

LYMPH NODES

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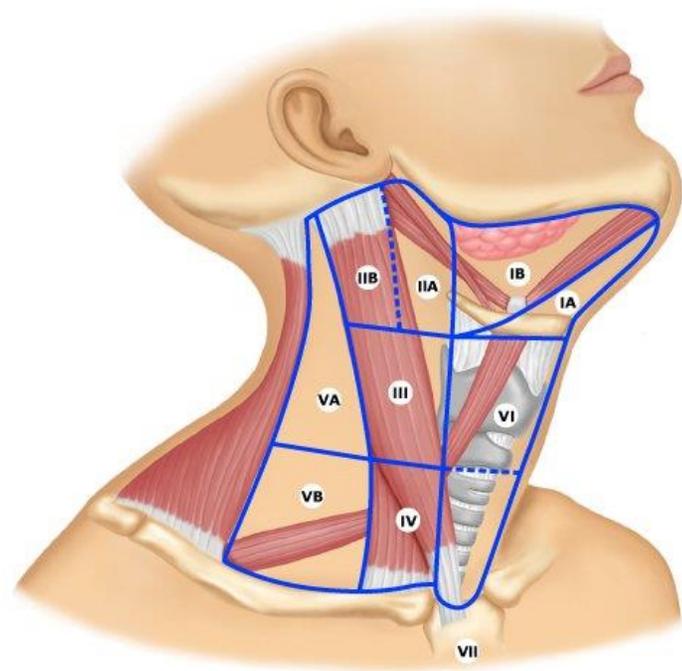
*Delineation of the neck node levels for head and neck tumors: A 2013 update.
DAHANCA, EORTC, HKNPCSG, NCIC CTG, NCRI, RTOG, TROG consensus
guidelines*

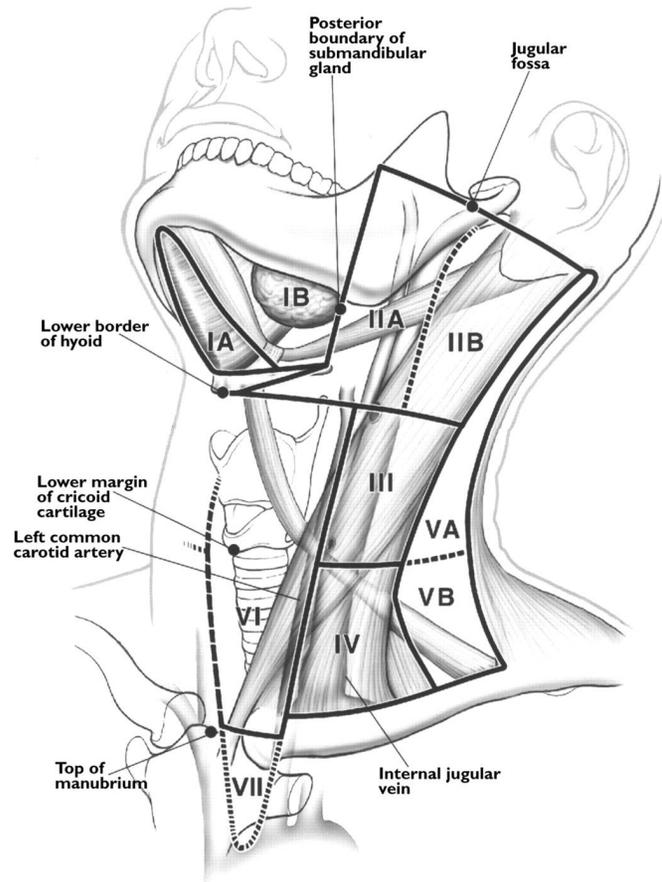
Vincent Grégoire, Kian Ang, Wilfried Budach, Cai Grau, Marc Hamoir, Johannes A. Langendijk, Anne Lee, Quynh-Thu Le, Philippe Maingon, Chris Nutting, Brian O'Sullivan, Sandro V. Porceddu, Benoit Lengele

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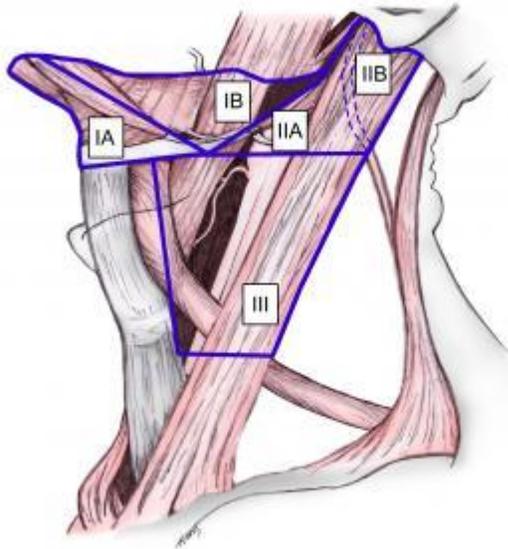


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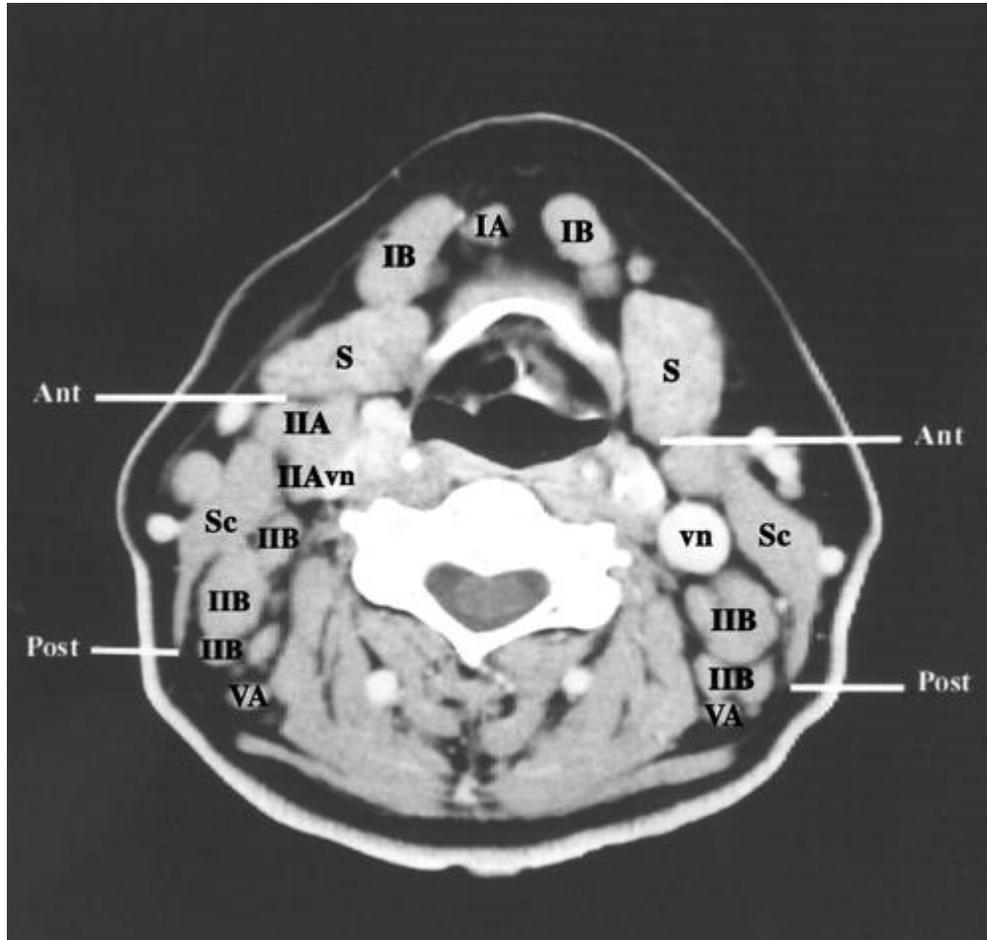


LEVEL IA

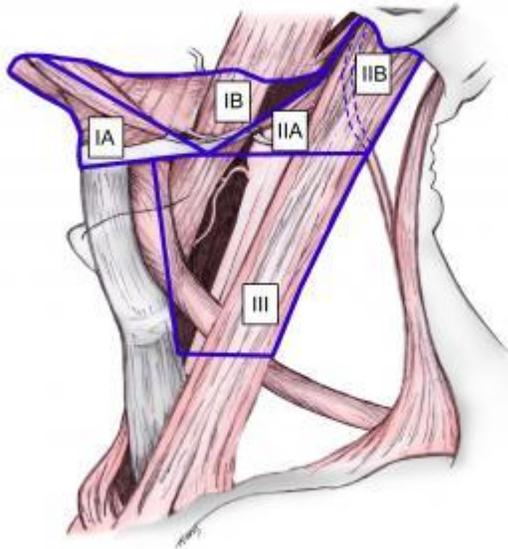


- “ triangular boundary of the anterior belly of the digastric muscles and the hyoid bone
- “ cancers arising from the floor of the mouth, anterior oral tongue, anterior mandibular alveolar ridge, and lower lip

LEVEL IA

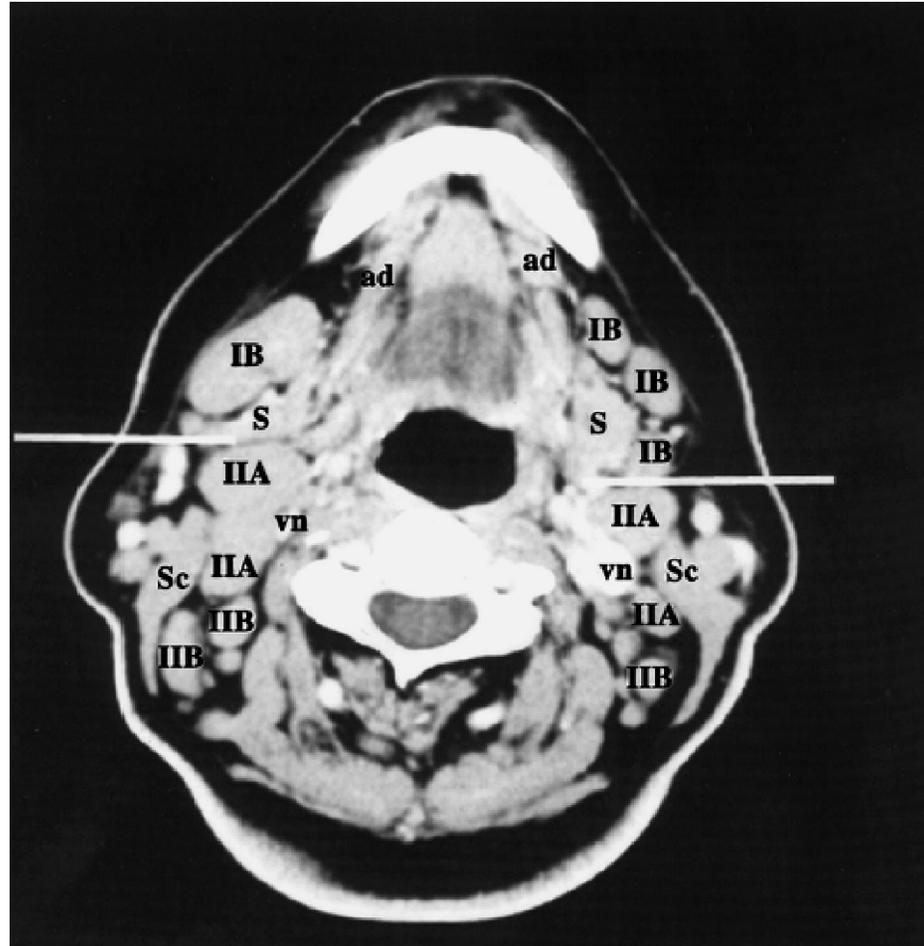


LEVEL IB

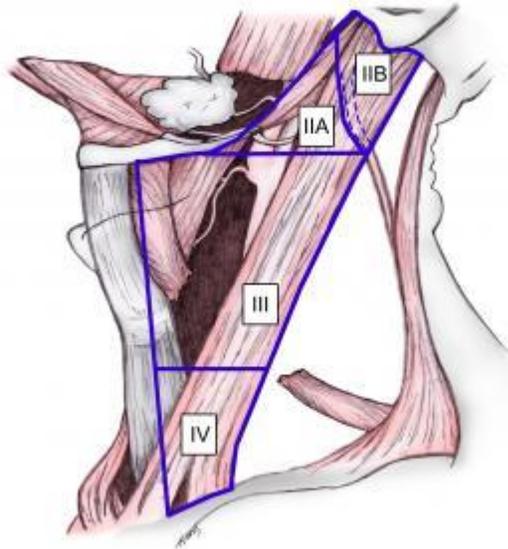


- “ boundaries of the anterior and posterior bellies of the digastric muscles, the stylohyoid muscle, and the body of the mandible
- “ vertical plane at the posterior aspect of the submandibular gland forms a use means of demarcating the posterior aspect of Level IB from IIA
- “ cancers arising from the oral cavity, anterior nasal cavity, soft tissue structures of the midface, and SMG

LEVEL IB

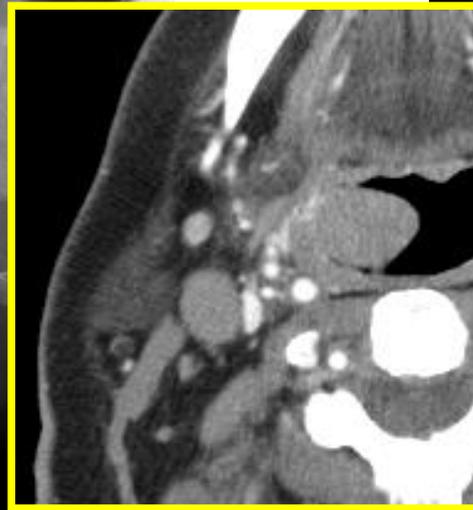
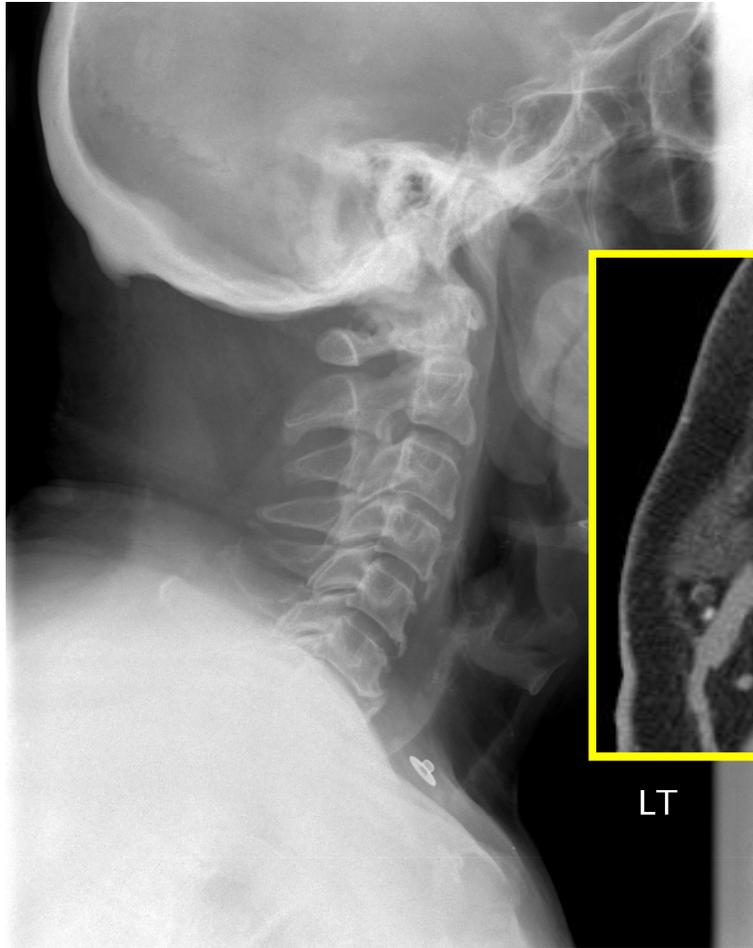


