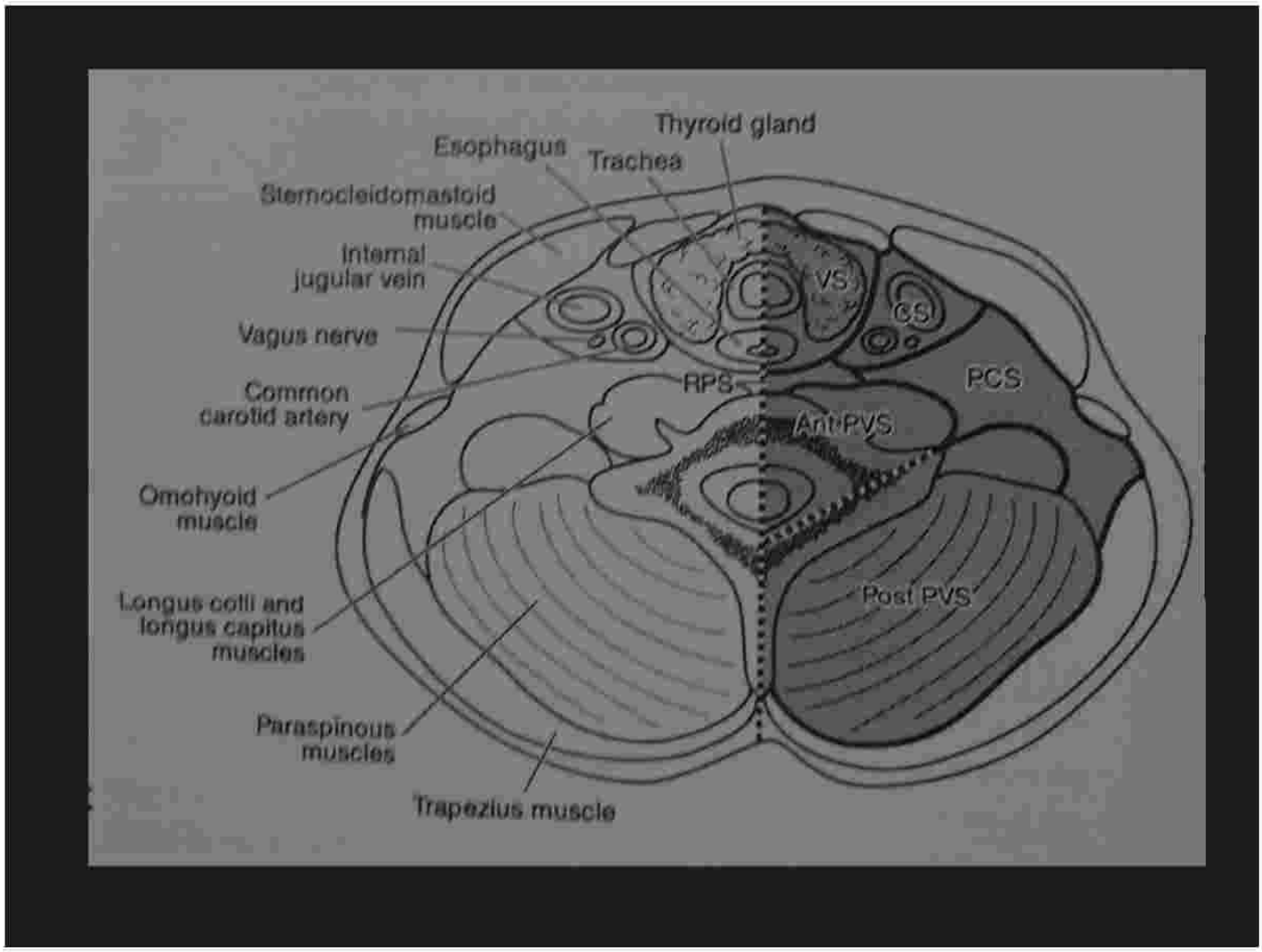
MRI

- Coils
  - Head coil – upto hyoid bone, below - neck coil
- Pulse sequences
  - TSE T2, T1, FLAIR, STIR/Fat Sat, Post contrast, DWI. Most important is T1 and T1+C
- Slice thickness 3-4mm, interslice gap of 0-50%
- Matrix - at least 256*256. For lesions around skull base and sino-nasal cavities 512*512
- MRS is upcoming

Neck spaces


Lateral pterygoid muscle
Sternocleidomastoid muscle
Masseter muscle
Mandible
Parotid gland
Retromandibular vein
Facial nerve
Tensor veli palatini muscle and fascia
Styloid process
Internal carotid artery
Internal jugular vein
Vagus nerve
Longus colli and longus capitus muscles
Trapezius muscle
Paraspinous muscles
BS
MS
PS
PMS
RPS
Pre PPS
CS (Post PPS)
Ant PVS
Post PVS
A

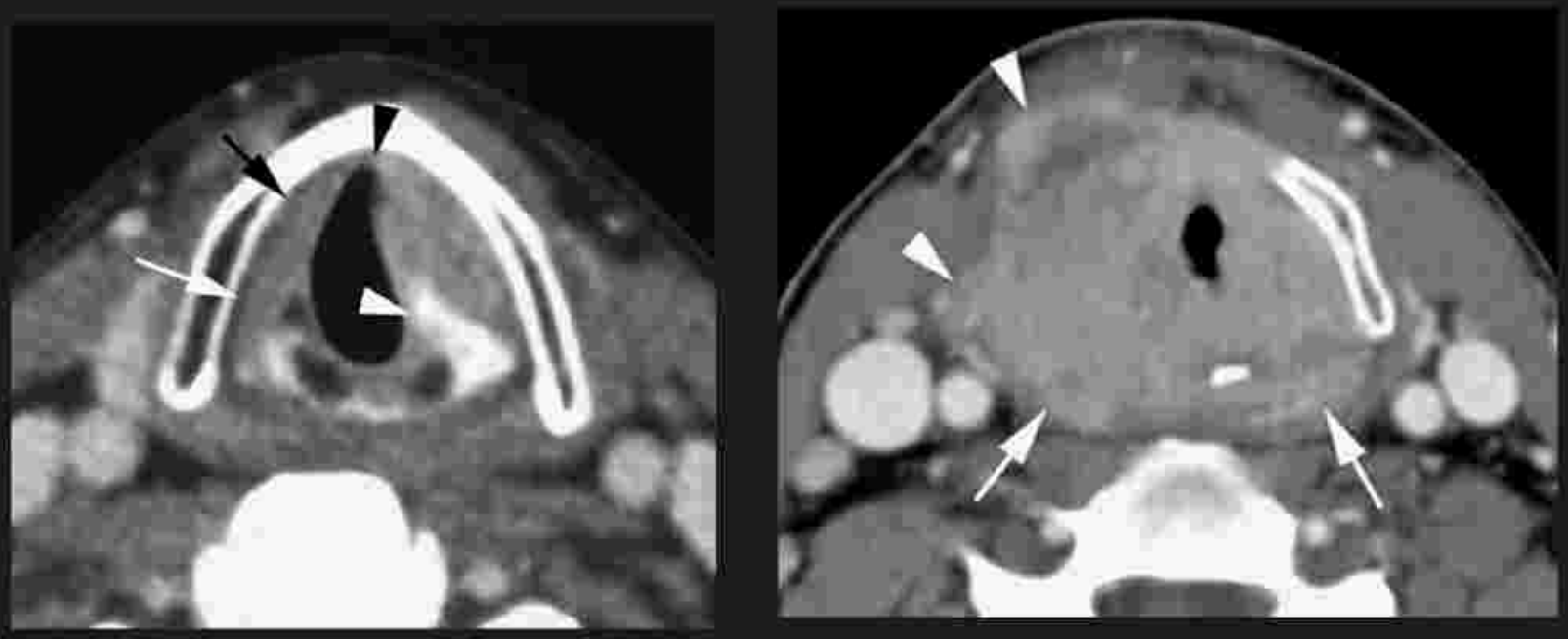

Mandible
Mylohyoid muscle
Sublingual salivary gland
Genioglossus muscle
Submandibular gland duct
Hyoglossus muscle
Submandibular salivary gland
Sternocleidomastoid muscle
Internal carotid artery
Vagus nerve
Internal jugular vein
Longus colli and longus capitus muscles
Paraspinous muscles
Trapezius muscles
SLS
SMS
RPS
PMS
Pre PPS
CS (Post PPS)
Ant PVS
PCS
Post PVS
B


Thyroid gland
Esophagus
Trachea
Sternocleidomastoid muscle
Internal jugular vein
Vagus nerve
Common carotid artery
Omohyoid muscle
Longus colli and longus capitus muscles
Paraspinous muscles
Trapezius muscle
VS
CS
PCS
RPS
Ant PVS
Post PVS

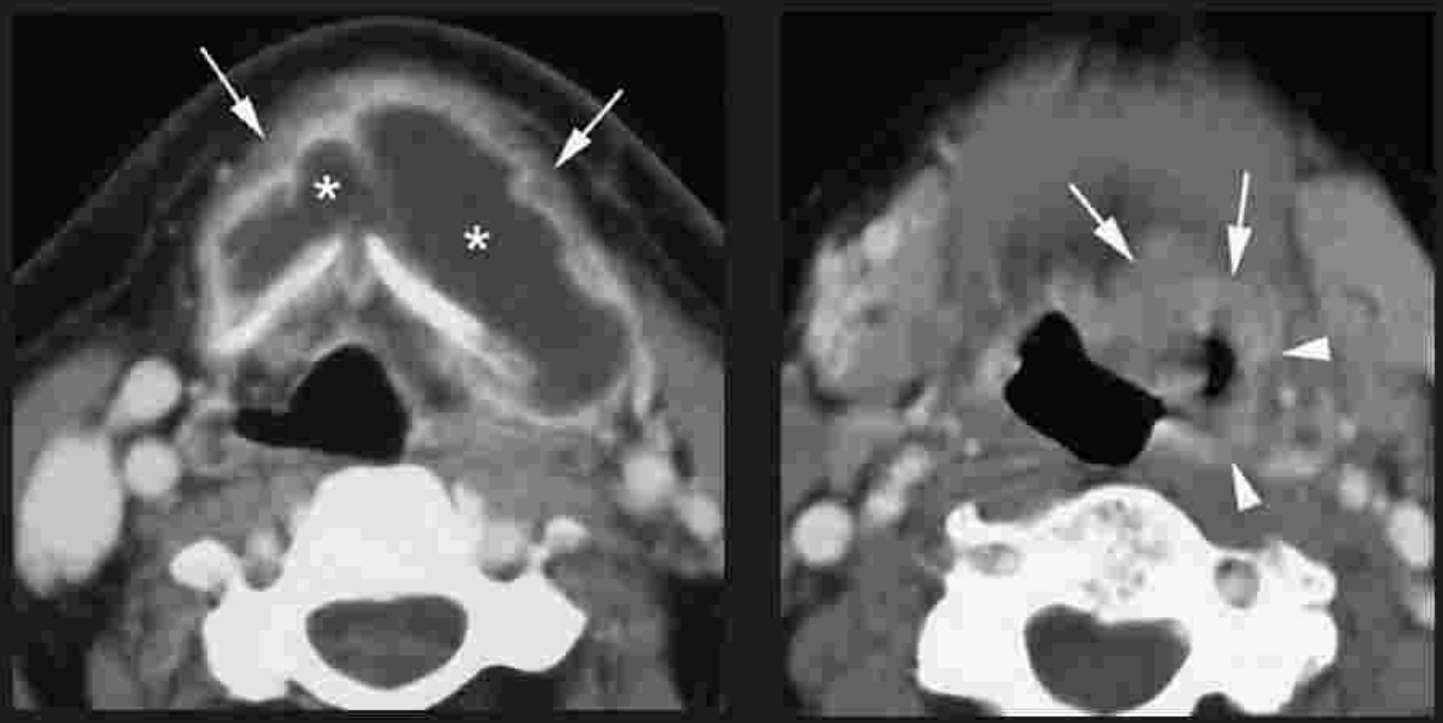
Nodal staging for head and neck

Table 2.1. N staging of lymph node metastasis from squamous cell carcinoma of the head and neck except nasopharynx and thyroid gland (AJCC/UICC, 2002)

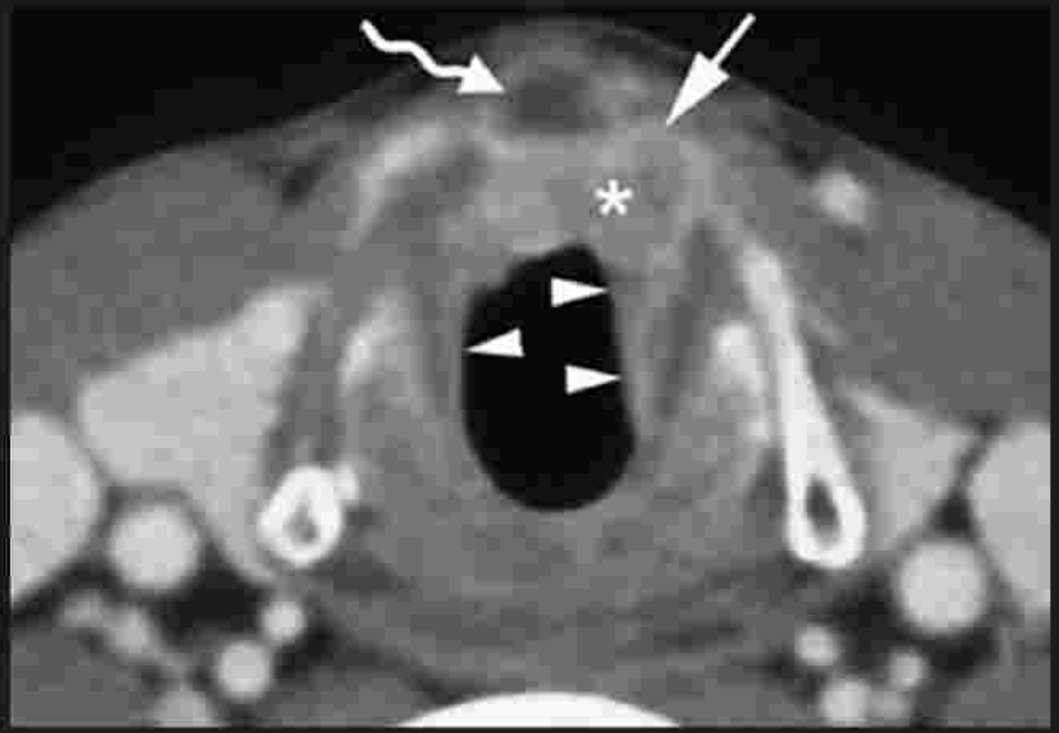
Nx	Regional lymph nodes cannot be assessed
N0	No regional lymph node metastasis
N1	Metastasis in a single ipsilateral lymph node, < 3 cm in greatest dimension
N2a	Metastasis in single ipsilateral lymph node > 3 cm but < 6 cm in greatest dimension
N2b	Metastasis in multiple ipsilateral lymph nodes, none > 6 cm in greatest dimension
N3	Metastasis in a lymph node > 6 cm in greatest dimension