LEVEL IIA

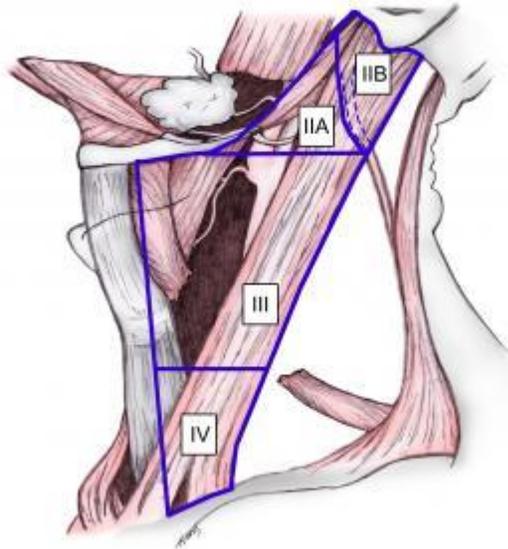


- “ around the upper third of the IJV and adjacent spinal accessory nerve
- “ anterior (medial) boundary is the lateral border of the sternohyoid muscle and the stylohyoid muscle (or posterior aspect of the SMG)
- “ anterior (medial) to the vertical plane defined by the spinal accessory nerve
- “ cancers arising from the oral cavity, nasal cavity, nasopharynx, oropharynx, hypopharynx, larynx, and parotid gland

LEVEL IIA

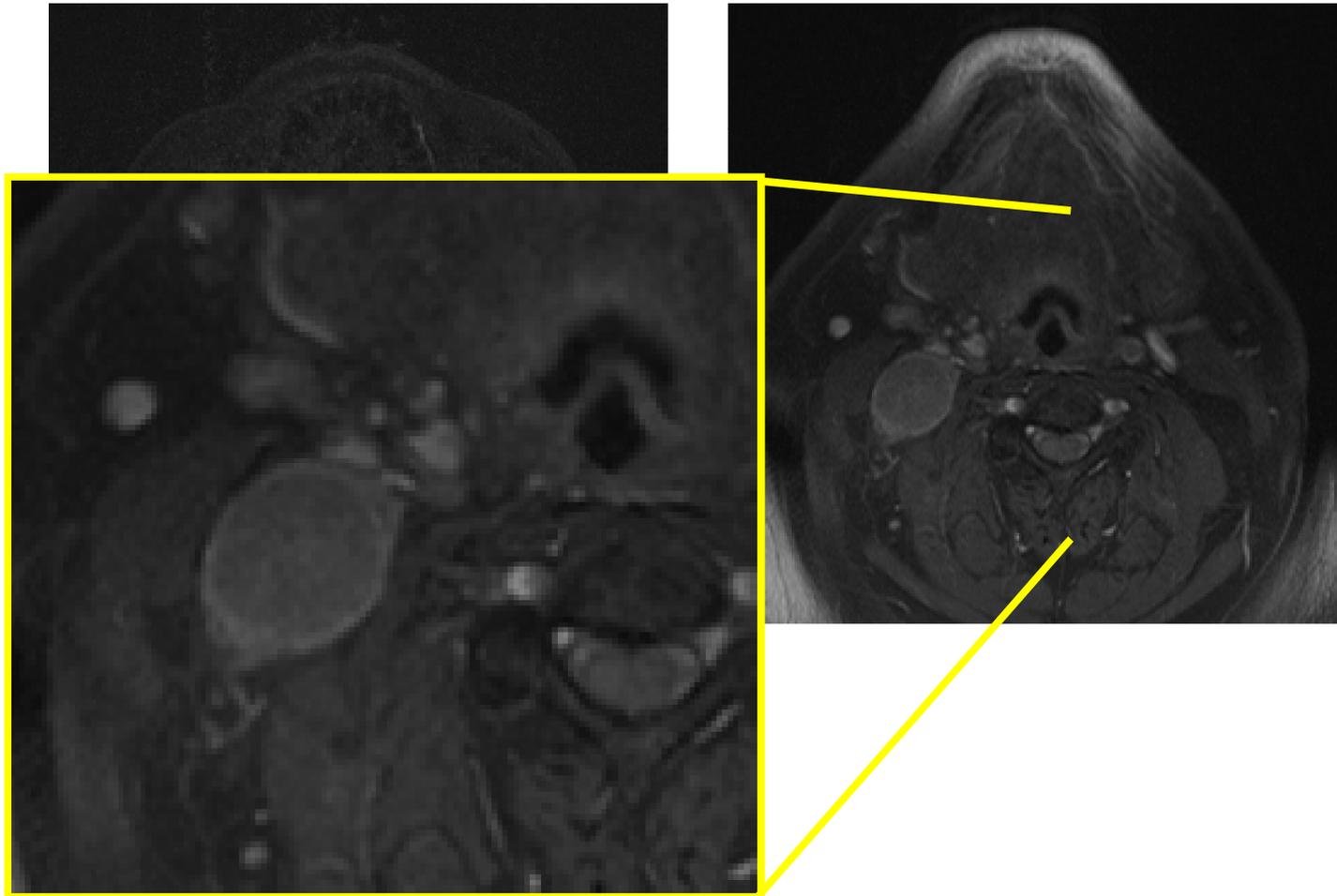


LEVEL IIB



- “ around the upper third of the IJV and adjacent spinal accessory nerve
- “ anterior (medial) boundary is the lateral border of the sternohyoid muscle and the stylohyoid muscle (or posterior aspect of the SMG)
- “ **posterior (lateral) to the vertical plane defined by the spinal accessory nerve**
- “ cancers arising from the oral cavity, nasal cavity, nasopharynx, oropharynx, hypopharynx, larynx, and parotid gland

LEVEL IIB



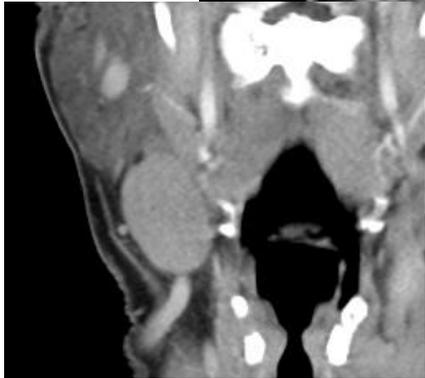
LEVEL IIA/IIB



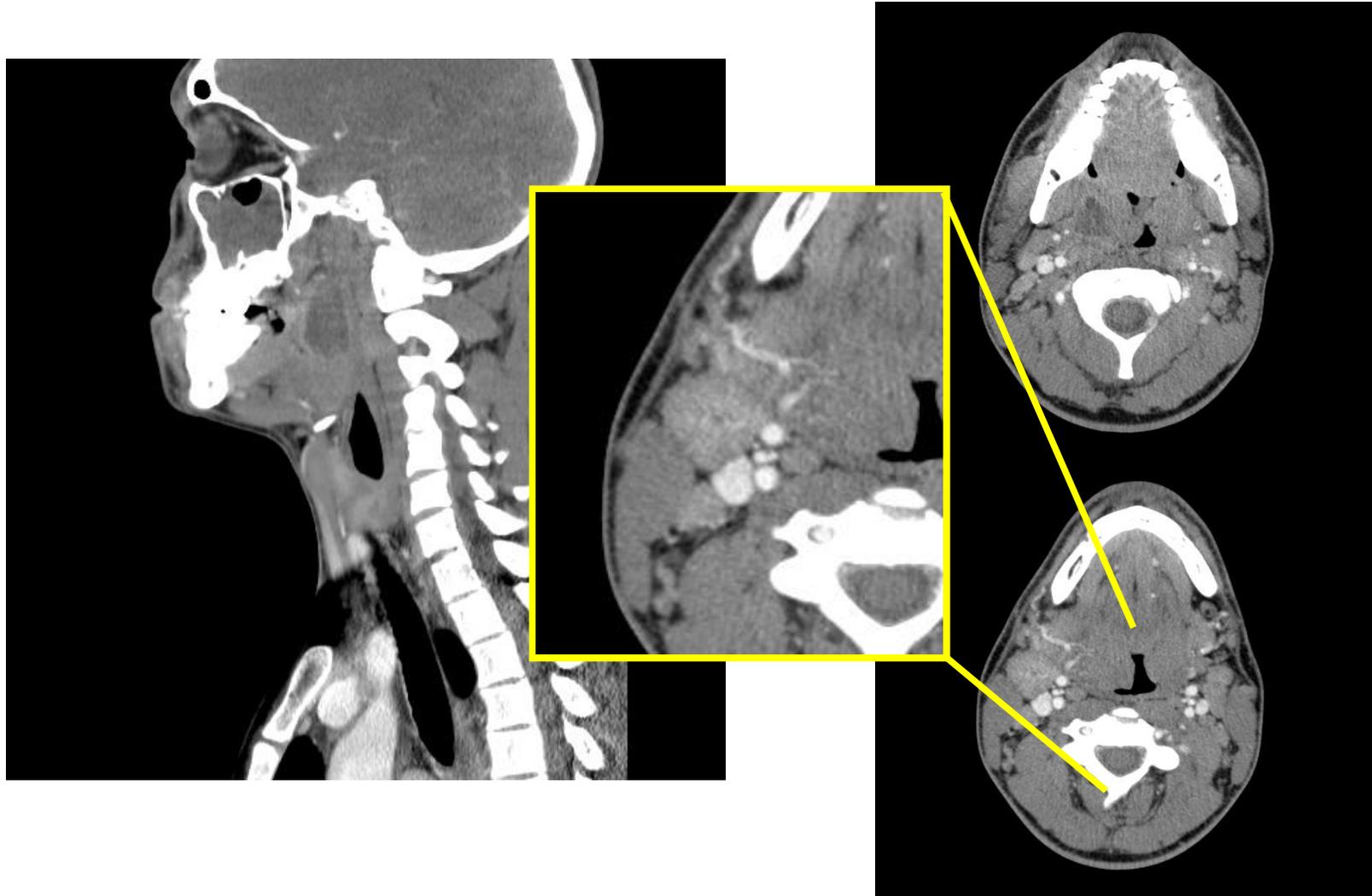
IIA



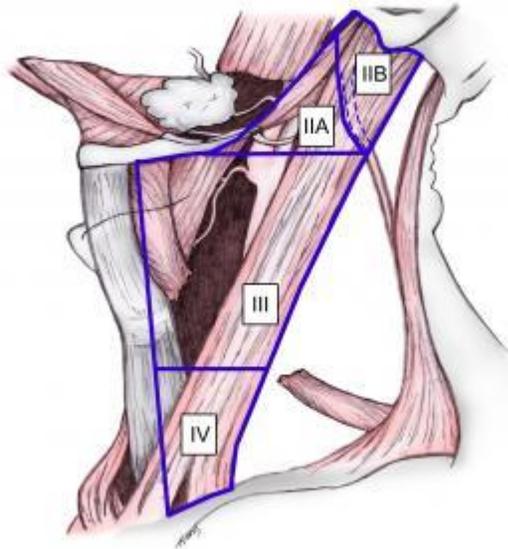
IIB



LEVEL IIA/IIB

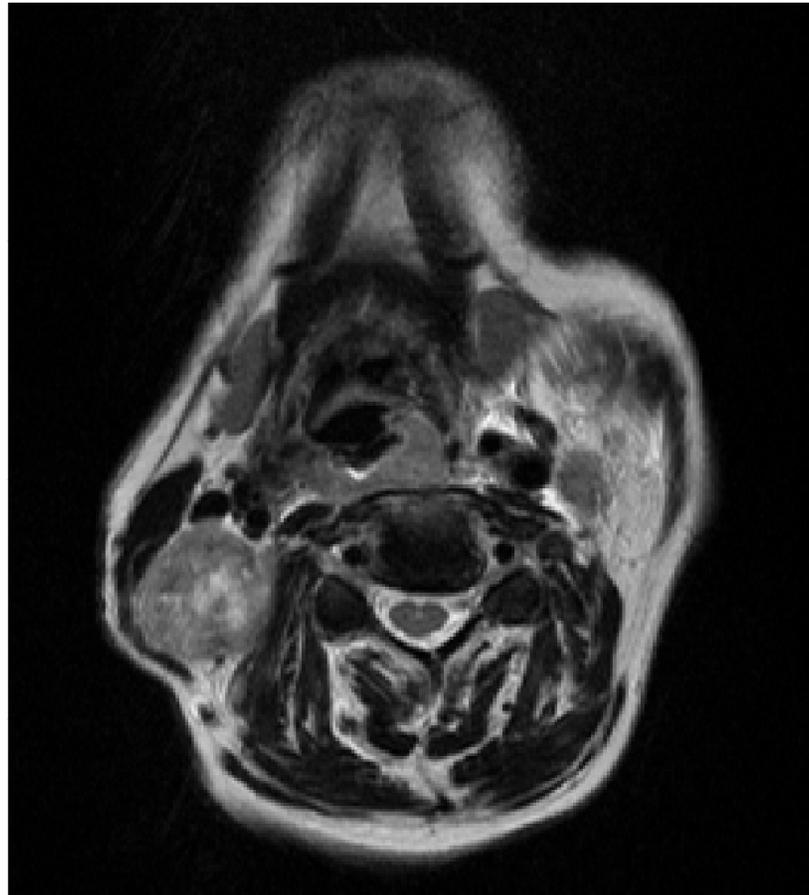


LEVEL III

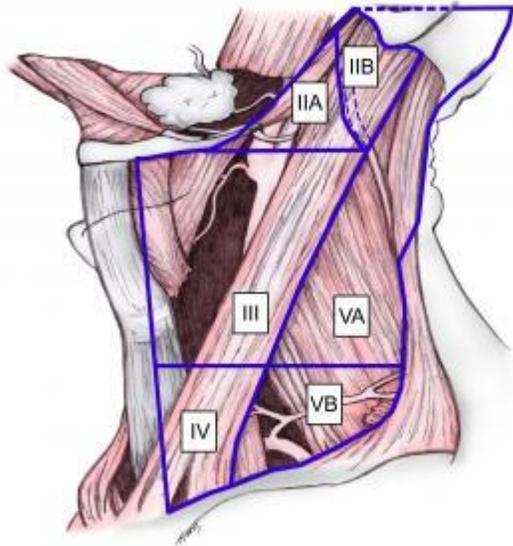


- “ inferior border of the hyoid bone (above) to the inferior border of the cricoid cartilage
- “ The anterior (medial) boundary is the lateral border of the sternohyoid muscle, and the posterior (lateral) boundary is the posterior border of the SCM
- “ cancers arising from the oral cavity, nasopharynx, oropharynx, hypopharynx, and larynx

LEVEL III

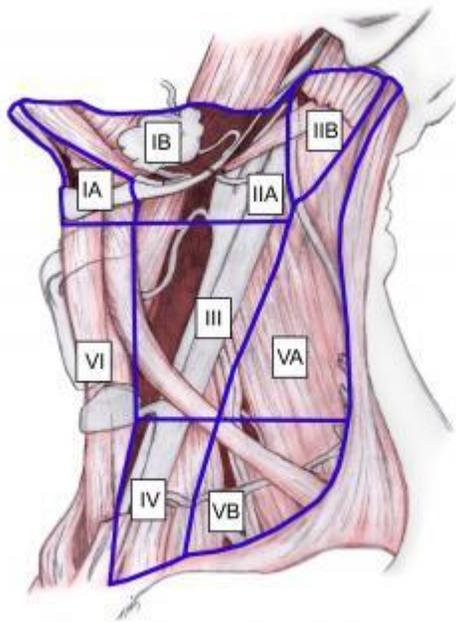


LEVEL IV



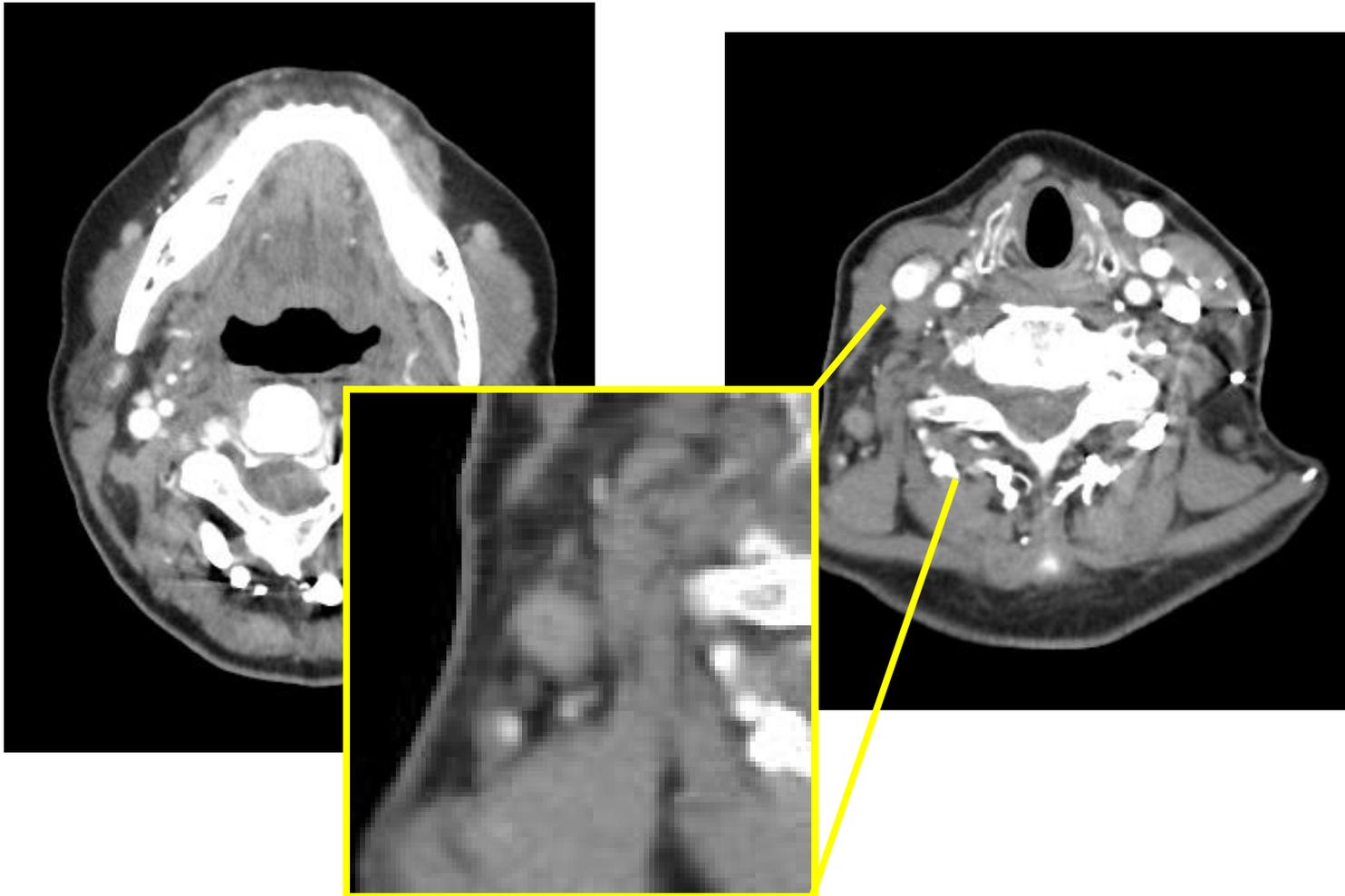
- “ inferior border of the cricoid cartilage (above) to the clavicle (below)
- “ anterior (medial) boundary is the lateral border of the sternohyoid muscle, and the posterior (lateral) boundary is the posterior border of the SCM
- “ Cancers arising from the hypopharynx, cervical esophagus, and larynx

LEVEL V

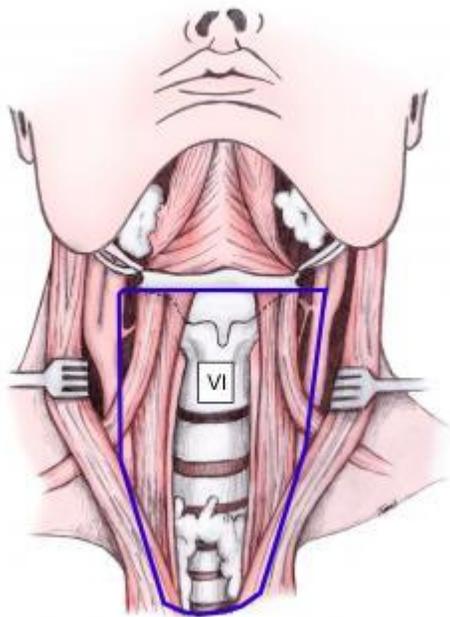


- “ superior boundary:
convergence of the SCM and
the trapezius muscles
- “ inferior boundary: clavicle
- “ anterior (medial) boundary:
posterior border of the SCM
- “ posterior (lateral) boundary:
anterior border of the trapezius
muscle
- “ cancers arising from the
nasopharynx and oropharynx
(VA), and the thyroid gland
(VB)

LEVEL VA/VB

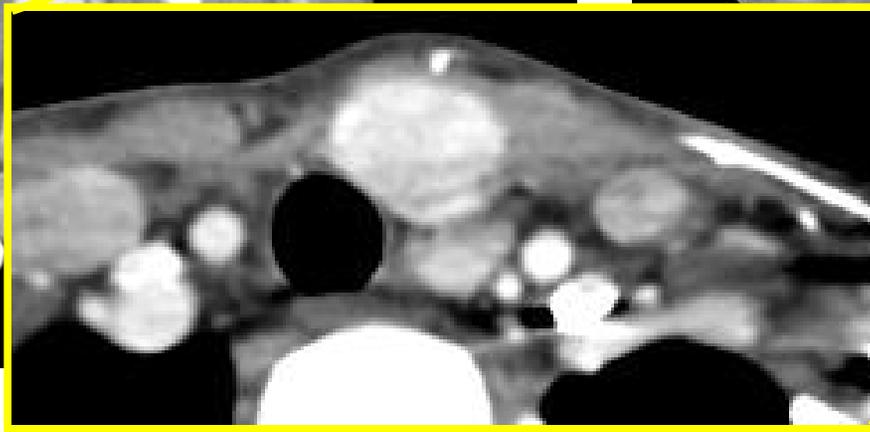
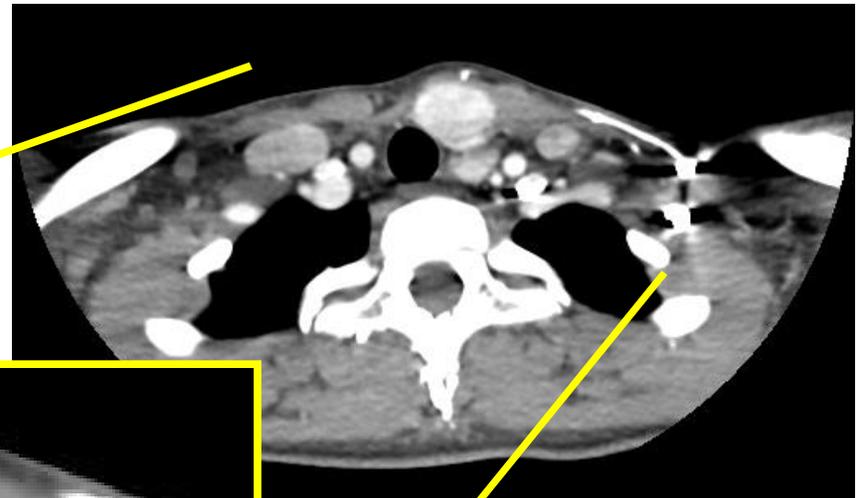
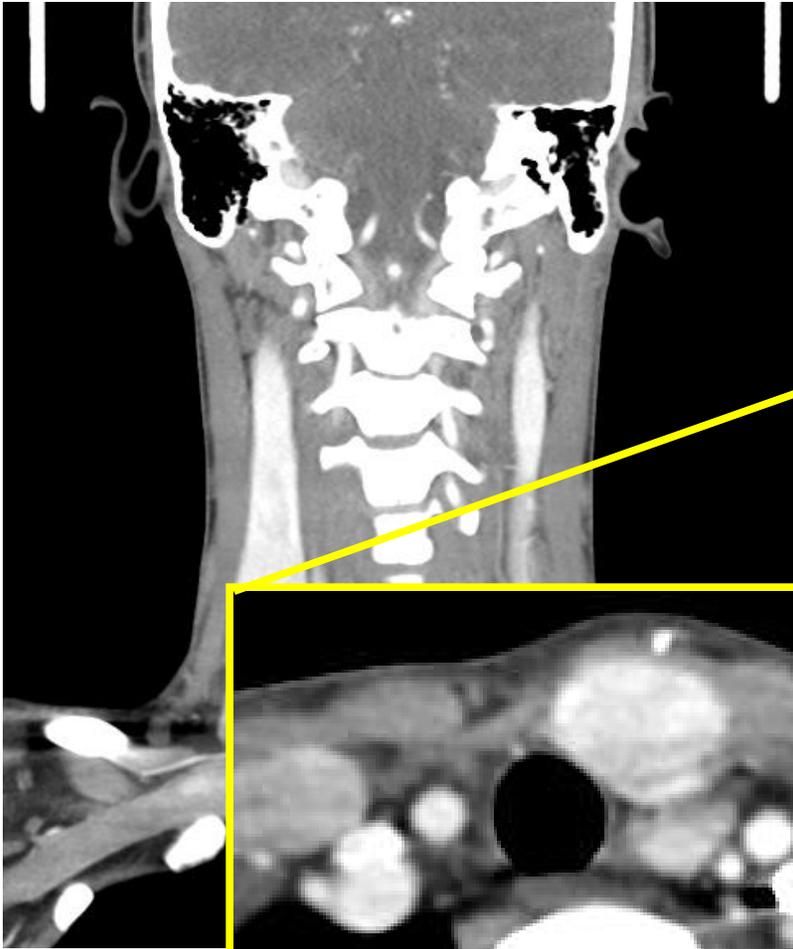


LEVEL VI

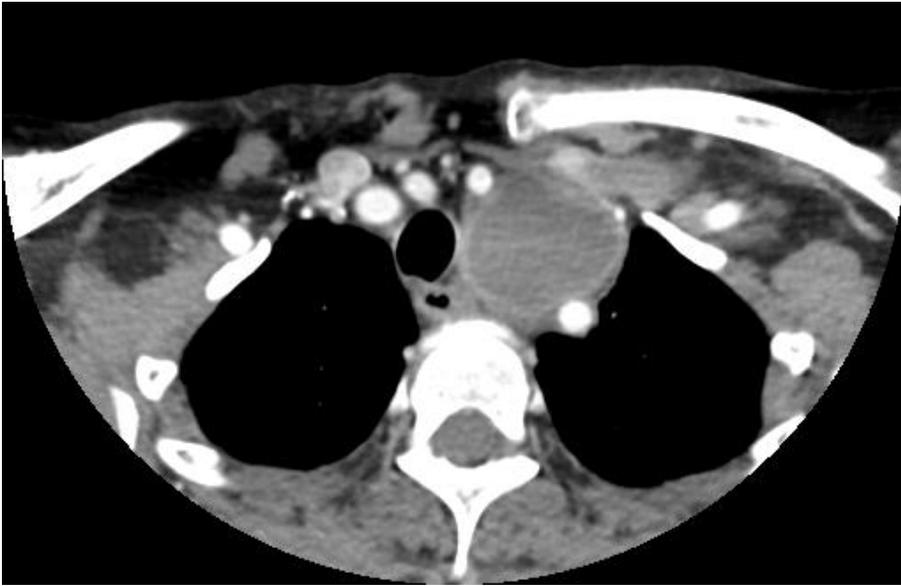


- “ Pre- and paratracheal nodes
- “ Precricoid (Delphian) node
- “ Perithyroid (RLN) nodes
- “ Superior: hyoid bone
- “ Inferior: suprasternal notch
- “ Lateral: CCAs