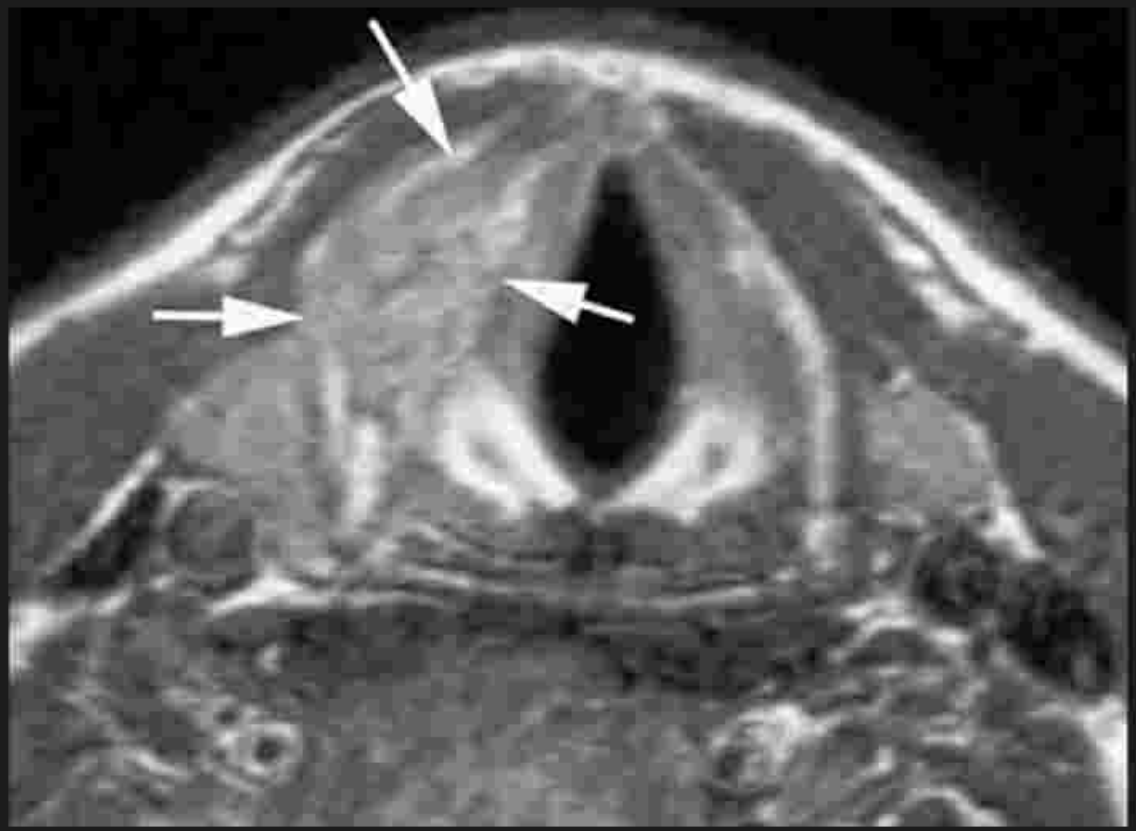
Glottic SCC



Supra-glottic SCC



Sub-glottic SCC



Metastasis

Table 4.2. T staging of glottic cancer (UICC 2002)

T1	Tumor limited to vocal cord(s) with normal mobility (may involve anterior or posterior commissure)
	T1a: limited to one vocal cord
	T1b: involving both vocal cords
T2	Extension into supra- and/or subglottis, and/or with impaired vocal cord mobility
T3	Vocal cord fixation and/or invasion of paraglottic space, and/or minor thyroid cartilage erosion
T4	Extralaryngeal tumor spread
	T4a: tumor invading through thyroid cartilage, or tissues beyond the larynx (e.g. trachea, soft tissues of the neck, strap muscles, thyroid gland, esophagus)
	T4b: tumor invading prevertebral space, mediastinum, or encasing carotid artery

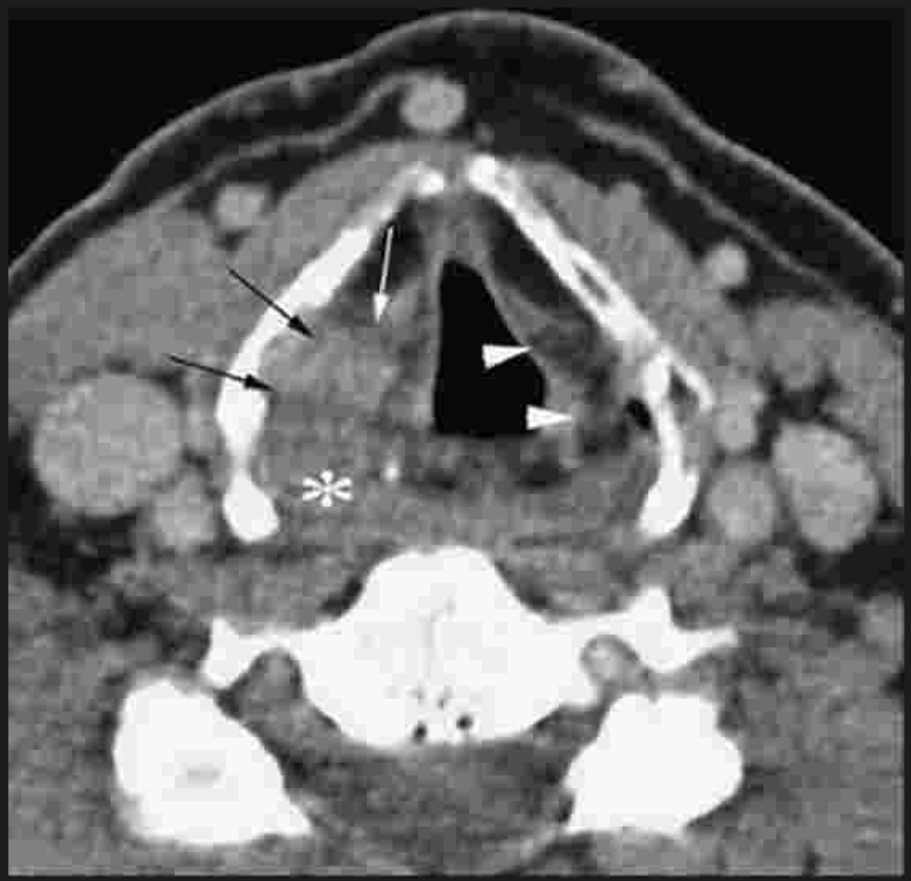
Table 4.3. T staging of supraglottic cancer (UICC 2002)

T1	Tumor limited to one subsite of supraglottis with normal vocal cord mobility
T2	Tumor invades mucosa of more than one adjacent subsite of supraglottis, glottis or region outside of supraglottis, without fixation of the larynx
T3	Vocal cord fixation or invasion of postcricoid area, pre-epiglottic and/or paraglottic space, and/or minor thyroid cartilage erosion
T4	Extralaryngeal tumor spread
	T4a: tumor invading through thyroid cartilage, or tissues beyond the larynx (e.g. trachea, soft tissues of the neck, strap muscles, thyroid gland, esophagus)
	T4b: tumor invading prevertebral space, mediastinum, or encasing carotid artery

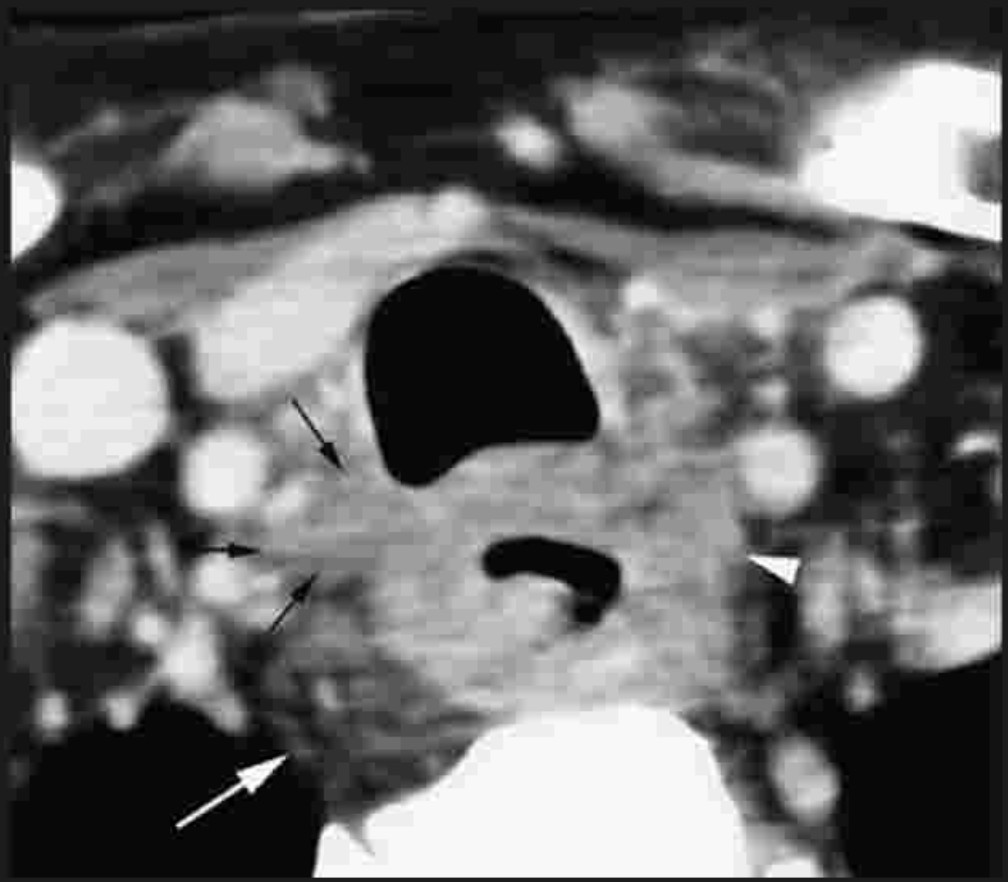
Table 4.4. T staging of subglottic cancer (UICC 2002)

T1	Tumor limited to subglottis
T2	Tumor extends to vocal cord(s) with normal or impaired mobility
T3	Vocal cord fixation
T4	Extralaryngeal tumor spread
	T4a: tumor invading through cricoid or thyroid cartilage, and/or invades tissues beyond the larynx (e.g. trachea, soft tissues of the neck, strap muscles, thyroid gland, esophagus)
	T4b: tumor invading prevertebral space, mediastinum, or encasing carotid artery

Hypopharynx and proximal oesophagus



Rt Pyriform sinus tumor



Upper oesophageal Ca

Table 5.1. Staging of primary tumors of the hypopharynx (American Joint Committee on Cancer 2002)

Primary tumor	
Tis	Carcinoma in situ
T1	Tumor limited to one subsite of hypopharynx and 2 cm or less in greatest dimension
T2	Tumor invades more than one subsite of hypopharynx or an adjacent site, or measures more than 2 cm but not more than 4 cm in greatest diameter without fixation of hemilarynx
T3	Tumor more than 4 cm in greatest dimension or with fixation of the hemilarynx
T4	Tumor invades thyroid/cricoid cartilage, hyoid bone, thyroid gland, esophagus, or central compartment soft tissues[a]
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
N2	
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

Table 5.2. Staging of primary tumors of the cervical esophagus (AMERICAN JOINT COMMITTEE ON CANCER 2002)

Primary tumor	
Tis	Carcinoma in situ
T1	Tumor invades the lamina propria or submucosa
T2	Tumor invades muscularis propria
T3	Tumor invades adventitia
T4	Tumor invades adjacent structures
Regional lymph nodes	
NX	Regional lymph nodes cannot be assessed
N0	No regional lymph node metastasis
N1	Regional lymph node metastasis

Oral cavity, Sublingual and Submandibular space

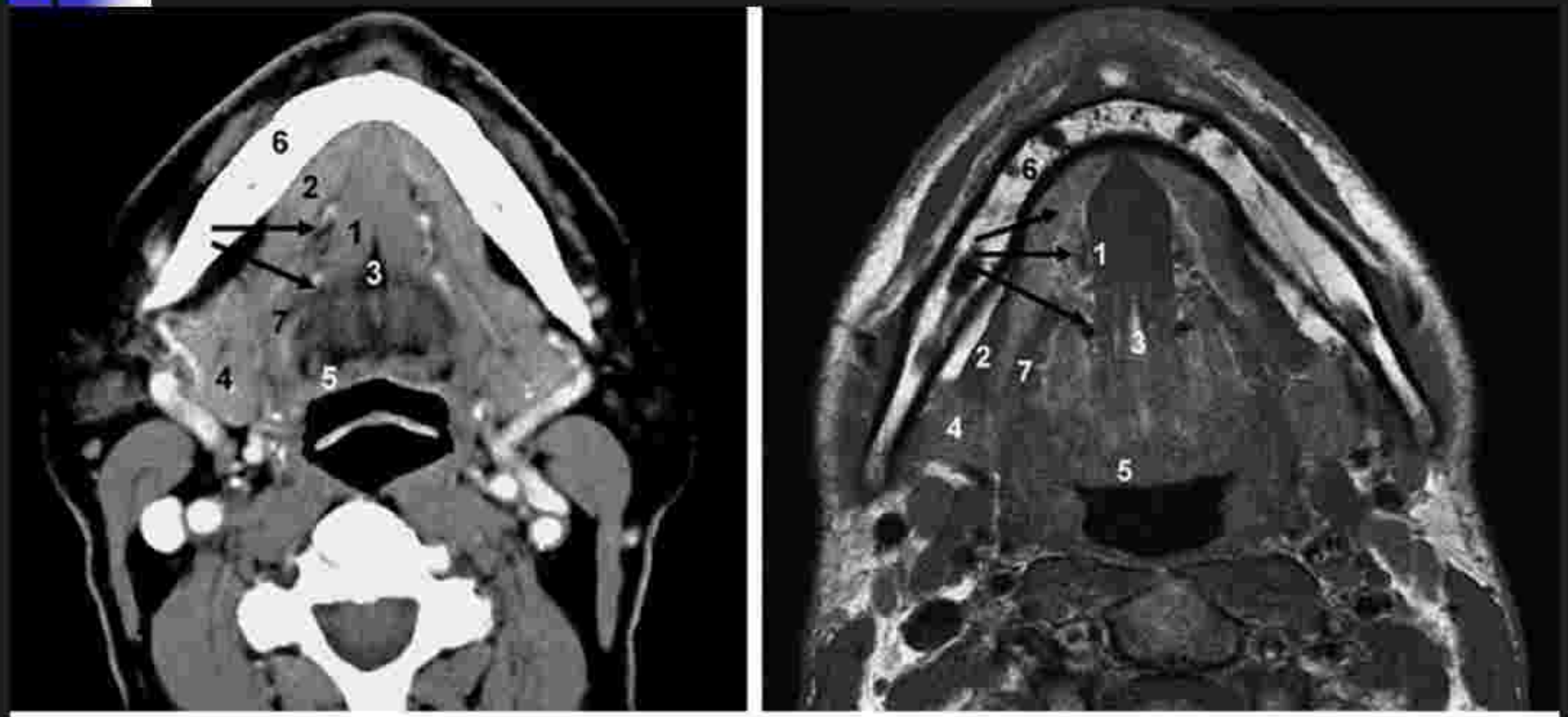


Fig. 6.1a,b. Axial CT (**a**) and MRI (**b**) of the floor of the mouth. *1*, geniohyoid muscle; *2*, mylohyoid muscle; *3*, fatty lingual septum; *4*, submandibular gland; *5*, base of the tongue; *6*, mandible; *7*, hyoglossus muscle; *arrows*, sublingual (fat) space with lingual artery and vein