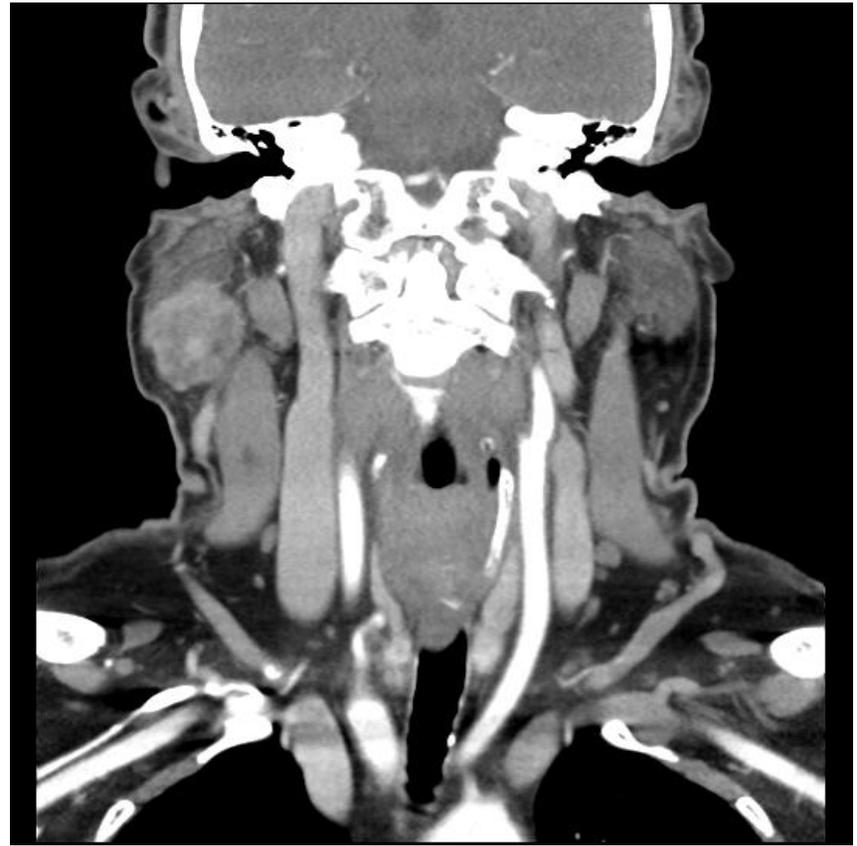
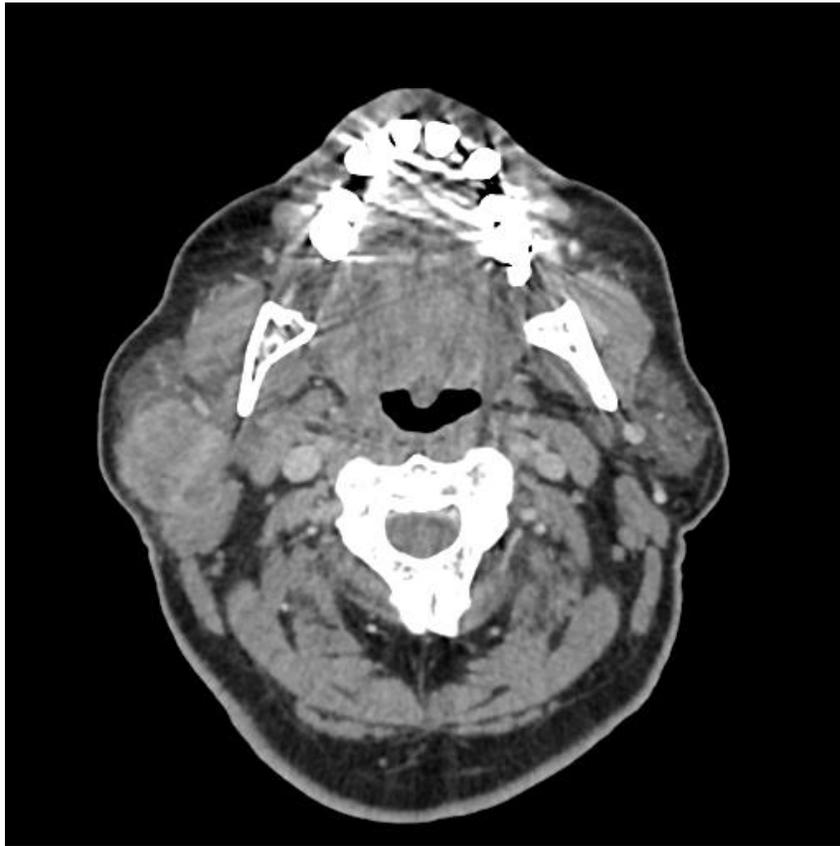
LEVEL VI



LEVEL VII

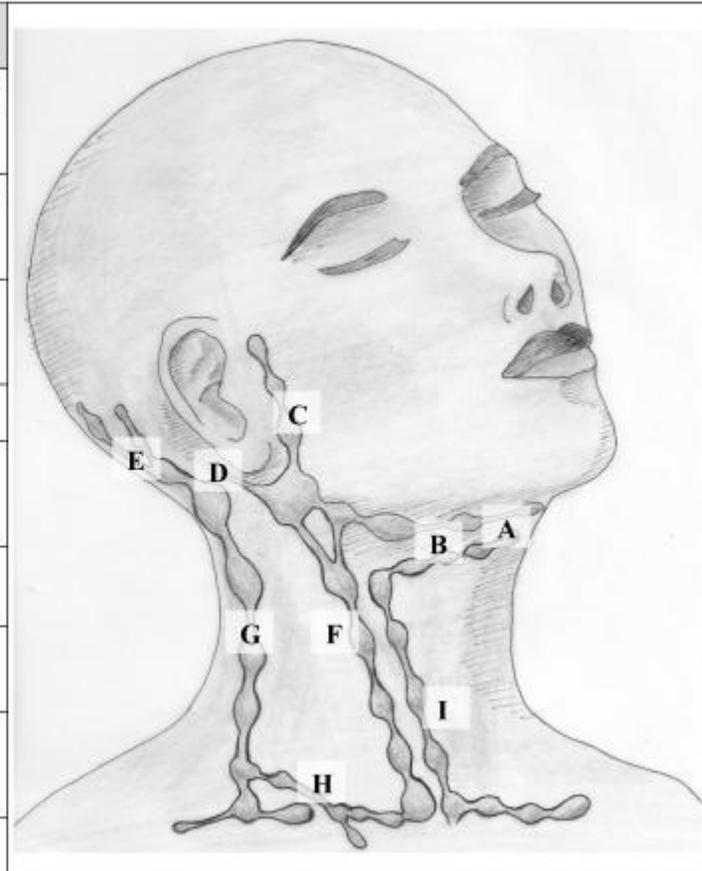


INTRAPAROTID NODE

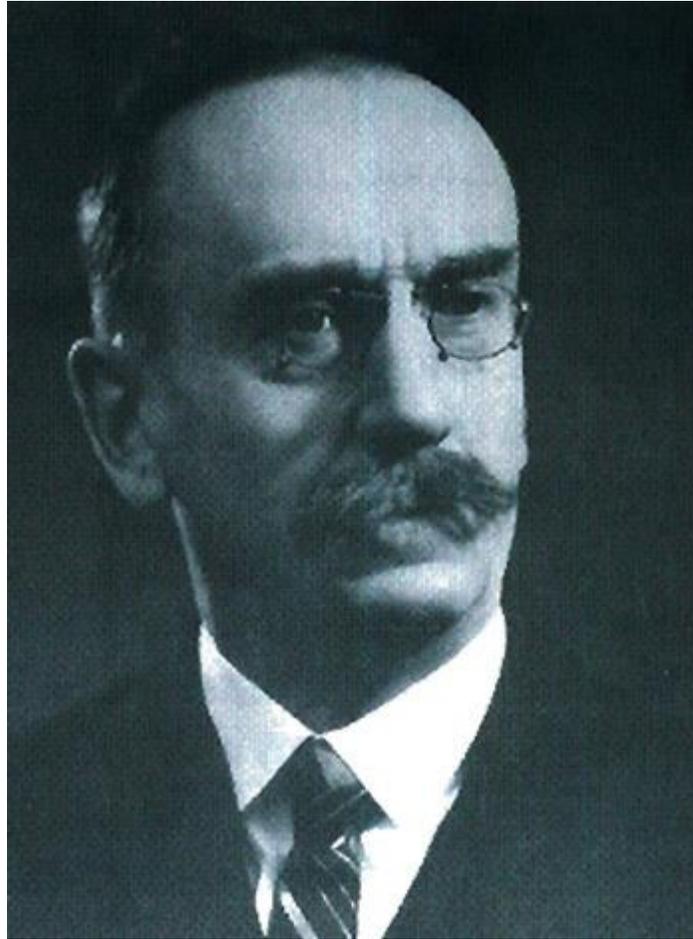


SUBOCCIPITAL NODE

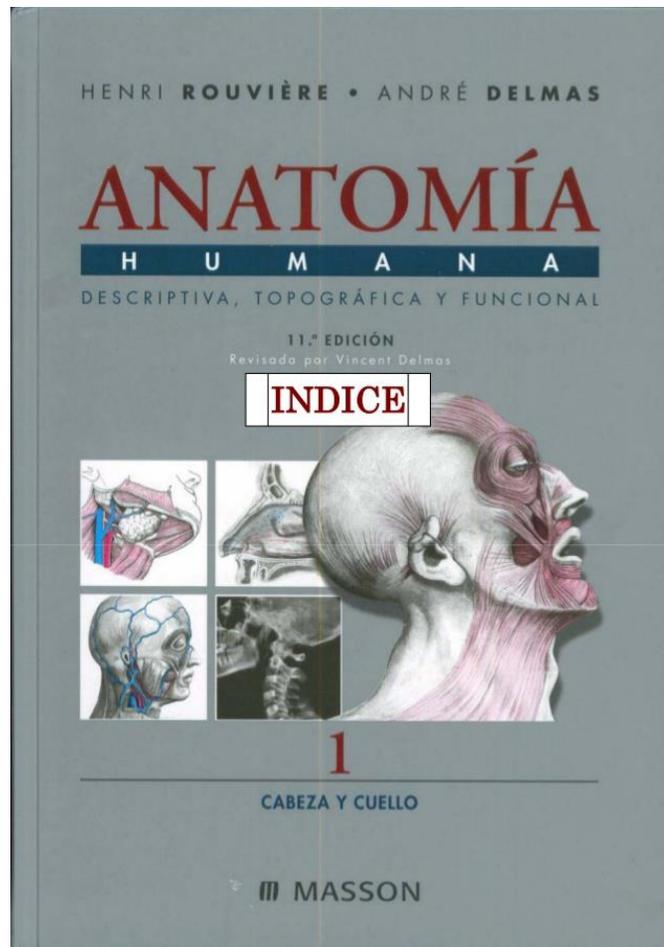
	Region	Drainage areas	Predilection sites for:
A	Submental	Bottom lip, tip of tongue, floor of mouth, skin of cheeks	Infectious processes of the oral cavity, nose, maxillary sinus or the face
B	Submandibular	Tongue, submandibular gland, lips, mouth, conjunctiva	Infectious processes of the oral cavity, nose, maxillary sinus or the face
C	Pre-auricular	Eyelids, conjunctiva, temporal region, parotis, middle ear	Infectious processes of the ears, teeth, lid infections, conjunctivitis
D	Post-auricular	Auditory canal, auricle, scalp	Infectious processes
E	Suboccipital	Scalp, neck	Infectious processes, toxoplasmosis, rubella, lymphomas
F	Jugular	Tongue, tonsils, parotis, auricle	Pharyngitis, rubella, cancer metastases, lymphomas
G	Posterior cervical	Scalp and neck	Tuberculosis, melanomas, lymphomas
H	Supraclavicular	Lungs, esophagus, abdomen (thoracic duct)	Thoracic and retroperitoneal carcinomas, lymphomas, sarcoidosis, tuberculosis
I	Paratracheal	Trachea, thyroid gland	Lesion of the thyroid



Professor of Anatomy & Embryology



Henri Rouviere



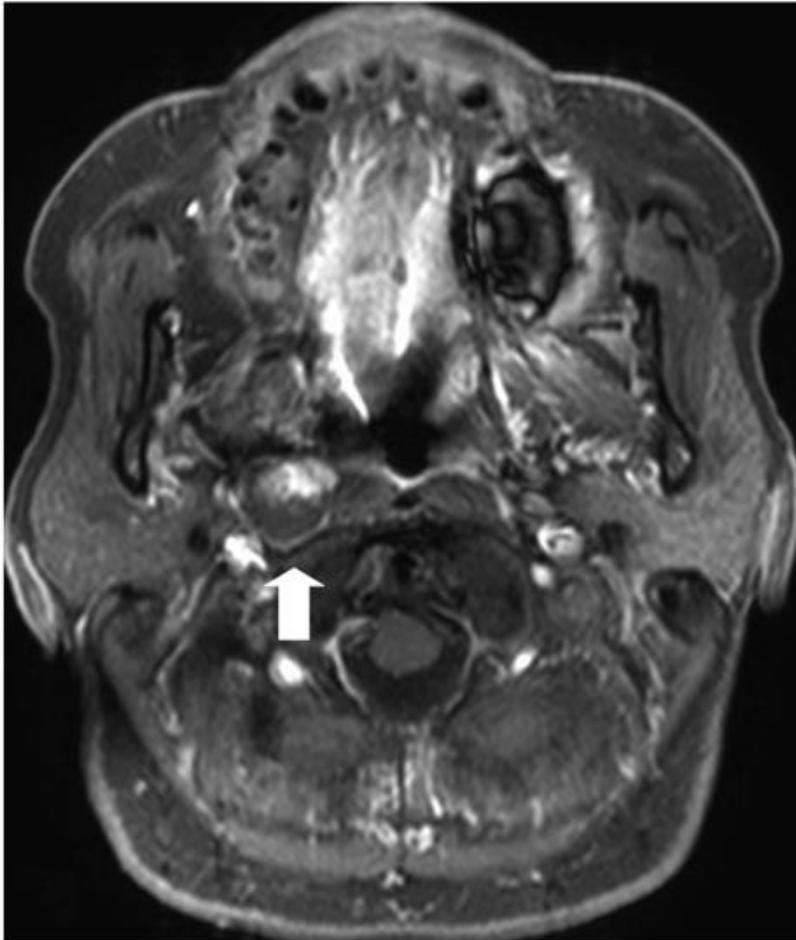
- “ French physician, MD 1903
- “ *Anatomie des Lymphatiques de l'Homme*, 1932
- “ Musée d'Anatomie Delmas-Orfila-Rouviere in Paris
- “ Node of Rouviere: most superior of the lateral group of RPLN

NODE OF ROUVIERE

- “ The lateral RPLNs receive drainage anteriorly via lymphatics draining from the incisive canal and nasal fossa to the soft palate
- “ A posterior route has also been described, which arises along the inner surface of the hard palate leading to the soft palate and on to the lateral nodes
- “ Rouviere discovered crossing of lymphatic vessels along the hard and soft palates in 50% of his specimens, therefore providing an anatomic basis for contralateral spread of nodal disease *
- “ The lateral retropharyngeal lymph nodes lie between the carotid artery and prevertebral muscles.
- “ These are most obvious anterior to the arch of C1, but can be seen to the level of the soft palate.
- “ The uppermost-positioning nodes anterior to the atlas are called as the nodes of Rouvière

* Rouviere H. *Anatomy of the Human Lymphatic System. English Edition.* Ann Arbor, Mich: Edwards Brothers;1938 :16. 18

NODE OF ROUVIERE



THYROID CA



NASOPHARYNGEAL CA

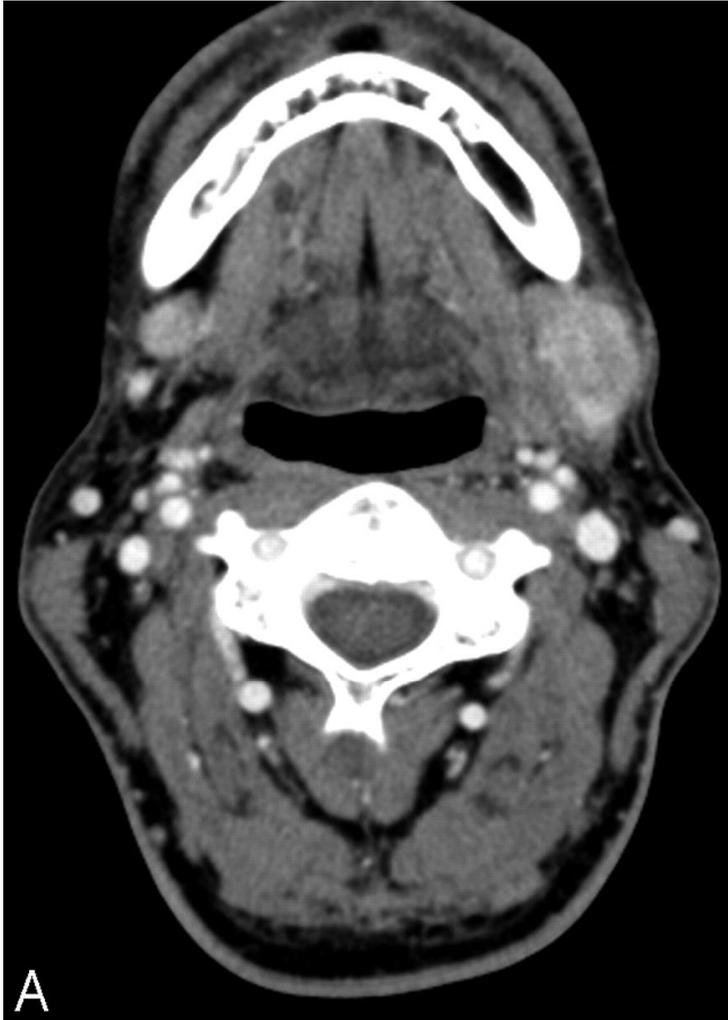
A, Axial T2 MR imaging at the level of the hard palate shows an enlarged right lateral retropharyngeal lymph node (asterisk).



L.V. Zollinger et al. AJNR Am J Neuroradiol 2008;29:1561-1563



A, Axial contrast-enhanced CT through the level of the mandible demonstrates bilateral enhancing masses within the submandibular glands.



L.V. Zollinger et al. AJNR Am J Neuroradiol 2008;29:1561-1563



NODE OF ROUVIERE

Can Rouviere's lymph nodes in non-malignant subjects be identified with MRI? *

- " Axial MR images which had been taken for the last 3 years
- " A total of 90 patients (86 adults and 4 children) with a variety of diseases except for malignancies were selected.
- " All 4 children showed Rouvière's nodes bilaterally, while only 5 of 86 adults (5.8%) depicted them
- " The lymph nodes were identified as isointense masses as nasopharyngeal lymphoid tissues (adenoids), when presented, with the size ranged from 4 to 13 mm. The nodes with a diameter of 5 mm or more were easily identified particularly with T2-weighted images
- " The benign reactive adenopathy appeared indistinguishable from that demonstrated in patients with malignant tumors in the head and neck

* Ichimura K. Auris Nasus Larynx. 1993;20(2):117-23.

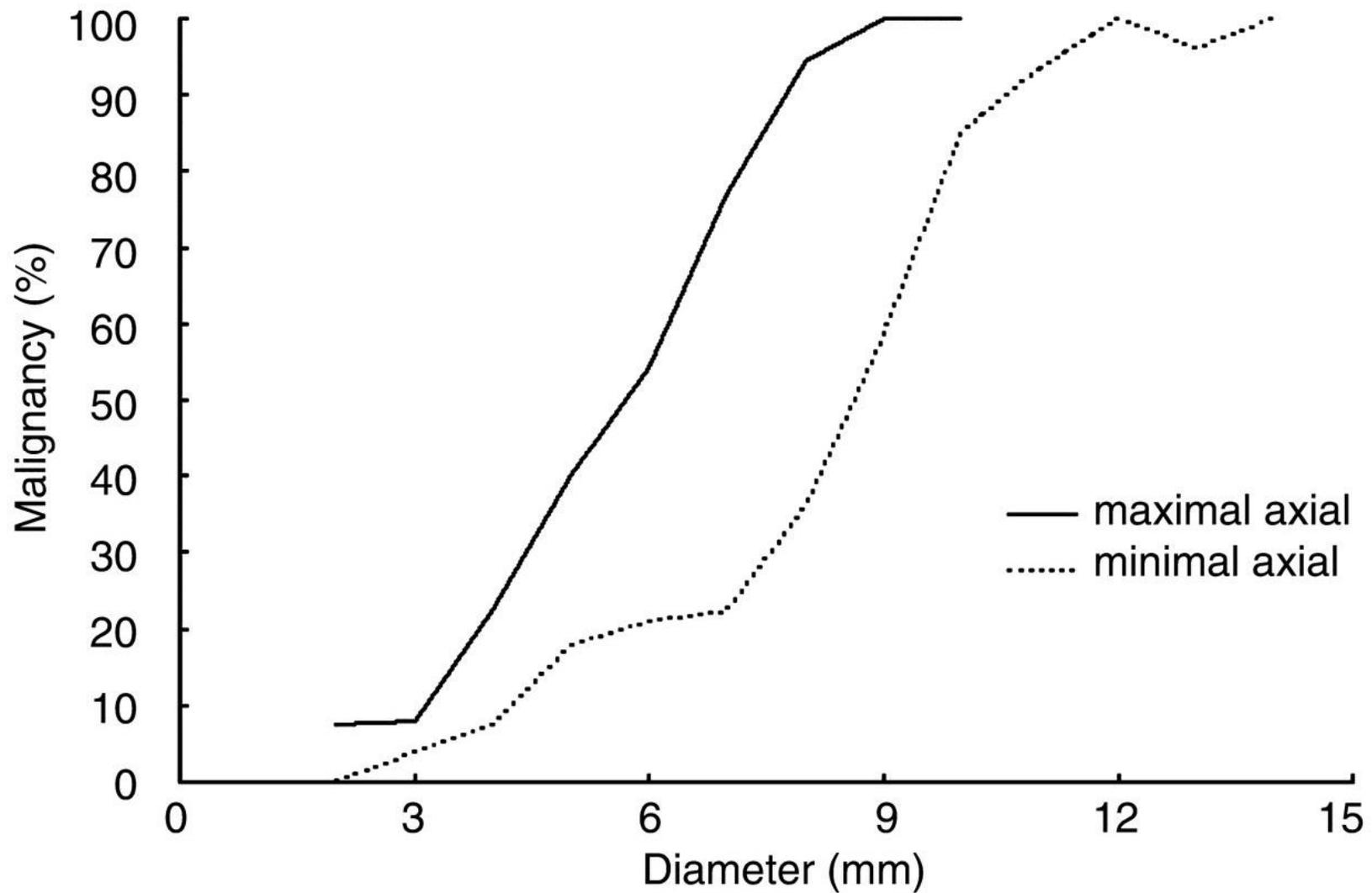


Radiologic Criteria of Retropharyngeal Lymph Node Metastasis in Nasopharyngeal Carcinoma Treated with Radiation Therapy 1. Zhang et al.

Radiology Vol. 255, No. 2: 605-612

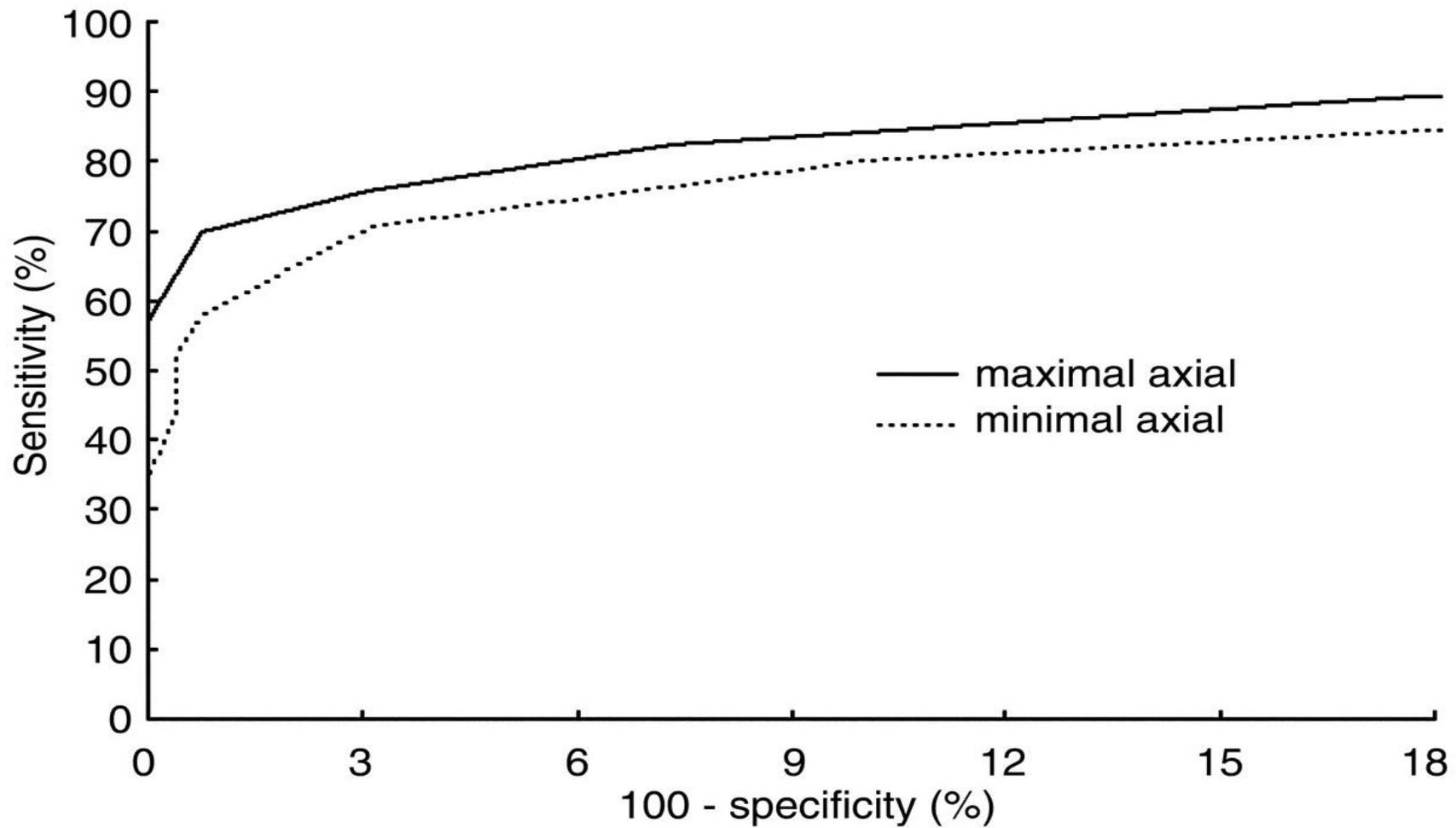


Radiologic Criteria of Retropharyngeal Lymph Node Metastasis in Nasopharyngeal Carcinoma Treated with Radiation Therapy 1. Zhnag et al.
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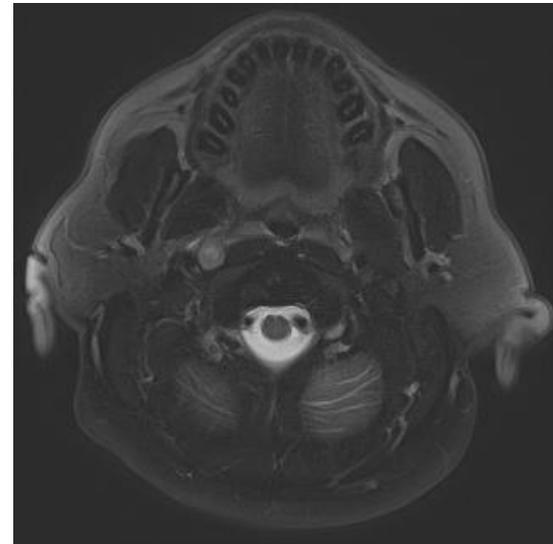
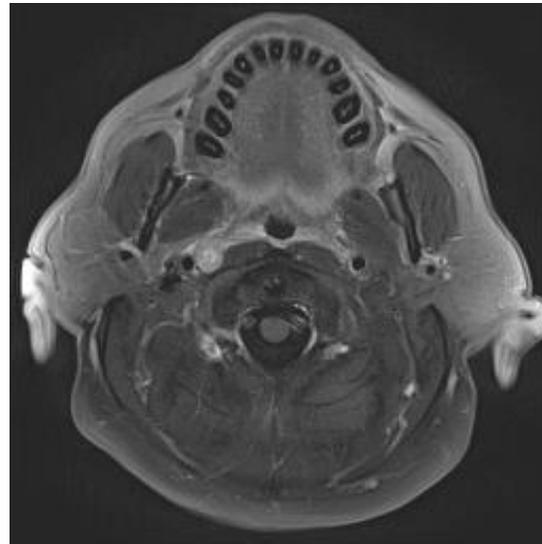
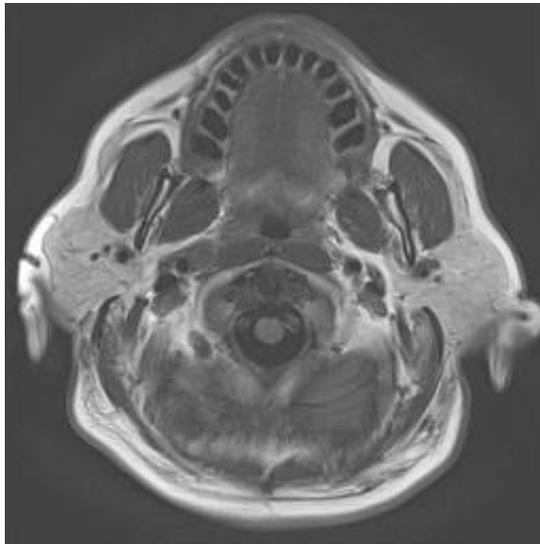
"Radiologic Criteria of Retropharyngeal Lymph Node Metastasis in Nasopharyngeal Carcinoma Treated with Radiation Therapy 1 "

Zhang et al. Radiology Vol. 255, No. 2: 605-612

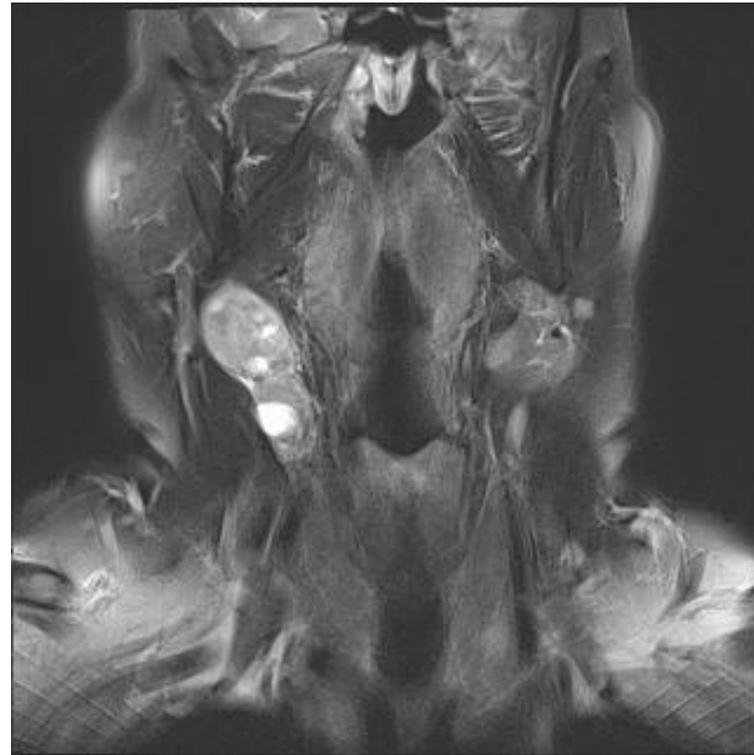
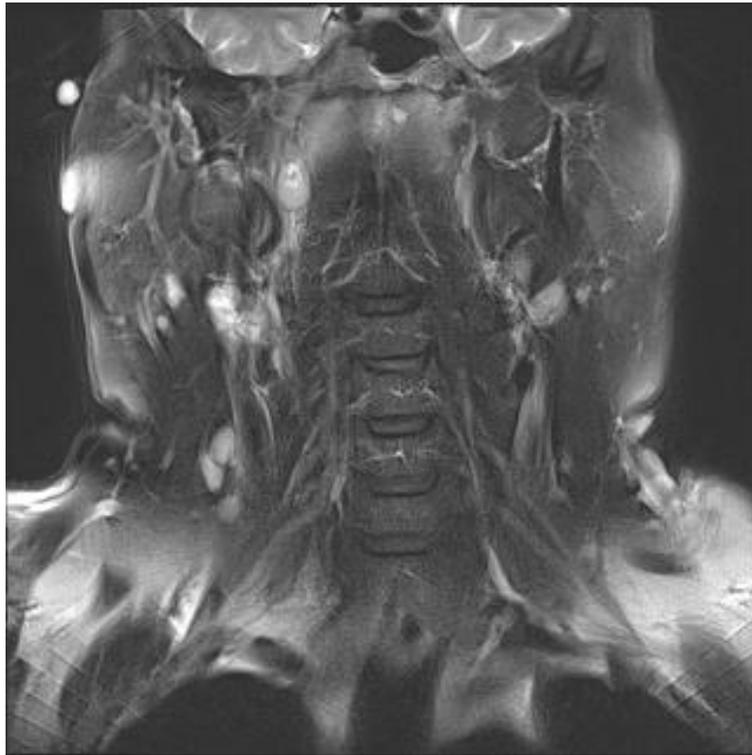


ROC curves show relationship between sensitivity and specificity of different size criteria of lateral RLNs. Minimal axial diameter is the more valid criterion because the AUC for it is larger than the AUC for maximal axial diameter. High specificity (x-axis) is caused by enormous number of true-negative lymph nodes for all sizes.