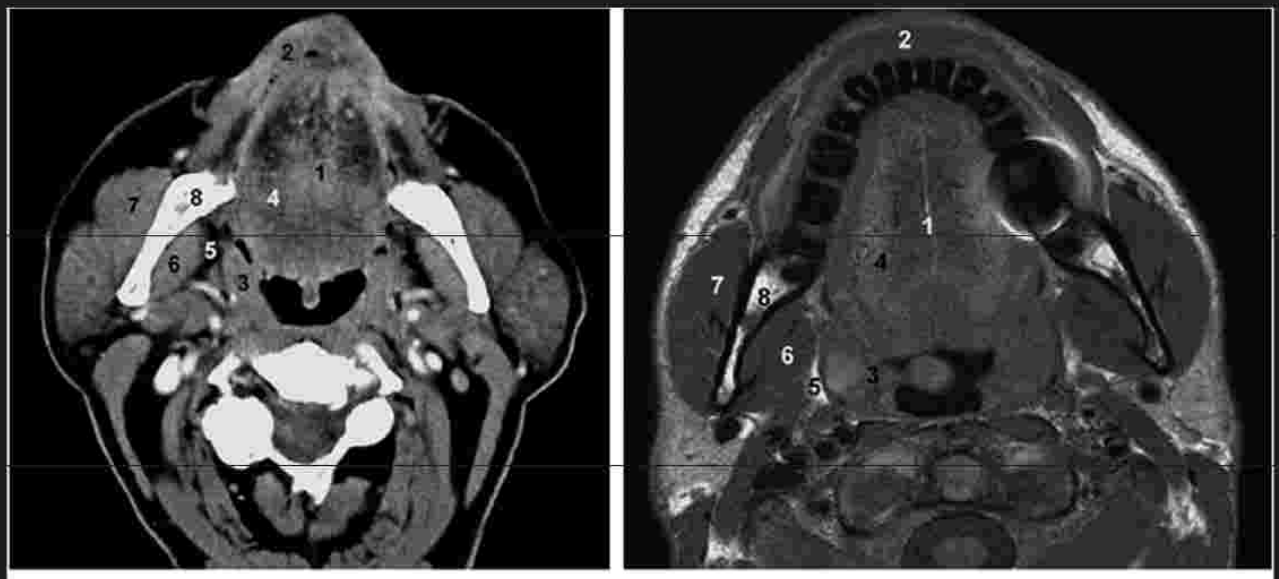
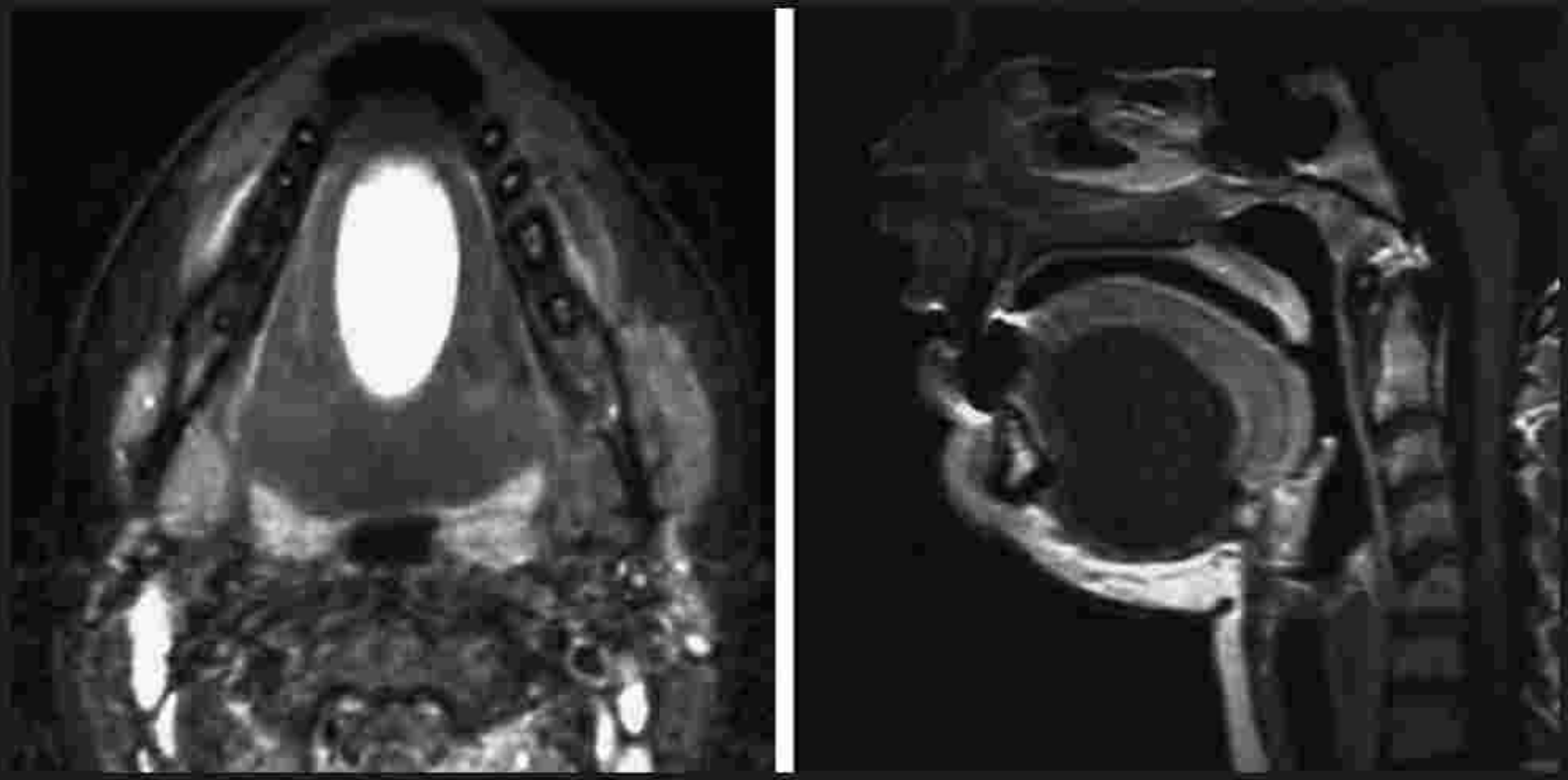


Fig. 6.2a,b. Axial CT (**a**) and MRI (**b**) at the level of the tongue. *1*, tongue with fatty lingual septum; *2*, (lower) lip; *3*, palatopharyngeal muscles and palatopharyngeal arch; *4*, intrinsic lingual muscles fibers; *5*, parapharyngeal fat space; *6*, medial pterygoid muscle; *7*, masseter muscle; *8*, mandible

Fig. 6.3a,b. Axial CT (**a**) and MRI (**b**) at the level of the maxilla. *1*, maxilla; *2*, mandible; *3*, lateral pterygoid muscle; *4*, soft palate; *5*, tongue; *6*, parapharyngeal fat space; *7*, masseter muscle; *8*, buccinator muscle; *9*, area of the retromolar trigone (with bony pterygoid process on CT); *arrows*, (Stensen's) parotid duct



Epidermoid

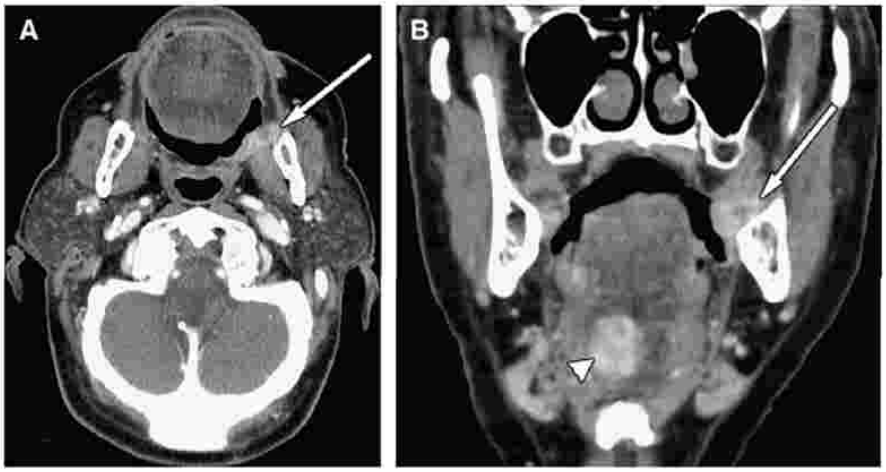


Fig. 2. (*A*) The patient presented with a clinically evident SCC of the left retromolar trigone (*arrow*) for which a CT scan of the oral cavity was performed. (*B*) Incidental right base of tongue primary cancer (*arrowhead*) was discovered at imaging.

Fig. 5. Focal low density within a normal sized lymph node (*arrow*) on postcontrast CT scan indicates metastatic disease.

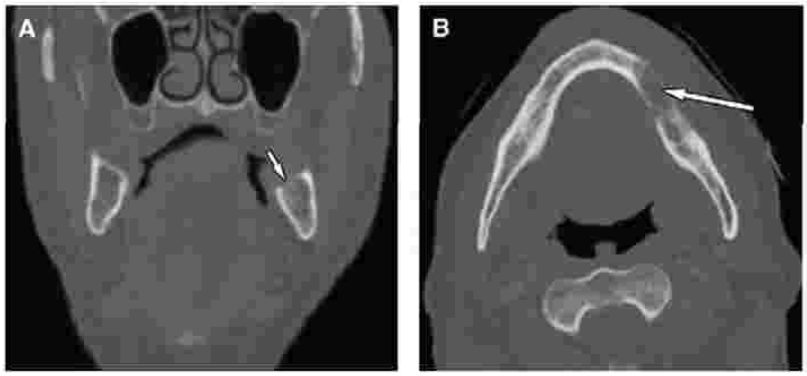


Fig. 10. (*A*) CT scan of the oral cavity showing early invasion of the mandibular cortex from a lower alveolar ridge SCC. (*B*) CT scan of the oral cavity with gross invasion of the mandible from gingival SCC.

Oropharynx

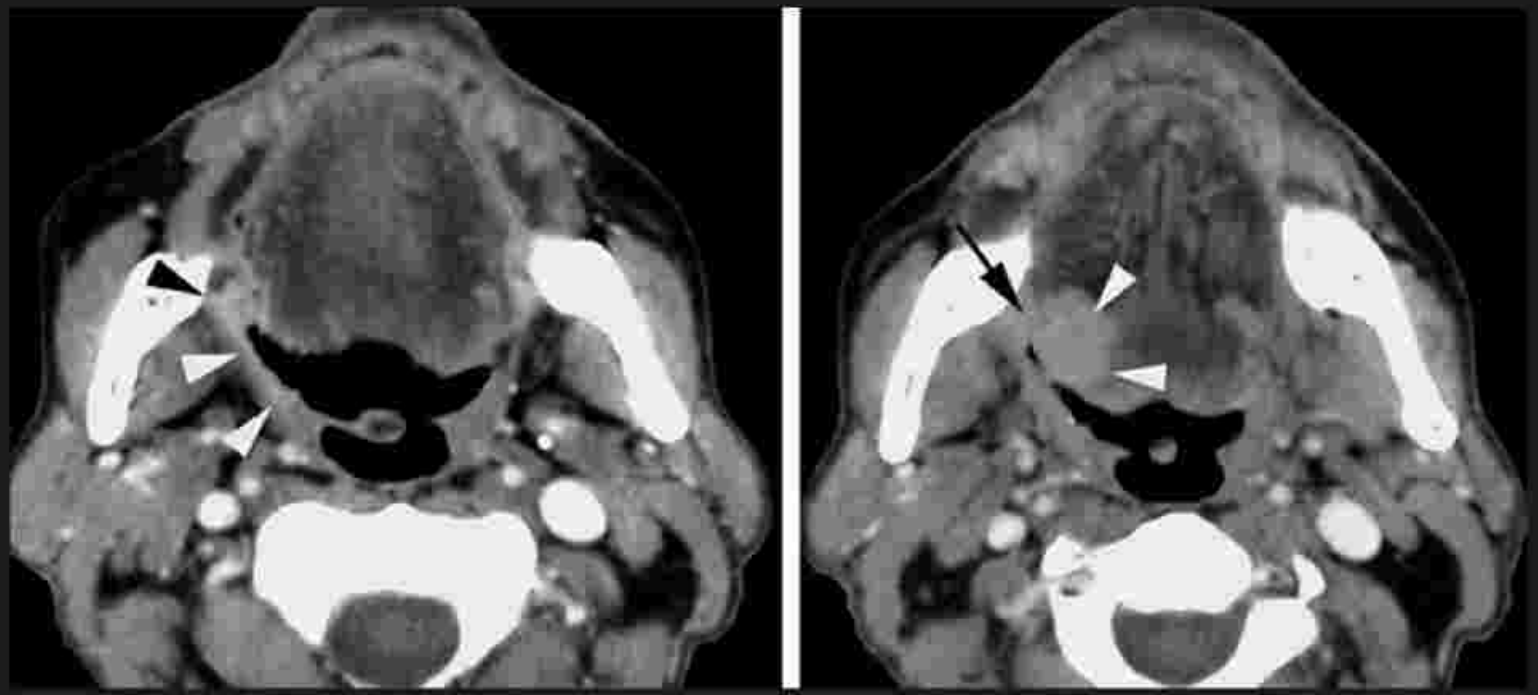
Table 7.1. Subsites within the oropharynx (UICC 2002)

Anterior wall
- Base of tongue (posterior to circumvallate papillae or posterior third)
- Vallecula

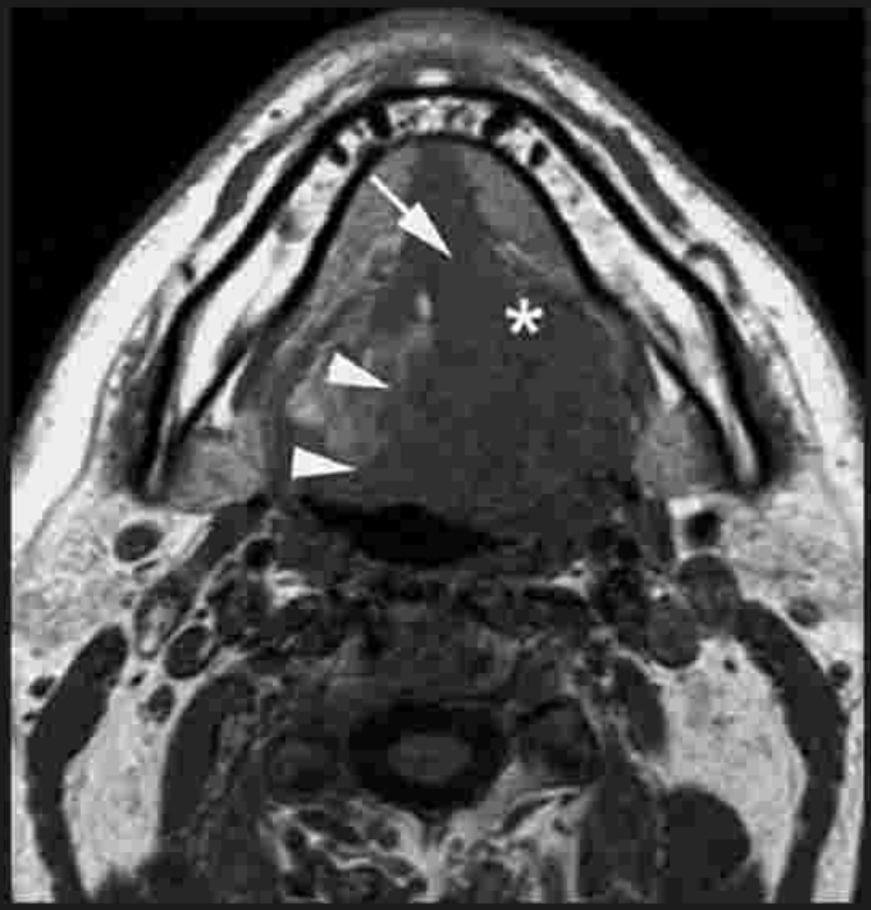
Lateral wall
- Tonsil
- Tonsillar fossa and tonsillar (faucial) pillars
- Glossotonsillar sulci

Posterior wall

Superior wall
- Inferior surface of soft palate
- Uvula



Rt tonsillar Ca



Left tongue base Ca

Table 7.2. T staging of oropharyngeal carcinoma (UICC 2002)

Tis	Carcinoma in situ
T1	Tumour ≤ 2 cm in greatest dimension
T2	Tumour > 2 cm but ≤ 4 cm in greatest dimension
T3	Tumour measures > 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, skull base, or encases the carotid artery

Nasopharynx

Rt fossa of rosenmuller tumor

TNM staging

T – Primary Tumor

- T1 Tumor confined to nasopharynx
- T2 Tumor extends to soft tissue of oropharynx and/or nasal fossa
  - T2a Without parapharyngeal extension
  - T2b With parapharyngeal extension
- T3 Tumor invades bony structures and/or paranasal sinuses
- T4 Tumor with intracranial extension and/or involvement of cranial nerves, infratemporal fossa, hypopharynx, or orbit

N – Regional Lymph Nodes

- NX Regional lymph nodes cannot be assessed
- N0 No regional lymph node metastasis
- N1 Unilateral metastasis in lymph node(s), 6 cm or less in greatest dimension, above supraclavicular fossa
- N2 Bilateral metastasis in lymph node(s), 6 cm or less in greatest dimension, above supraclavicular fossa
- N3 Metastasis in lymph node(s)
  - (a) Greater than 6 cm in dimension
  - (b) In the supraclavicular fossa

Parapharyngeal space

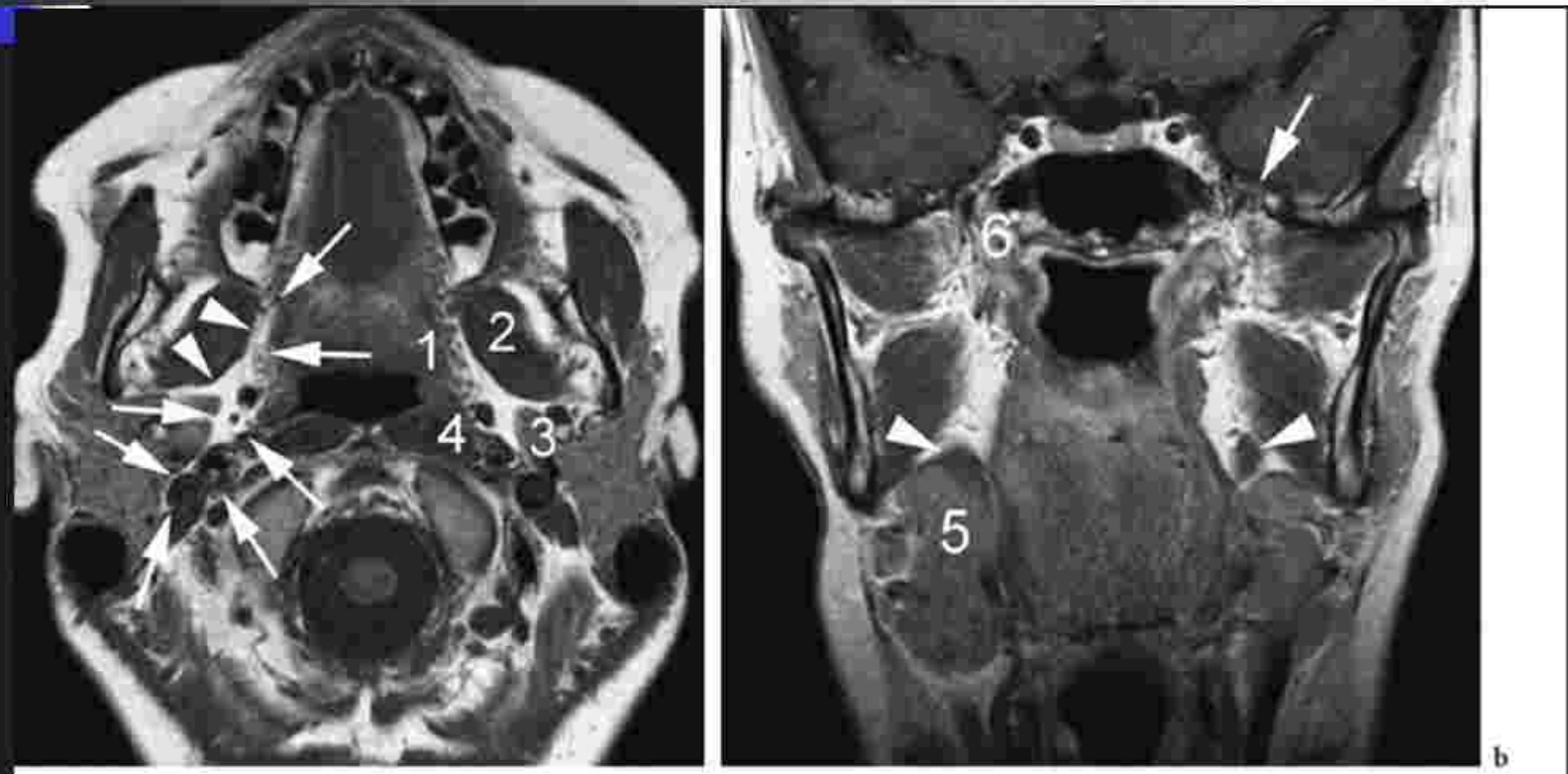


Fig. 9.1a,b. Axial T1-weighted spin-echo image (**a**) at the level of the soft palate. The boundaries of the parapharyngeal space (PPS) (including prestyloid and retrostyloid compartment) are indicated by *arrows* and *arrowheads* on the right. On the left, the adjacent spaces are labeled: *1*, pharyngeal mucosal space; *2*, masticator space; *3*, parotid space; *4*, retropharyngeal/prevertebral space. **b** Coronal T1-weighted spin-echo images through prestyloid compartment of the PPS. Inferiorly, this space is closed by the submandibular gland (*5*), while superiorly, it reaches the skull base (*6*). The foramen ovale (*arrow*), through which exits the mandibular nerve, communicates with the masticator space. The styloglossal muscles run through the PPS (*arrowheads*)


m
k
a
s
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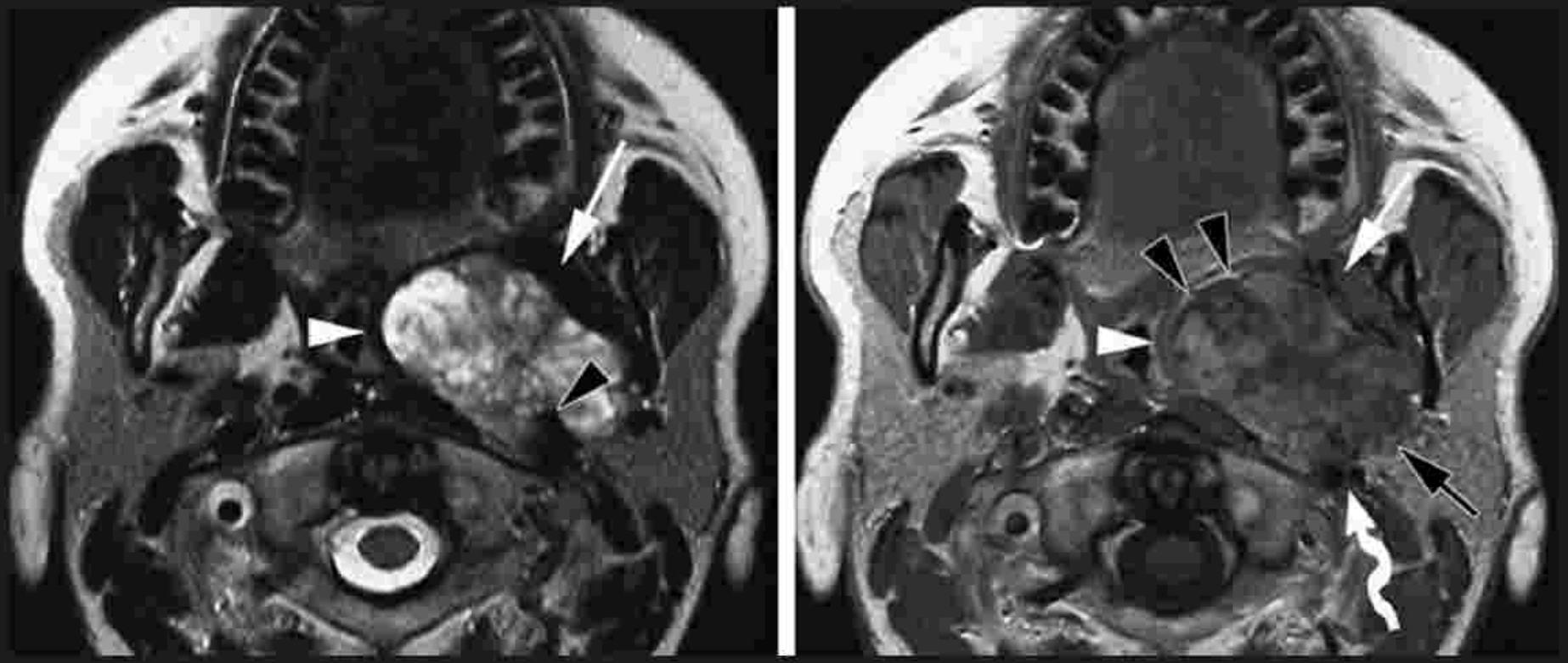
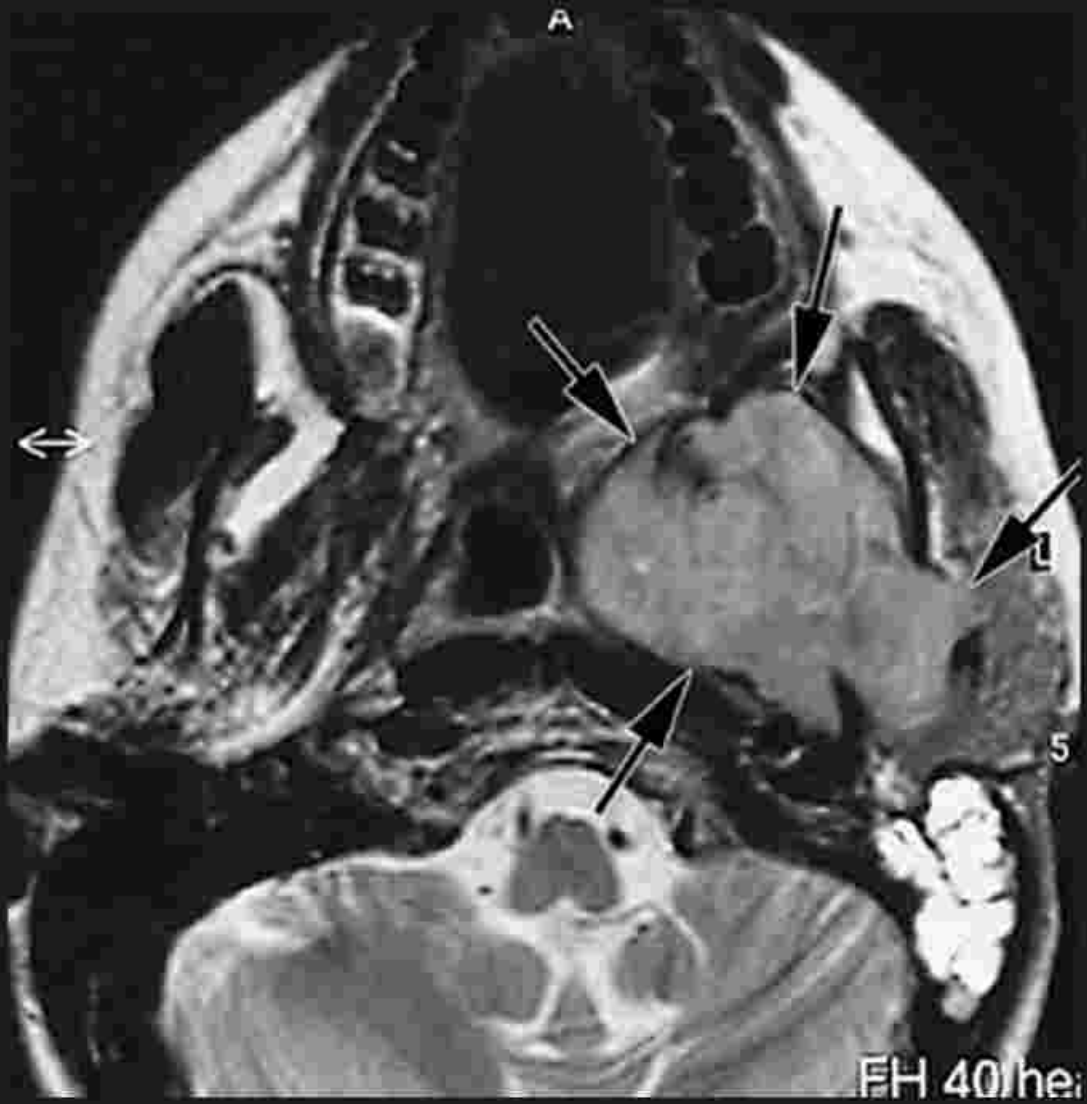


Prestyloid compartment - Pleomorphic adenoma

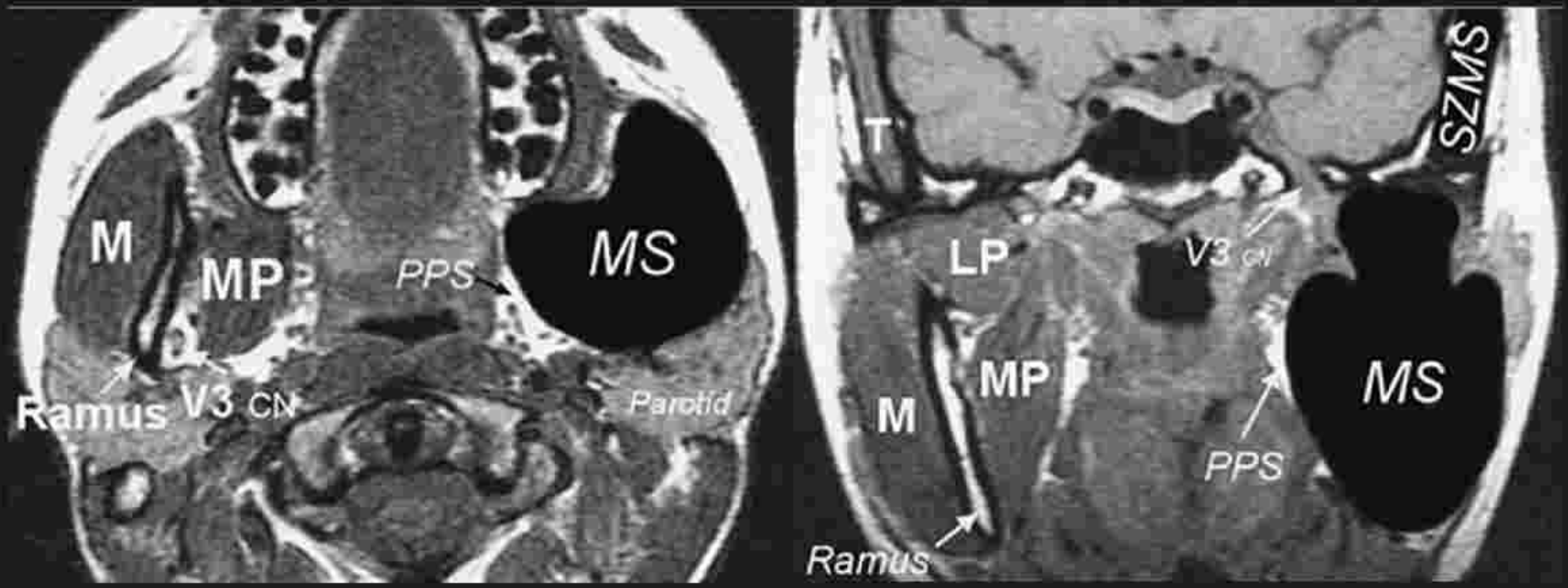
Post-styloid compartment - schwannoma

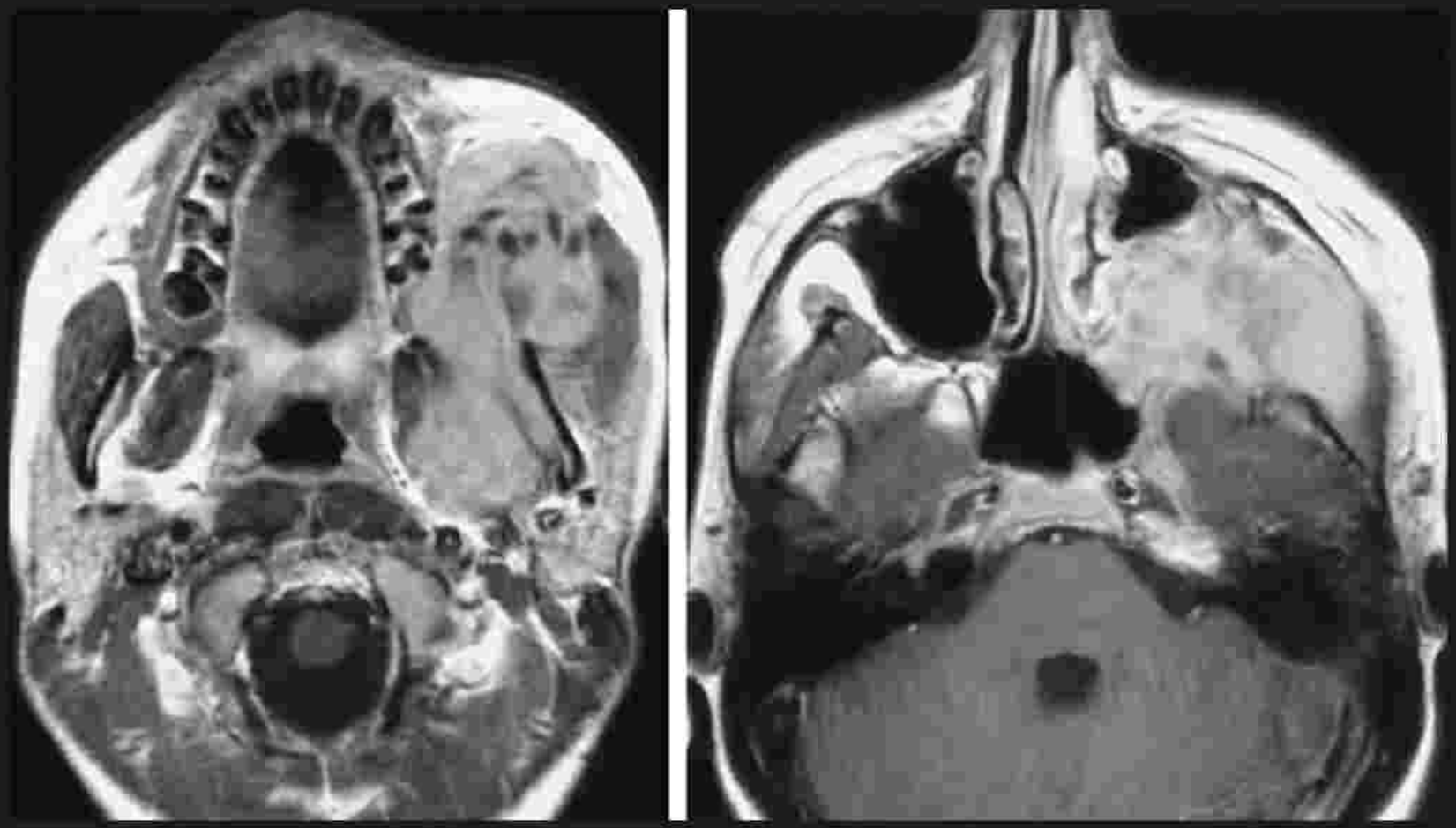
B/L Post-styloid compartment - paraganglioma