NODE OF ROUVIERE



NODE OF ROUVIERE



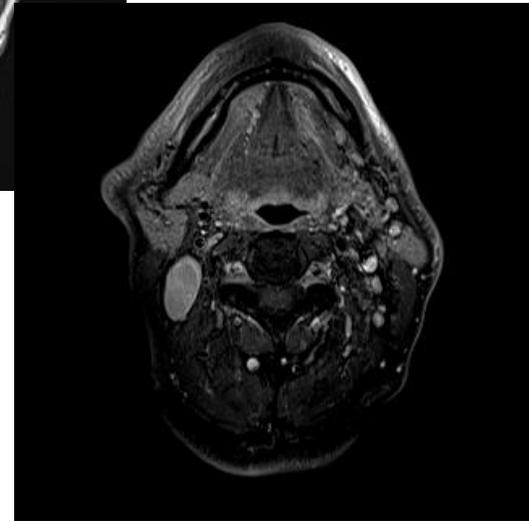
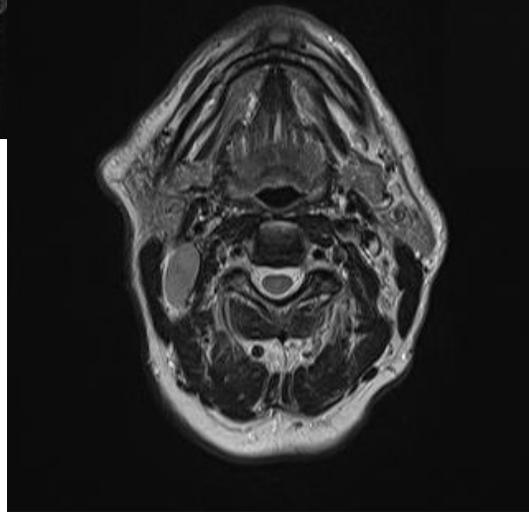
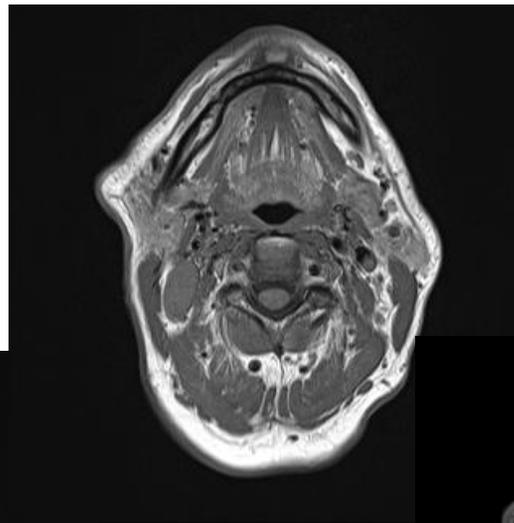
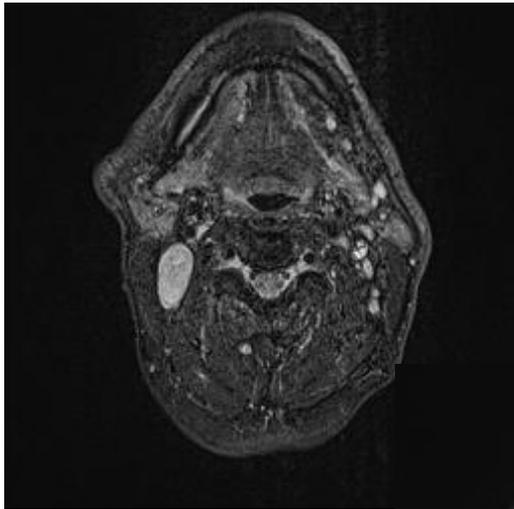
RLN RADIOLOGIC CRITERIA

- “ Best size criterion: minimal axial diameter of 6 mm or larger
 - . accuracy of 87.5%
 - . The PPV of this criterion was 91.9% (217 of 236), and the NPV was 83.9% (240 of 286)
 - . The maximal axial diameter of RLNs was used to assess metastasis in studies .
 - . maximal axial diameter was not as useful as the minimal axial diameter in the prediction of tumor-positive RLNs; the more useful size criterion for the diagnosis of RLN metastases was the minimal axial diameter, in accordance with the results of a study in cervical nodes reported by Van den Brekel et al (15). The radiologic criterion of a minimal axial diameter of 5 mm or larger, which was often used to assess RLN involvement, was inferior to the criterion of the minimal axial diameter of 6 mm or larger for the diagnosis of RLN metastases.
- “ Central necrosis is another reliable indicator
 - . specificity of 100%
 - . However, central necrosis is usually not visible in small lymph nodes (only three (1.1%) of 264 metastatic RLNs had a minimal axial diameter of less than 6 mm in this series)
- “ Grouping of three or more borderline (minimal axial diameter of 1.2 mm smaller) cervical nodes is always suggestive of a metastasis

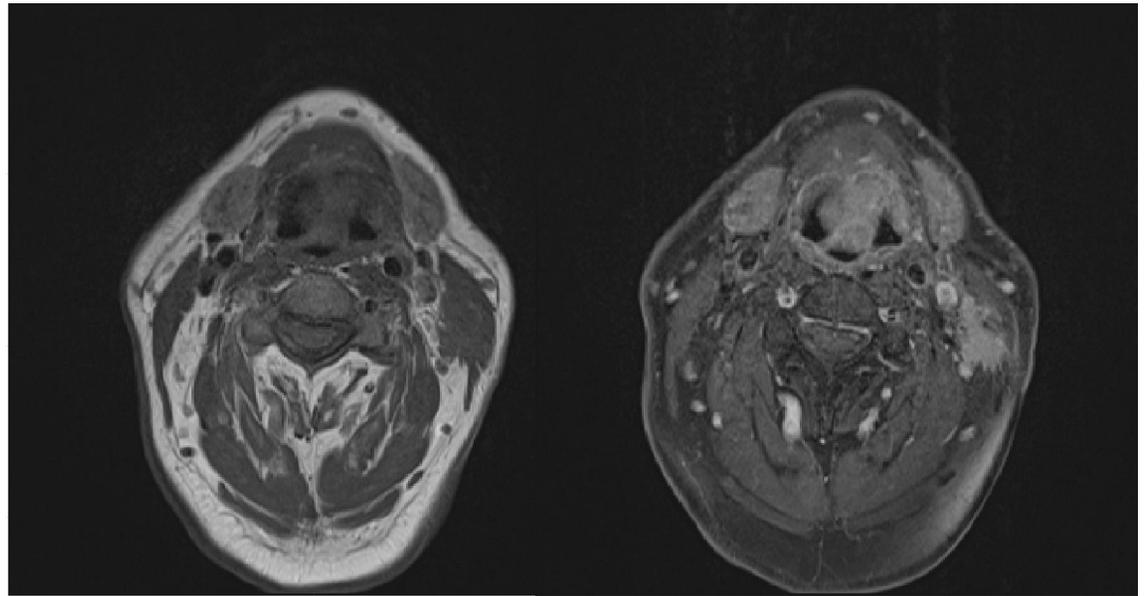
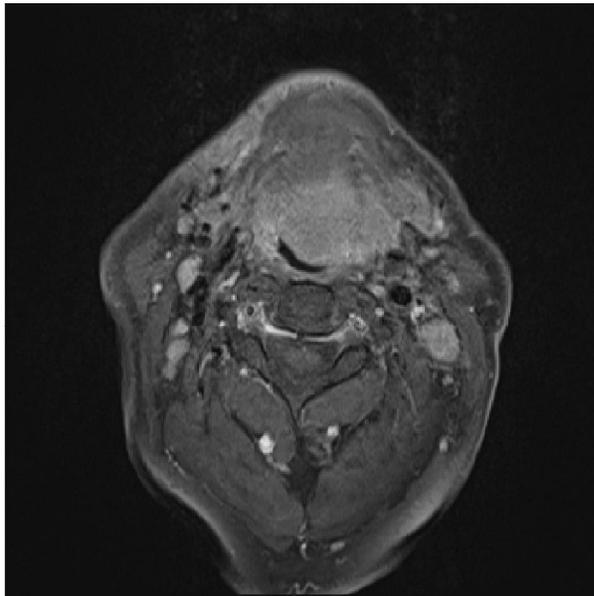
CONCLUSION

- “ nodes with a minimal axial diameter of 6 mm or larger,
- “ any nodes with central necrosis,
- “ any finding of groups of two or more RLNs, and
- “ any medial RLNs.

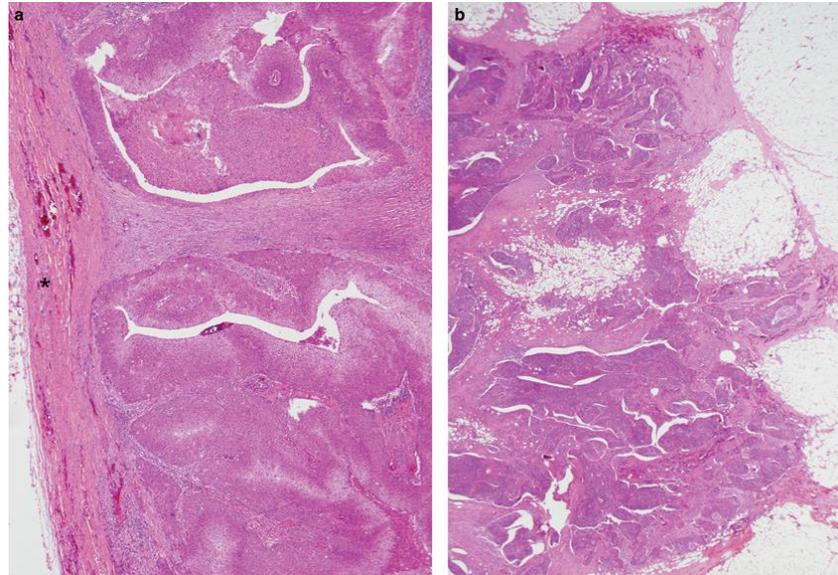
Encapsulated node



EXTRACAPSULAR SPREAD



EXTRACAPSULAR SPREAD



ECE grade	0	1	2	3	4
Illustration					
Description	Tumor confined to the substance of the lymph node (surrounded by lymphoid tissue)	Tumor reaching the capsule of the lymph node (no intervening lymphoid tissue) and with thickening of overlying capsule.	Tumor in perinodal tissue but extending ≤ 1 mm beyond the lymph node capsule.	Tumor in perinodal tissue and extending > 1 mm beyond the lymph node capsule.	Soft tissue metastasis. Tumor mass without residual nodal tissue or architecture (no germinal centers or subcapsular sinus).

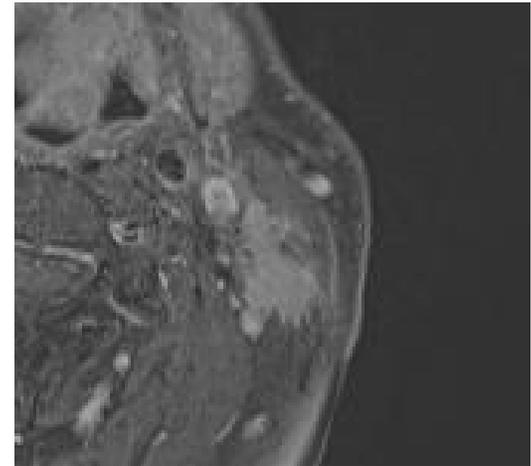
Extracapsular extension is a poor predictor of disease recurrence in surgically treated oropharyngeal squamous cell carcinoma

James S Lewis Jr, Danielle H Carpenter, Wade L Thorstad, Qin Zhang and Bruce H Haughey. Mod Pathol. 2011 Nov; 24(11): 1413. 1420.

EXTRACAPSULAR SPREAD

Extracapsular extension is a poor predictor of disease recurrence in surgically treated oropharyngeal squamous cell carcinoma*

- “ Extracapsular extension in SCC nodal metastases usually predicts worse outcome.
- “ However, there are no standard histologic grading criteria.
- “ Correlated grades with outcomes while controlling for p16 status.
- “ 101 cases, for which p16 was positive in 90 (89%). Extracapsular extension grades did not correlate with nodal size ($P=0.28$) or p16 status ($P=0.8$)



EXTRACAPSULAR SPREAD

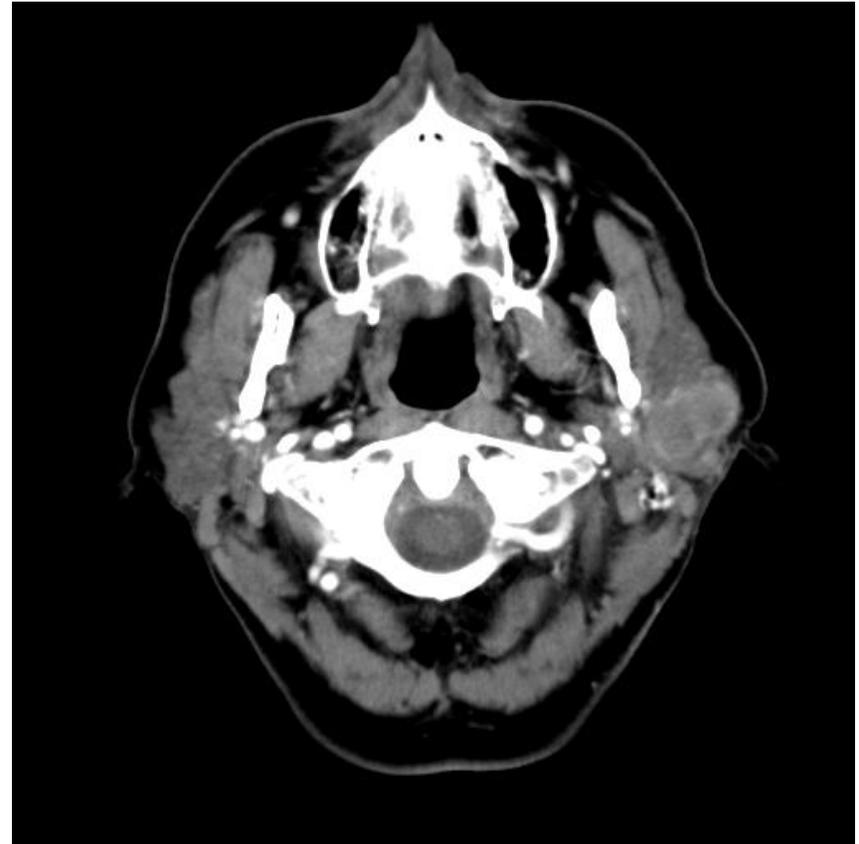
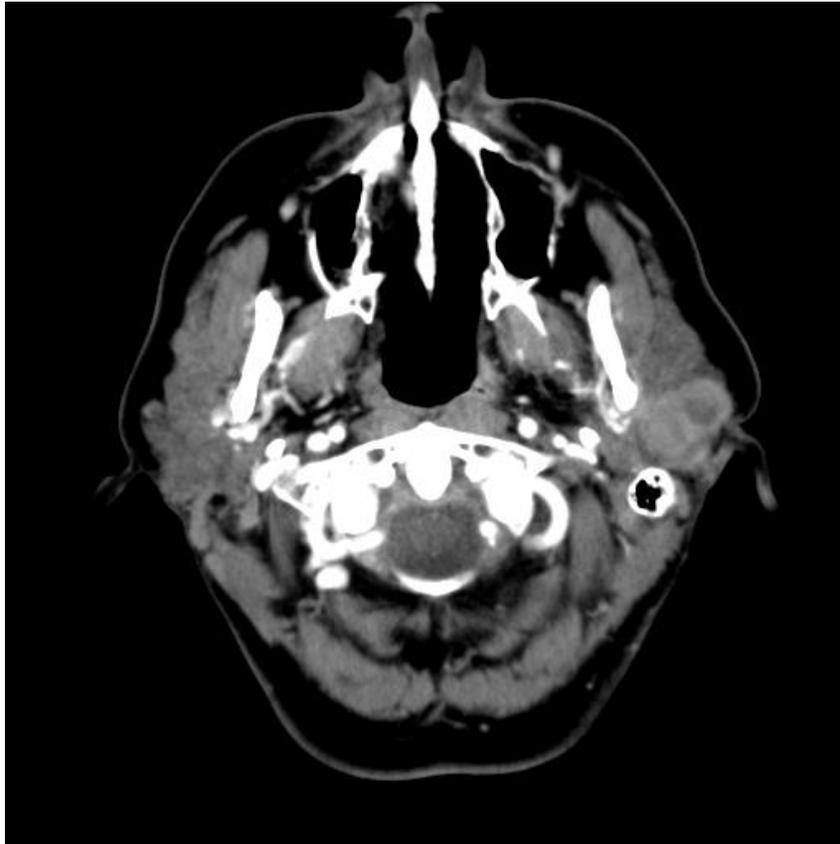
ECE grade	0	1	2	3	4
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Take home points

- “ the size of the lymph node metastases did not correlate with presence or absence of extracapsular extension.
- “ grade 4 extracapsular extension, correlates with disease recurrence, but not very strongly. Seven of the 37 patients (19%) with grade 4 extracapsular extension recurred.
- “ grade 4 extracapsular extension correlated strongly with higher T-stage
- “ patients that had either no extracapsular extension (grades 0 or 1) or even bonafide extracapsular extension, but still with residual nodal architecture present (grades 2 or 3), had a very low rate of recurrent disease (3/64 or 5%).
- “ only extracapsular extension grade 4, regardless of p16 status, put patients at higher risk of recurrence. However, this correlation was not statistically significant when controlling for tumor T-stage.

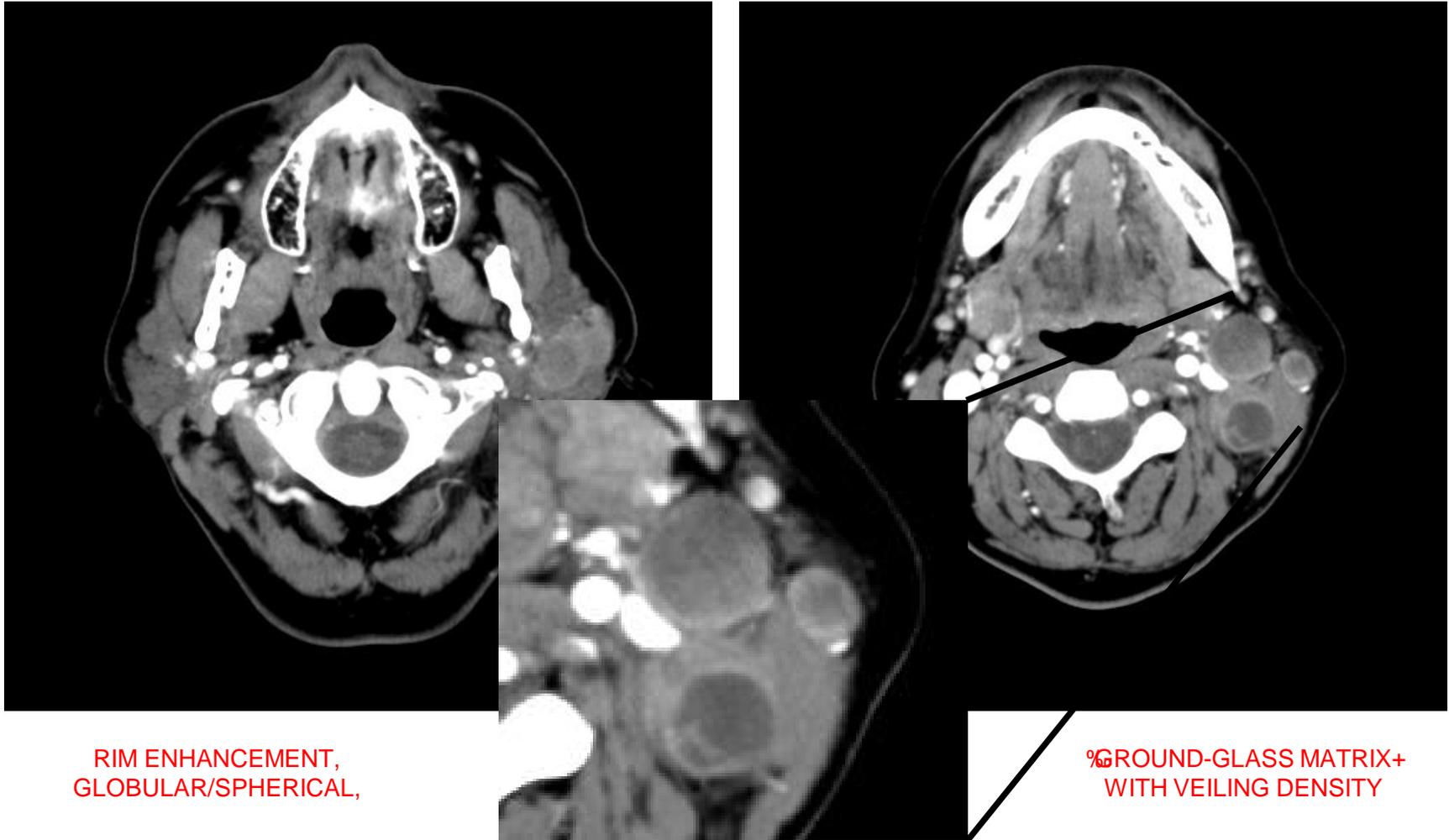
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PAROTID AND PERI-PAROTID