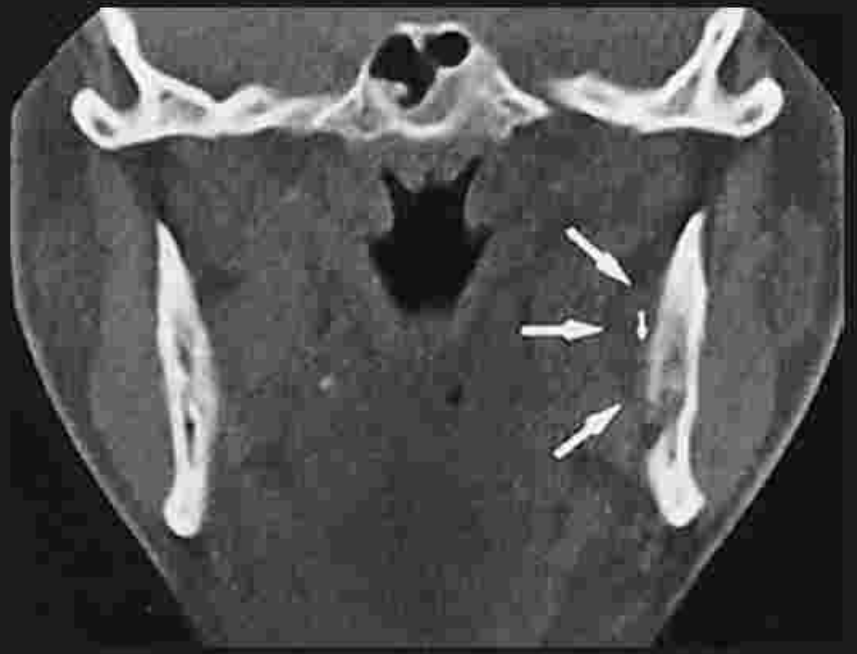
Deep mandibular lesion extending to PPS
Rhabdomyosarcoma

Masticator space



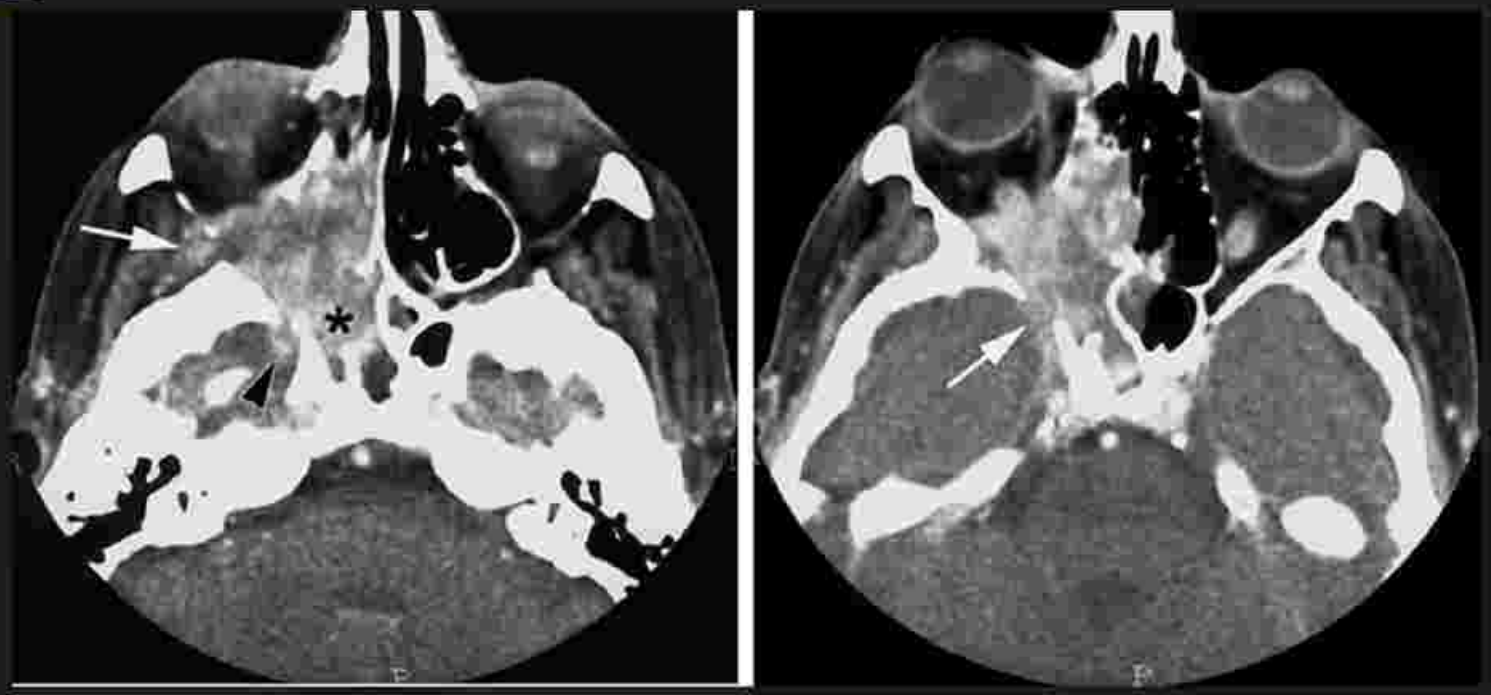


Lt masticator space lesion
Rhabdomyosarcoma

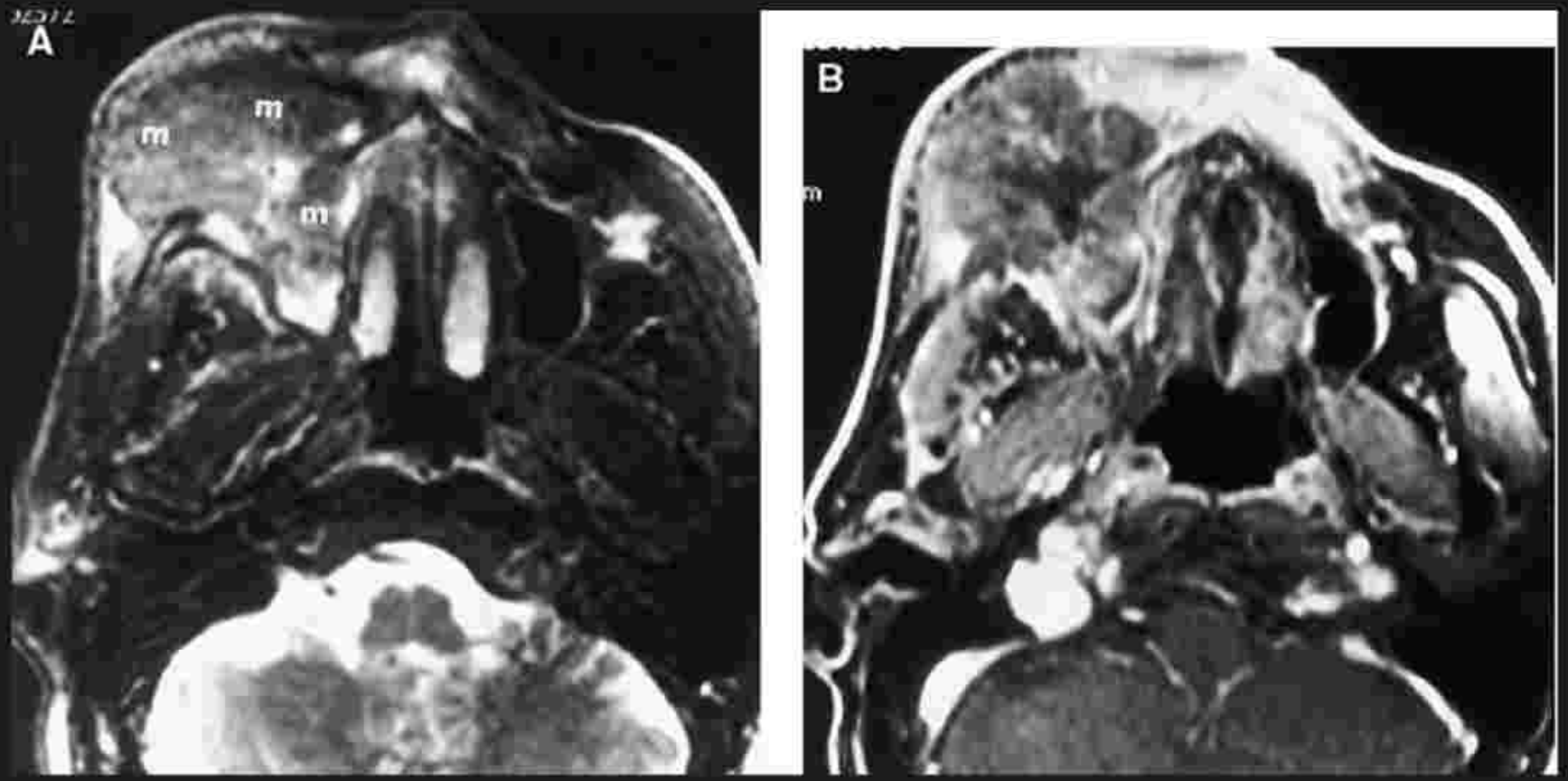


Osteosarcoma

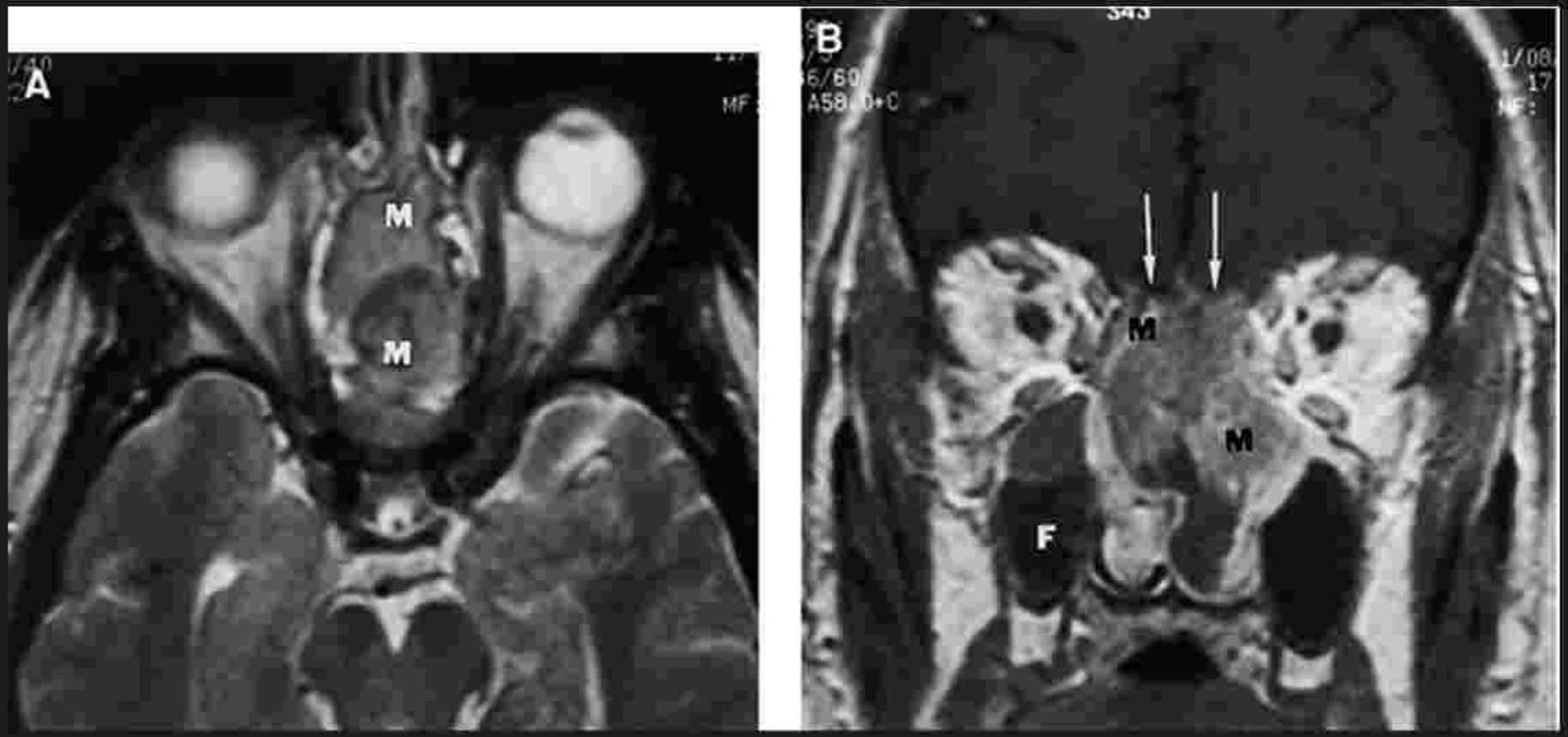
Sino-nasal cavities



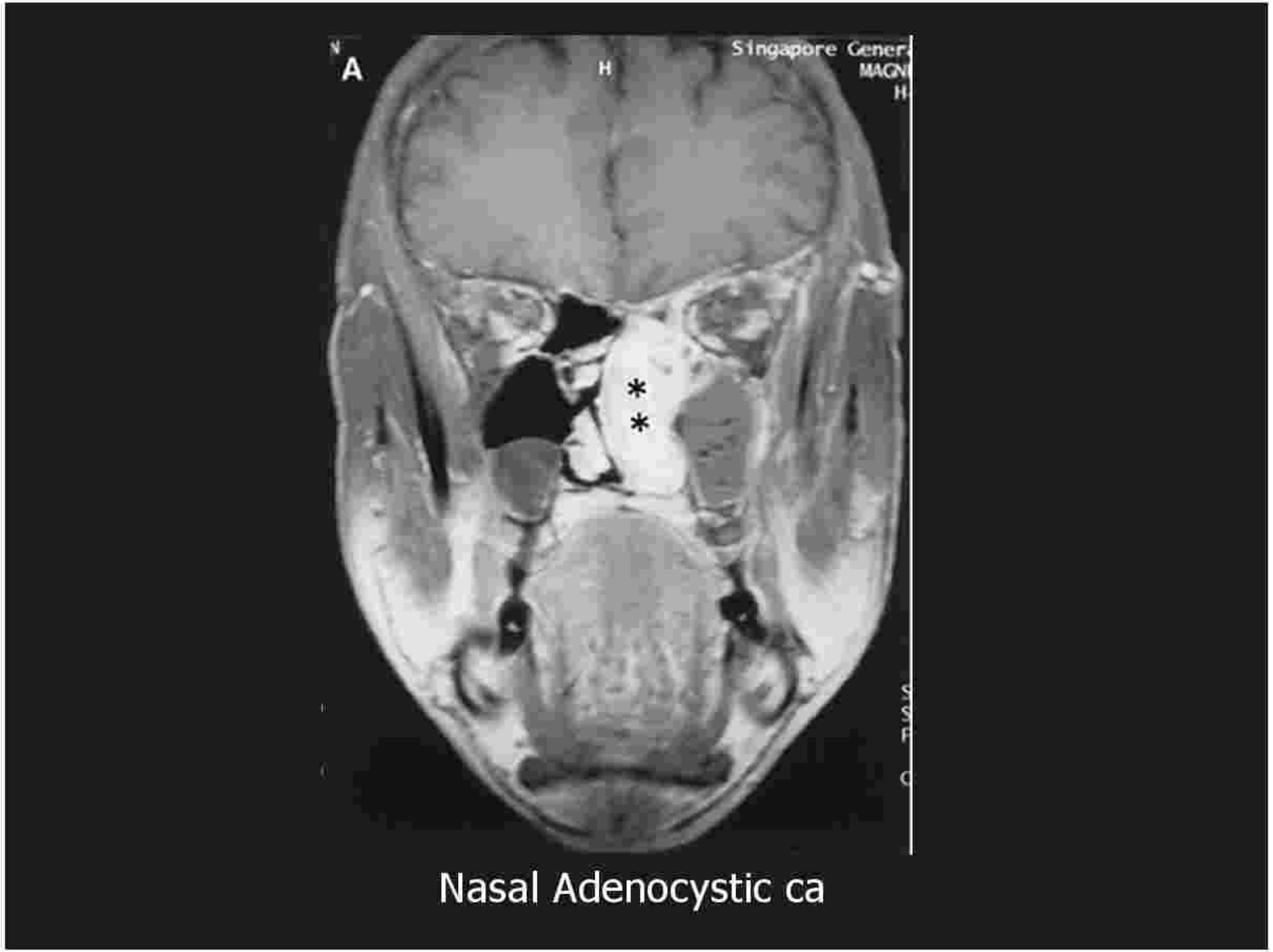
SCC



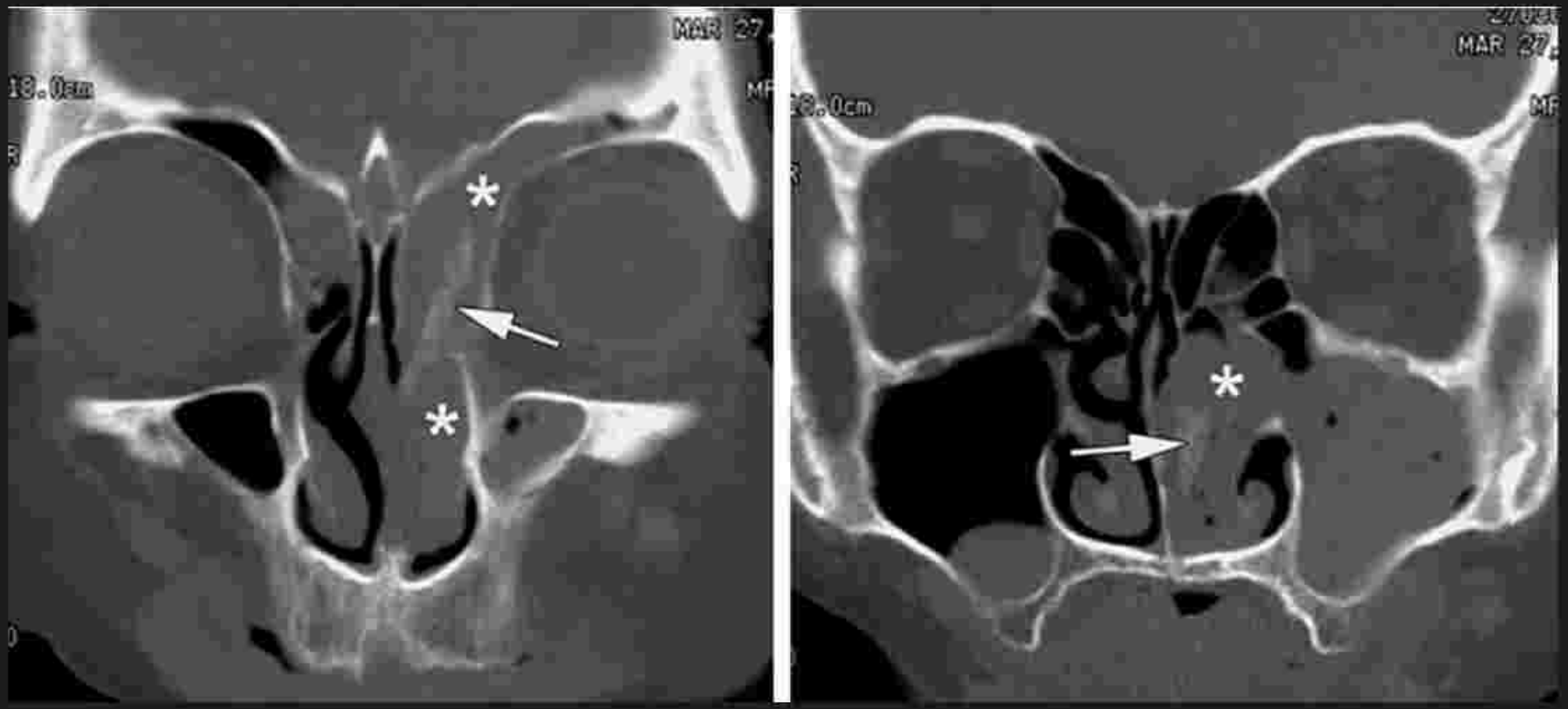
SCC of Rt maxillary sinus



Esthesioneuroblastoma



Nasal Adenocystic ca

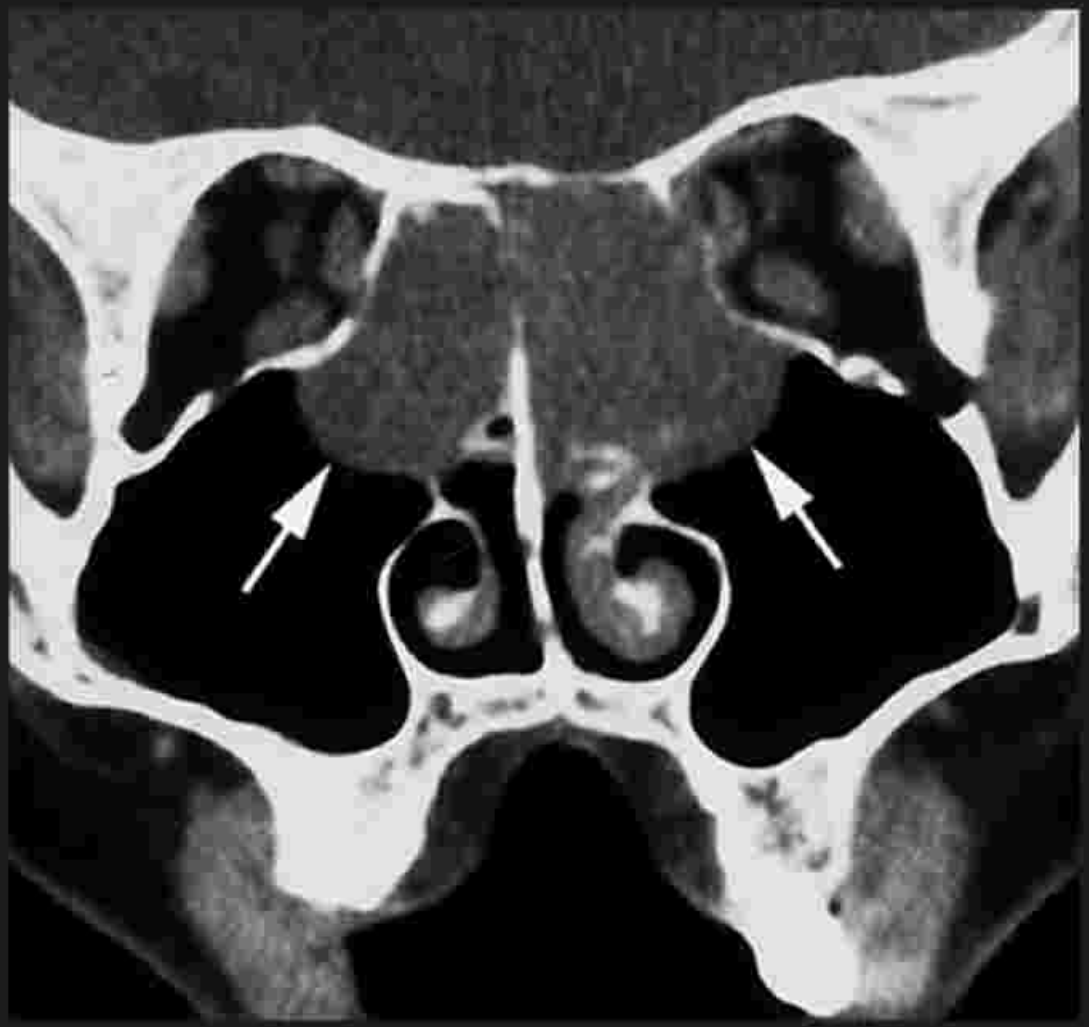


Inverted papilloma

Metastasis

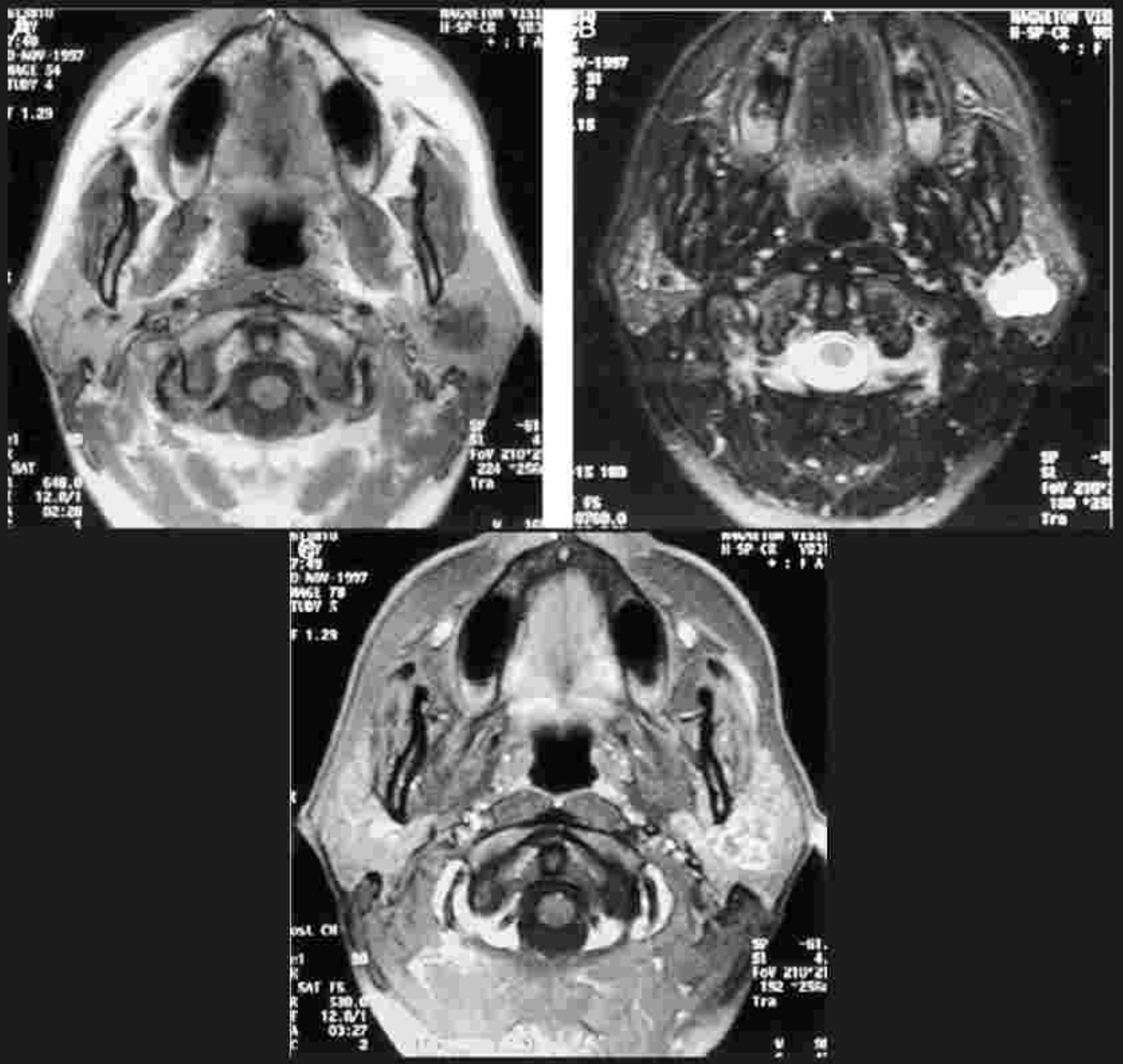
Meningioma

Hemangioma

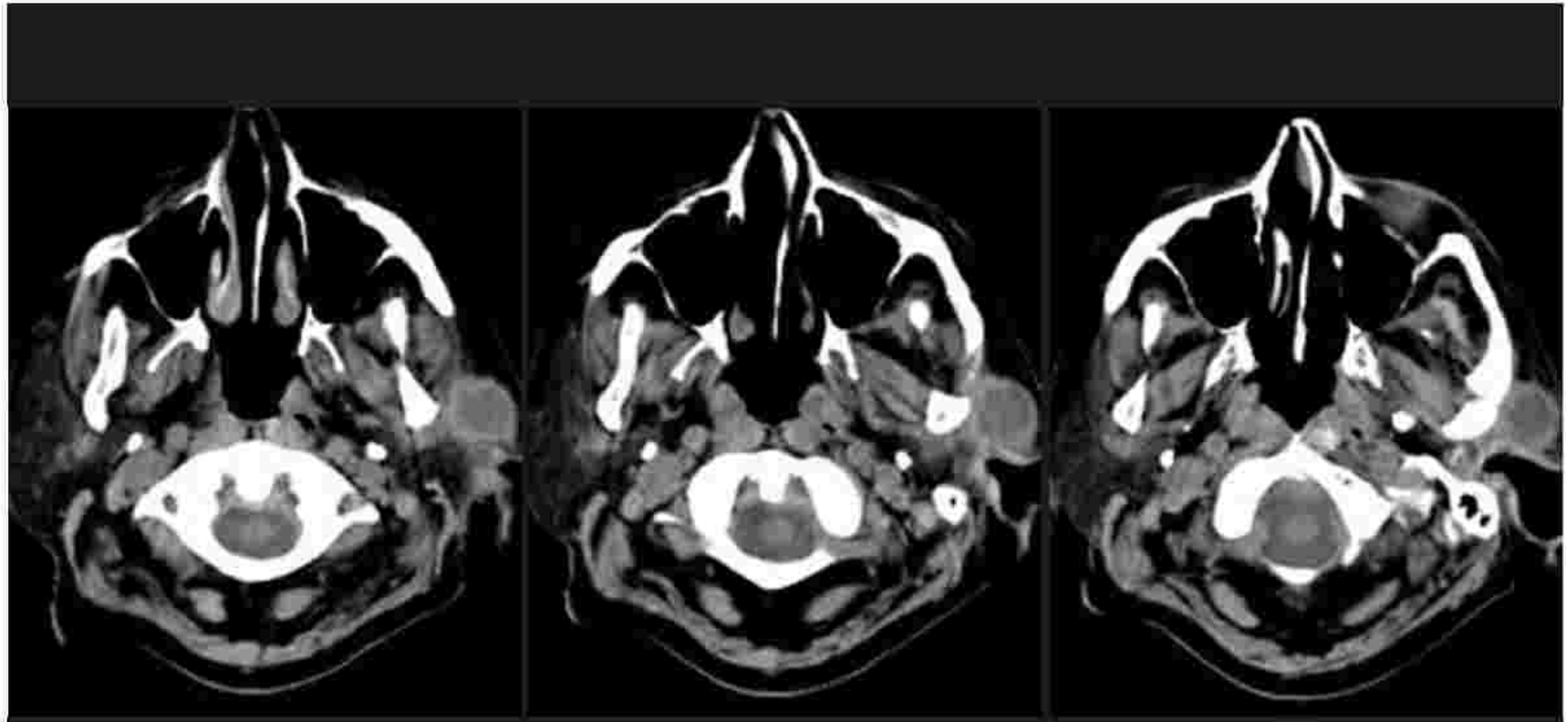


NHL

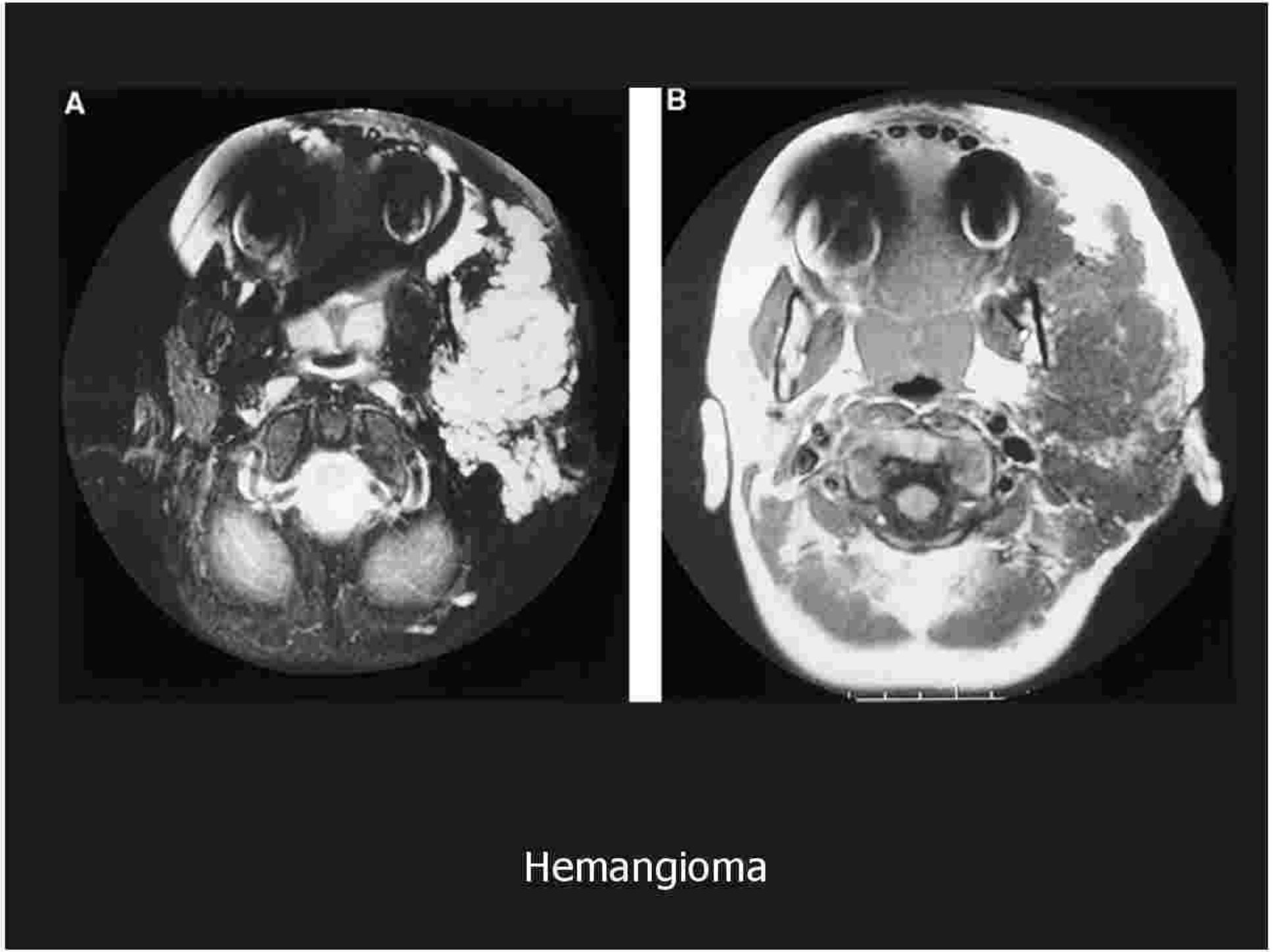
Parotid gland (Parotid space)



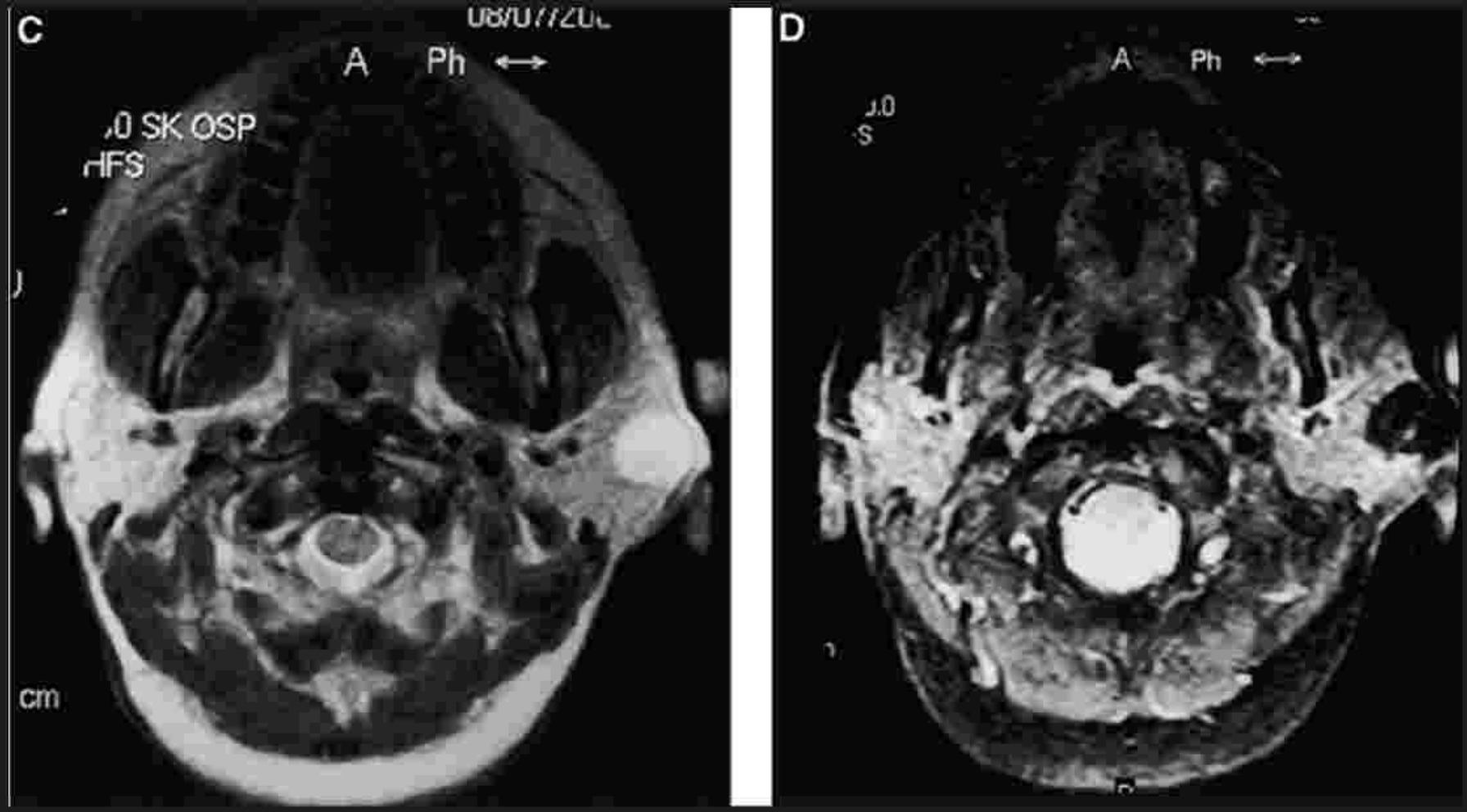
Pleomorphic adenoma



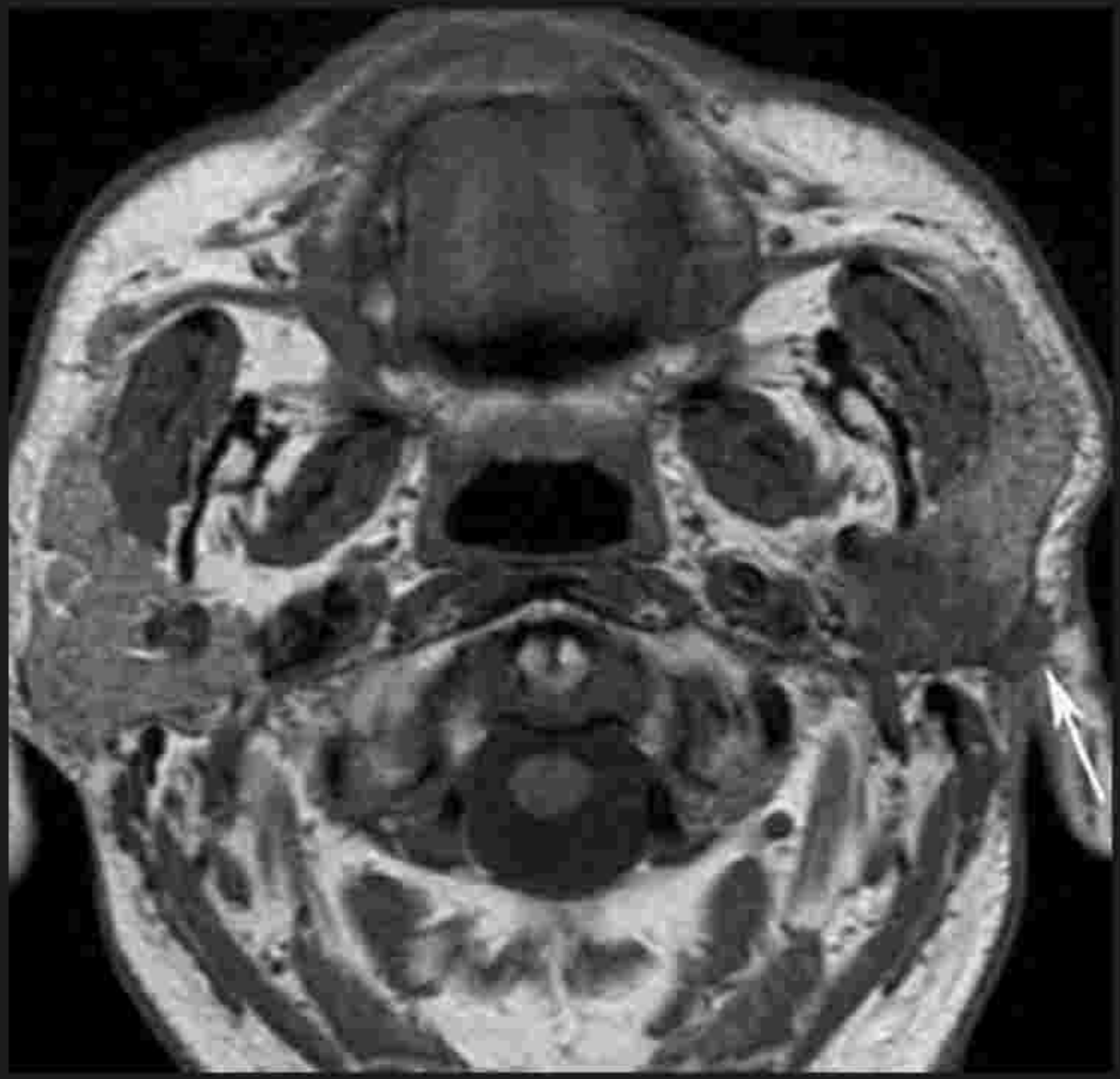
Warthin’s tumor



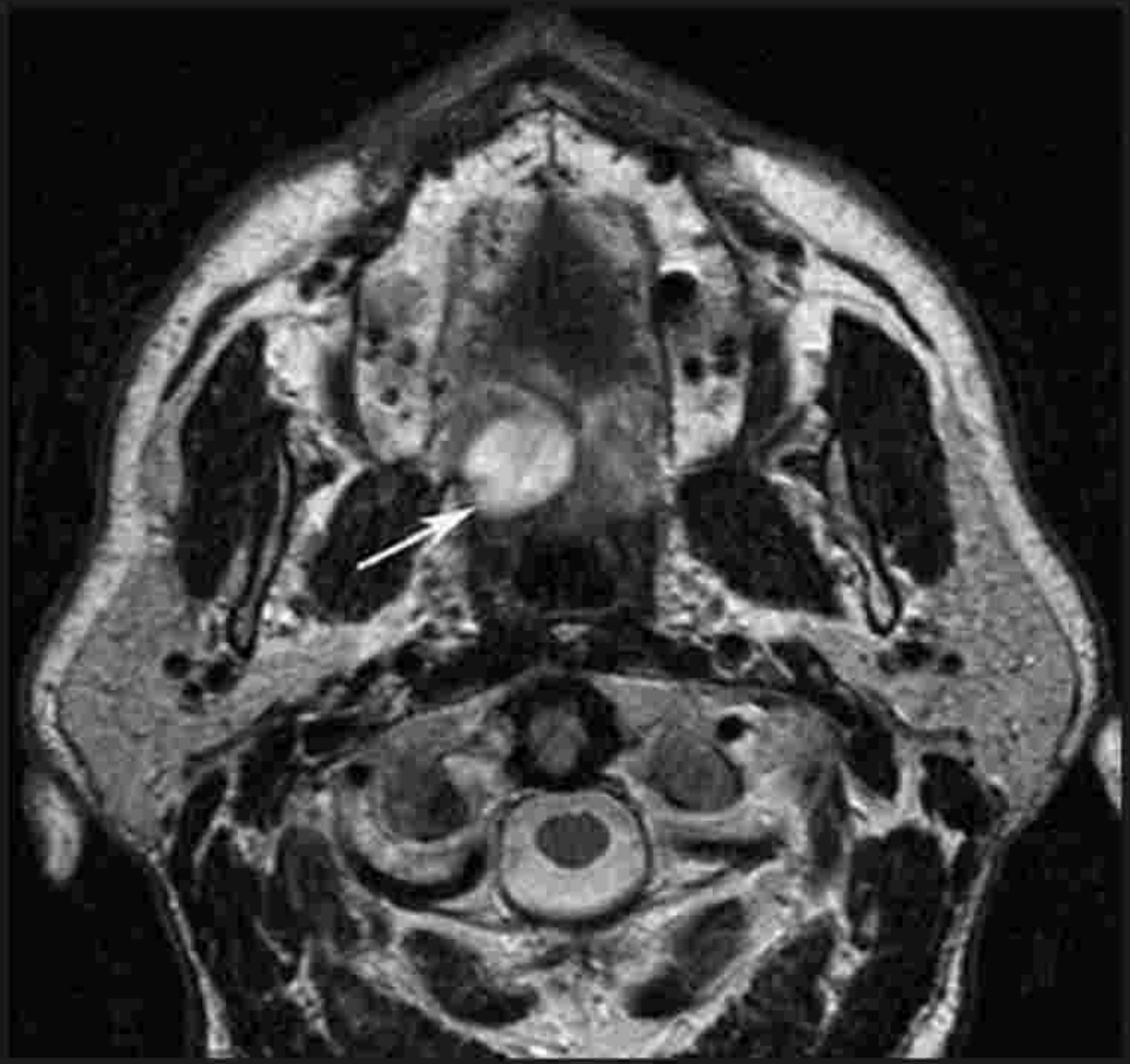
Hemangioma



Left parotid lipoma



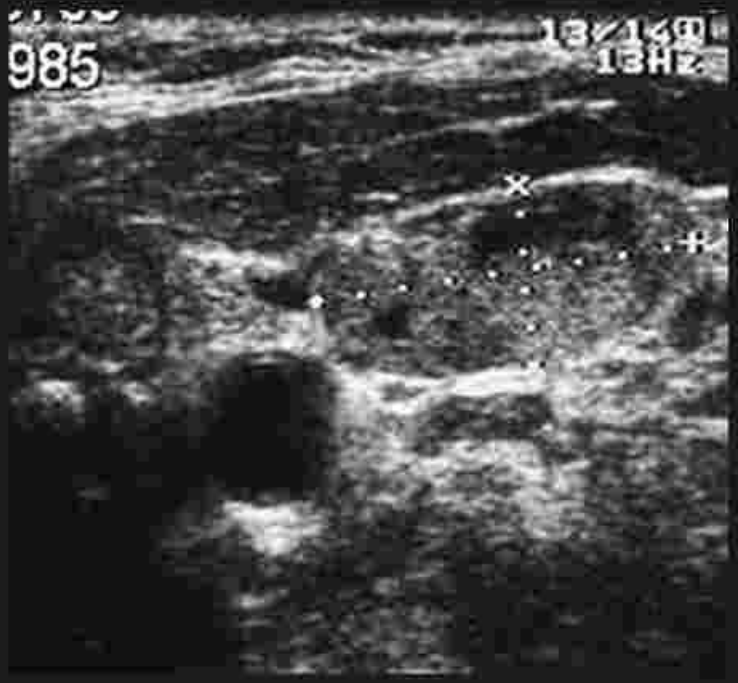
Adenocarcinoma



Mucoepidermoid tumor of minor salivary gland

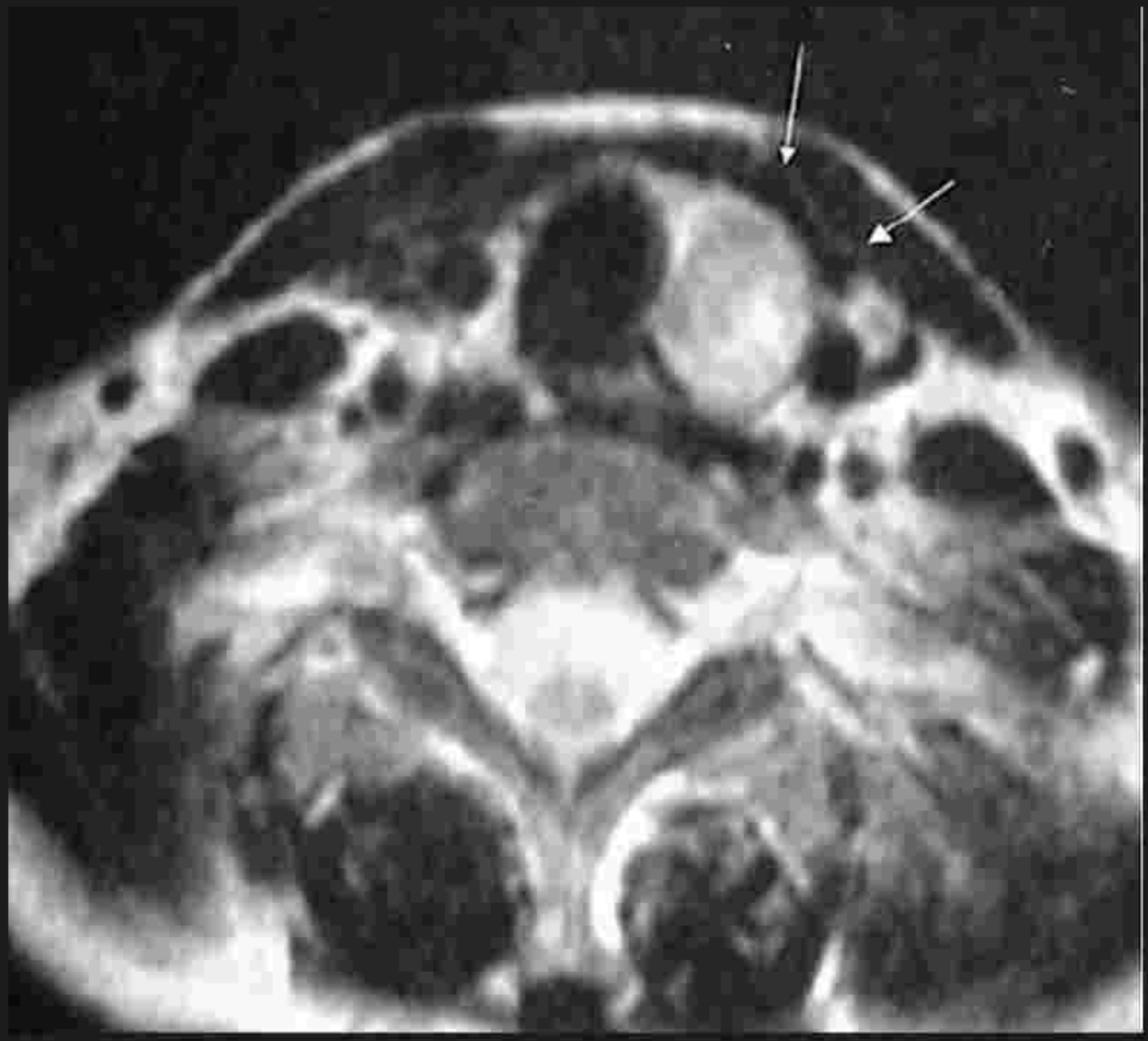
Thyroid & parathyroid (visceral space)

Papillary carcinoma



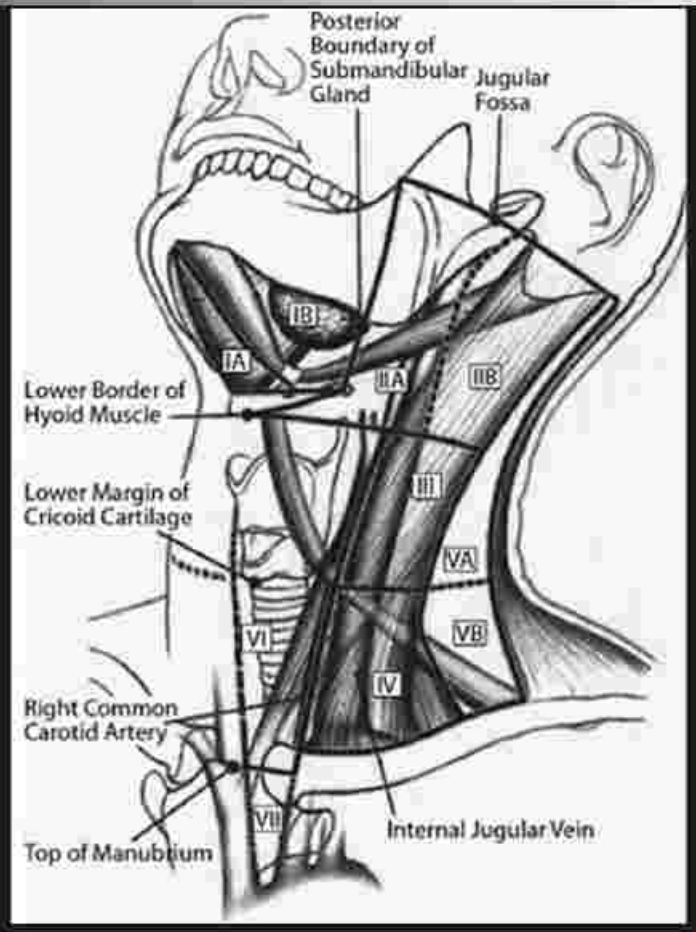
with lymph node metastasis

Anaplastic carcinoma

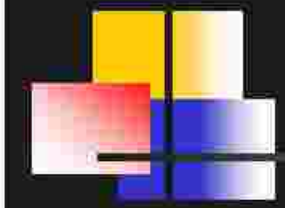


Parathyroid adenoma

Neck nodes



Neck nodes - Levels



contd...

Level I

Above - mylohyoid

Below - hyoid

anterior to a line drawn connecting posterior edge of submandibular gland

IA - Between mylohyoid muscles

IB - Lateral to mylohyoid muscles

Level II

Above - skull base, at the lower level of the bony margin of the jugular fossa

Below-lower margin of the body of the hyoid bone

Posterior-anterior to a transverse line connecting the posterior edge of the sternocleidomastoid muscles

Anterior-posterior to a transverse line connecting the posterior edge of the submandibular glands

Level IIA nodes are situated anterior, medial or lateral to the internal jugular vein. These also define Level II lymph nodes that are posterior to the internal jugular vein but directly abut the vein whereas Level IIB nodes are posterior to the internal jugular vein and have an identifiable fat plane between the lymph node and the vein

Level III

Above - Hyoid bone
Below - Cricoid cartilage
Posterior - anterior to a line connecting the posterior margins of the SCM muscle and lateral to medial margin of either the common carotid artery or the internal carotid artery

Level IV

Above - Cricoid cartilage
Below - Clavicle
Posterior - anterior and medial to an oblique line drawn connecting the posterior edge of the sternocleidomastoid muscle and the posterolateral edge of the anterior scalene muscle and lateral to the carotid artery

Level V

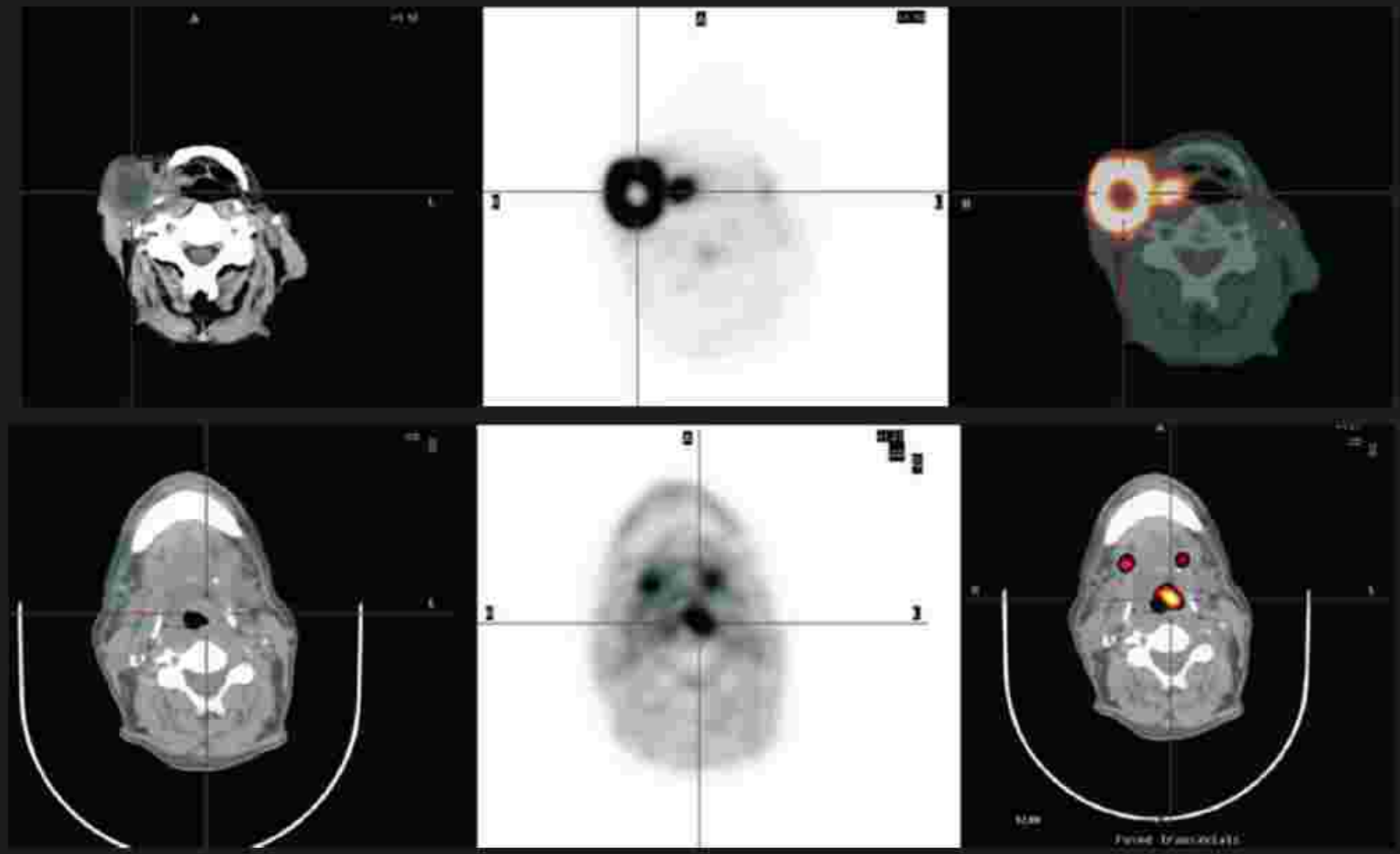
Above - Skull base
Below - Clavicle
Anterior - Posterior edge of SCM muscle
Posterior - anterior to trapezius
Level VA nodes lie between the skull base and the level of the lower margin of the cricoid cartilage arch
Level VB nodes are located between the lower margin of the cricoid cartilage and the clavicle

Level VI

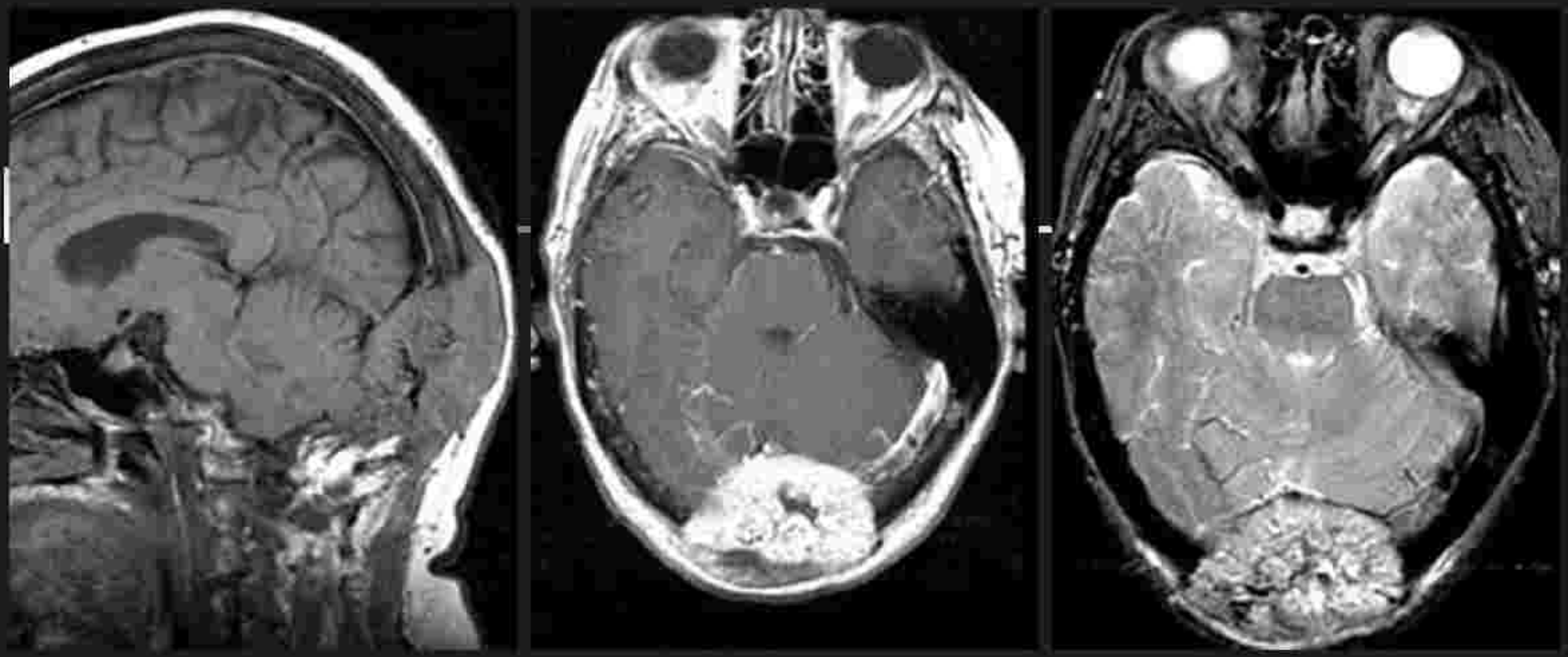
Above - Hyoid bone
Below - Upper part of sternum
Between - the medial margins of the left and right common or internal carotid arteries

Level VII

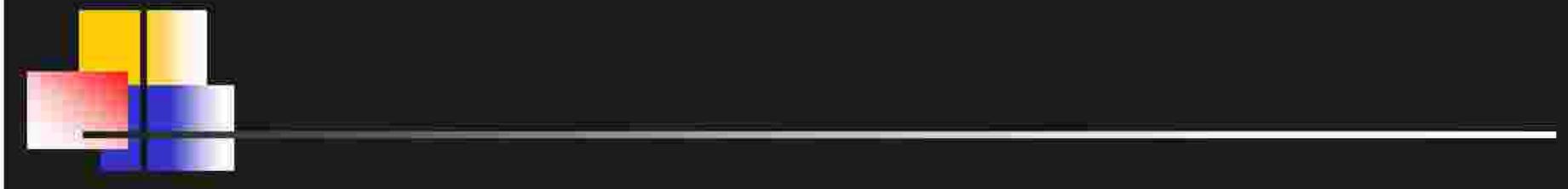
Lie caudal to the top of the manubrium, between the medial margins of the left and right common carotid arteries, and extend caudally to the level of the innominate vein



PET-CT



Metastasis (RCC)



Thank You