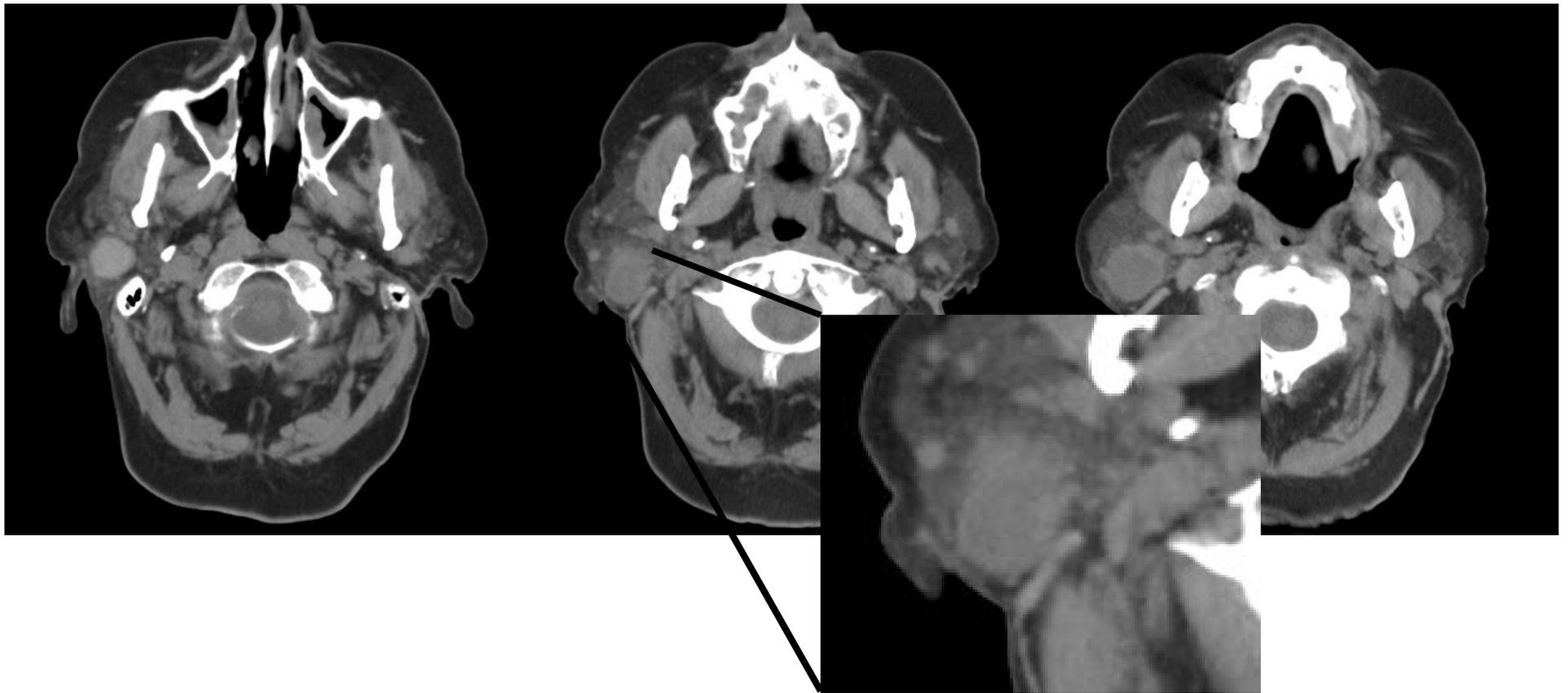


PRIMARY ANGIOSARCOMA OF PAROTID

PAROTID AND PERI-PAROTID

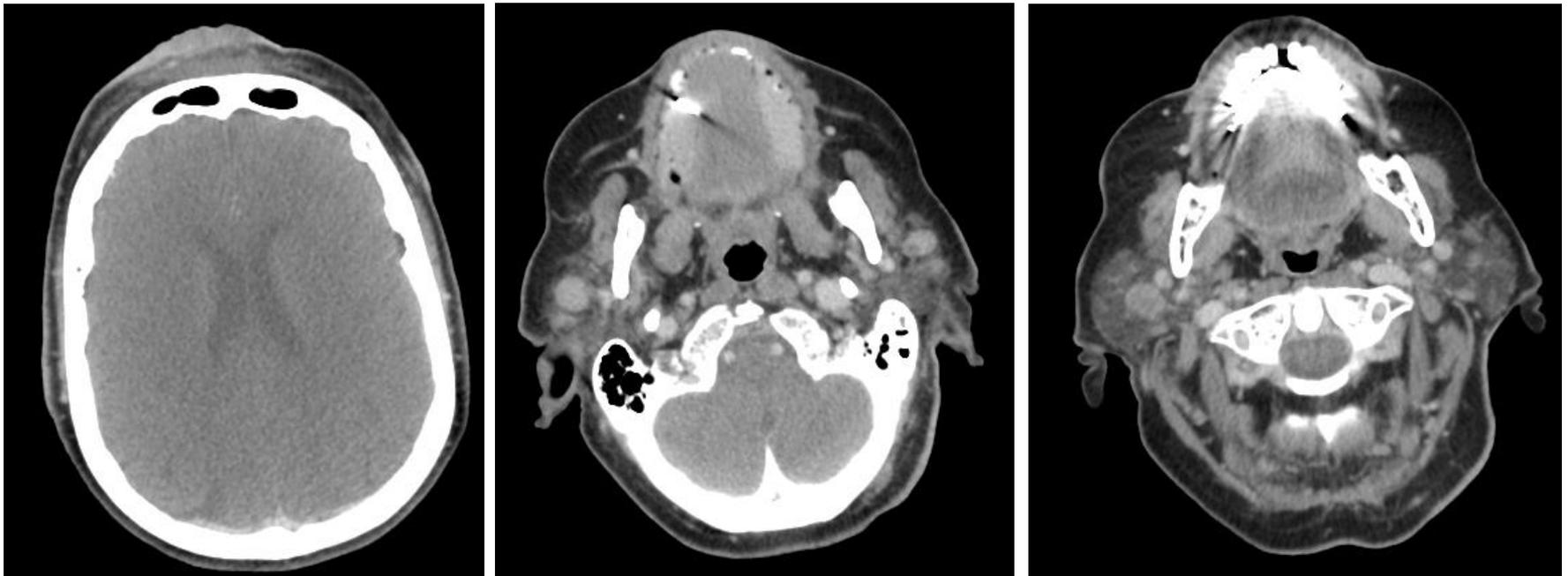


PAROTID AND PERIPAROTID



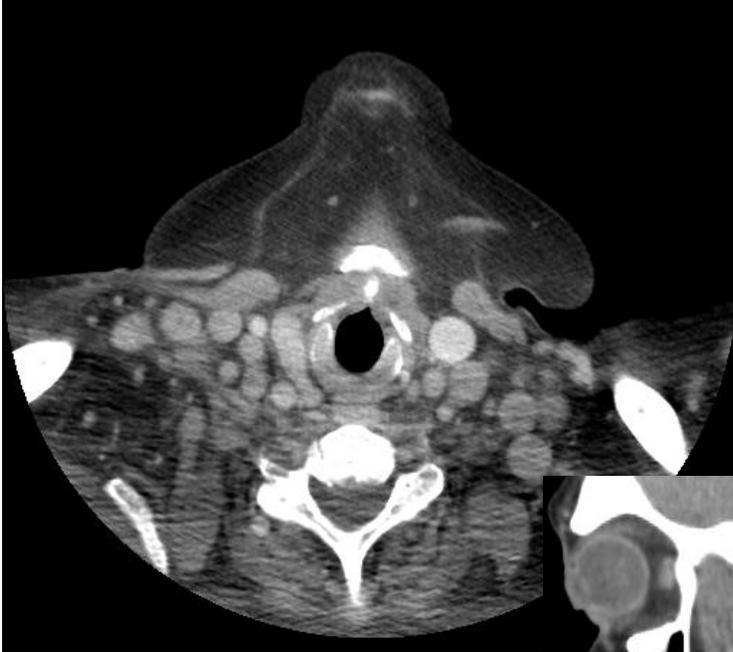
METASTATIC BASAL CELL

PAROTID AND PERIPAROTID

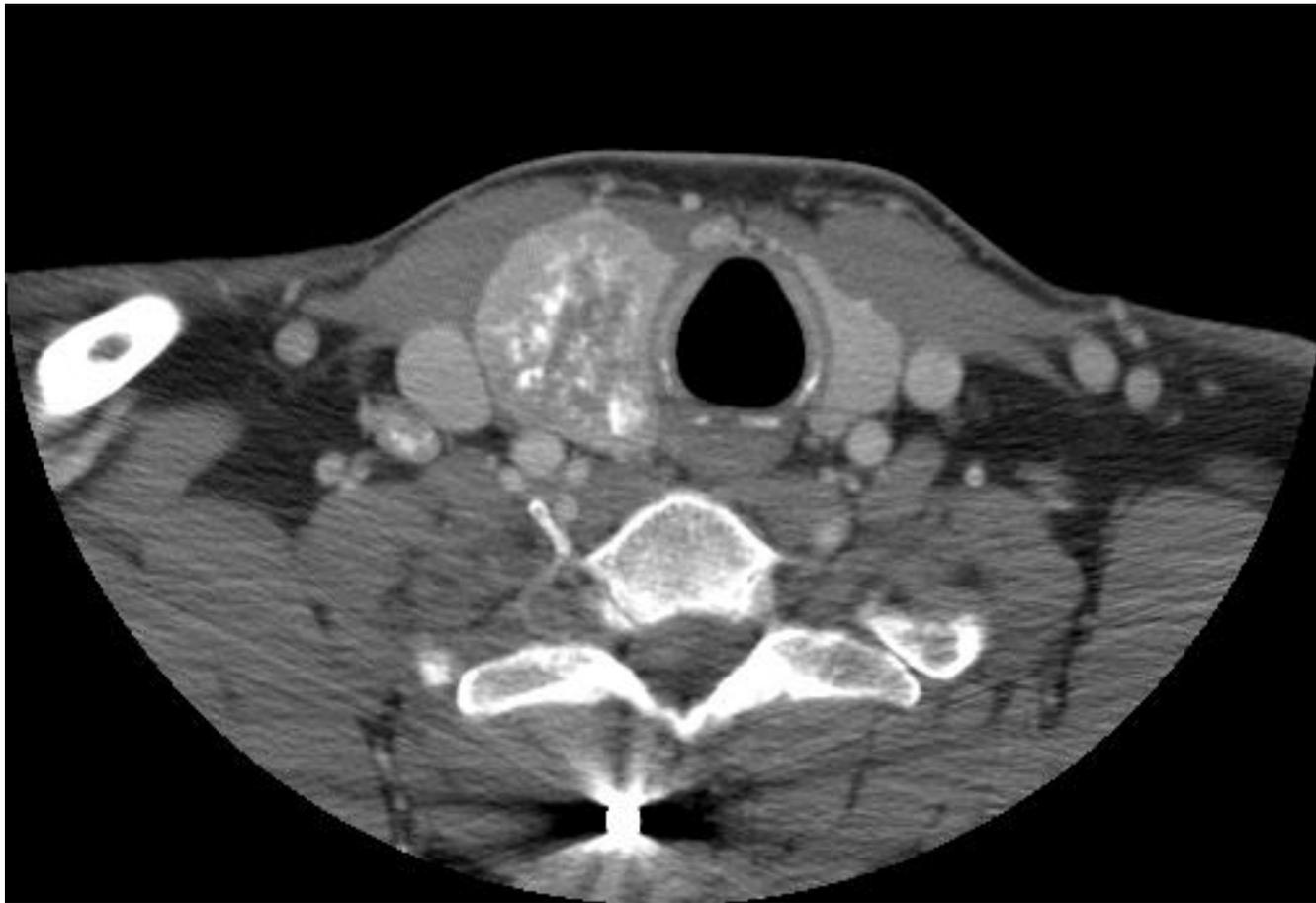


MYCOSIS FUNGOIDES

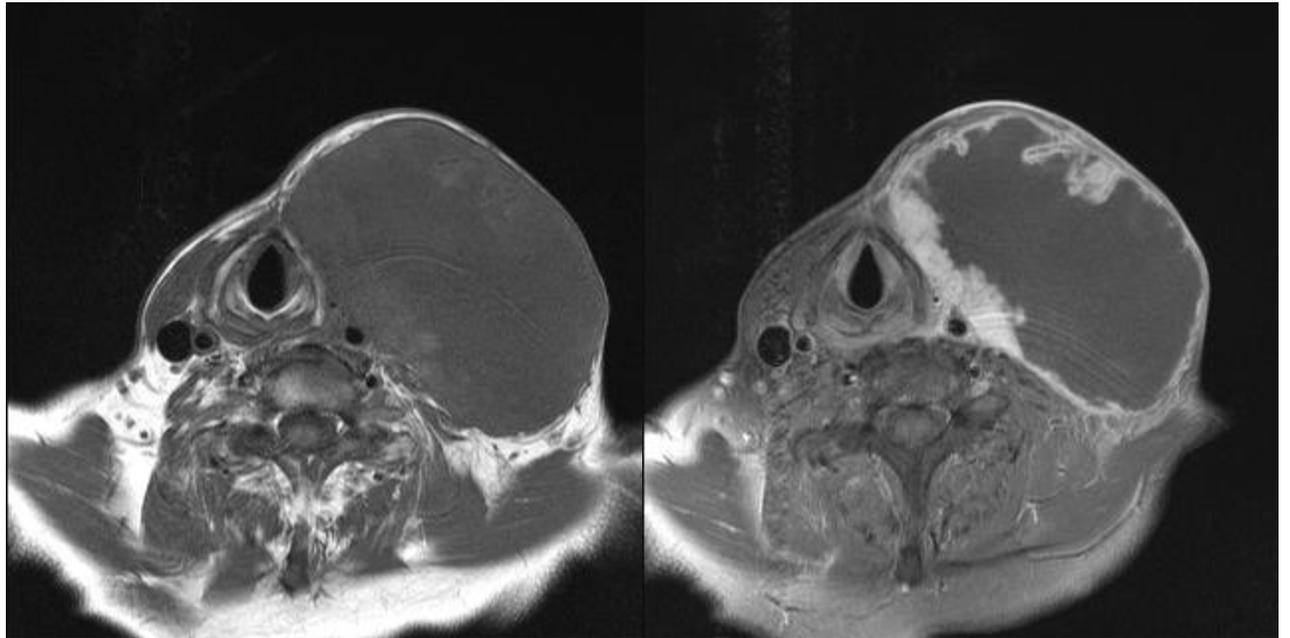
LYMPHOMA



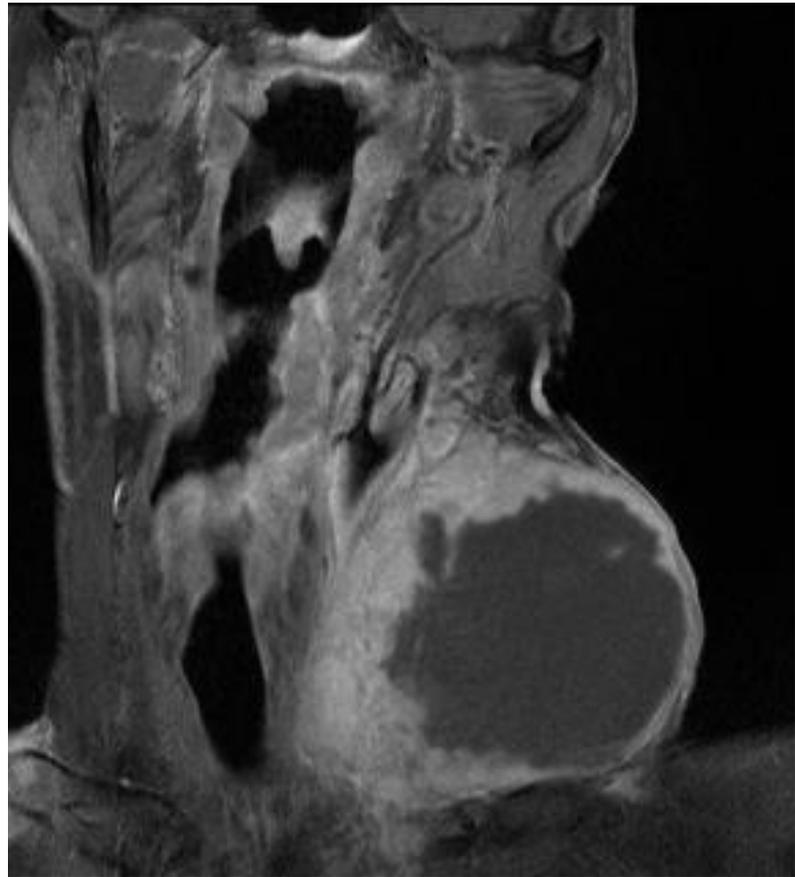
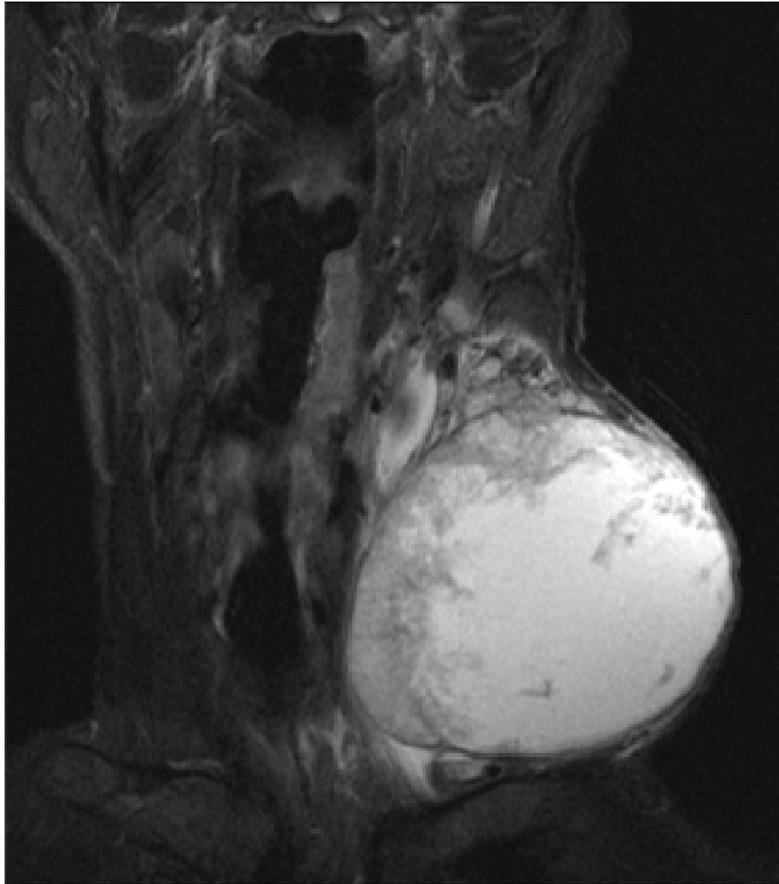
MEDULLARY THYROID CA



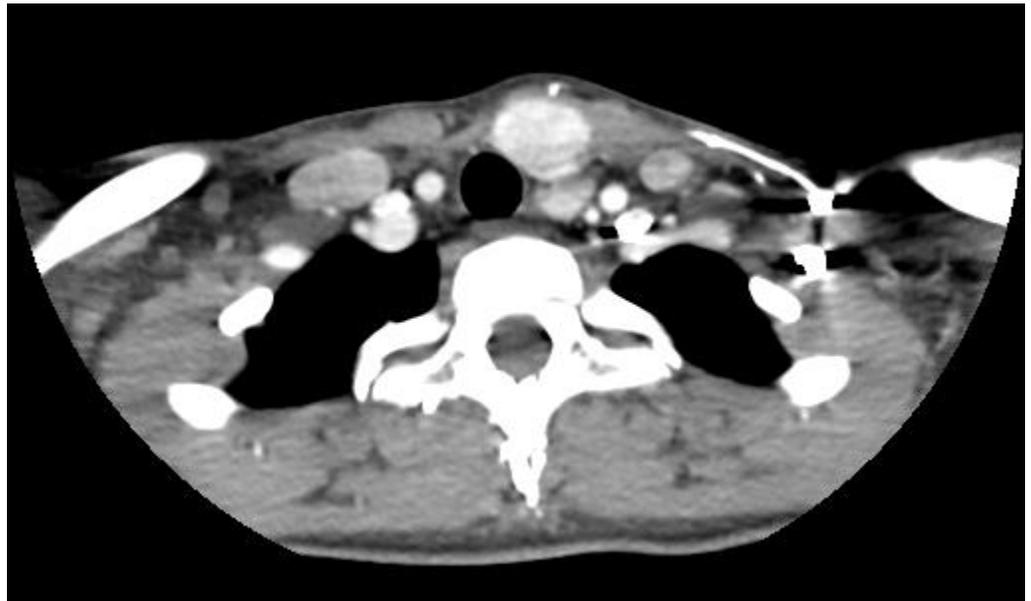
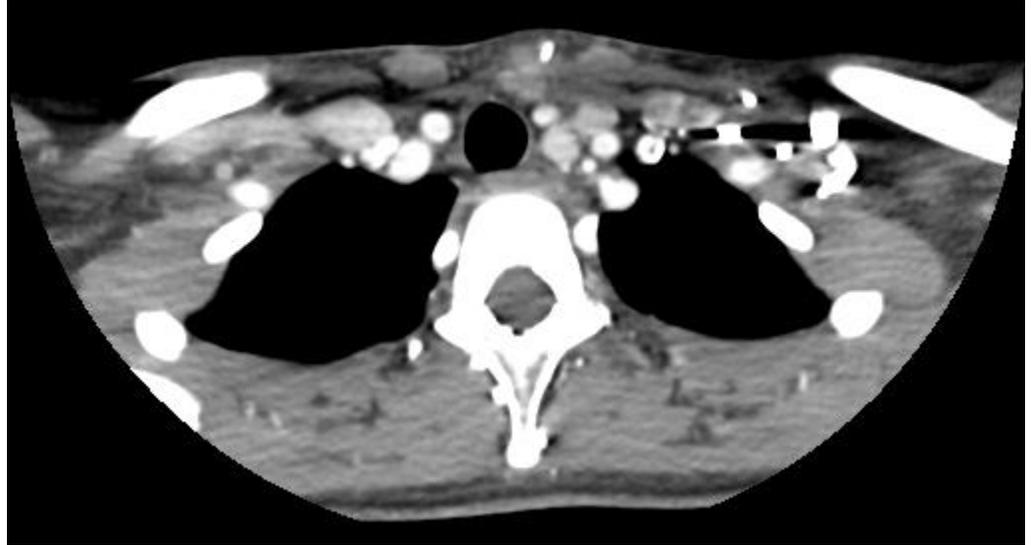
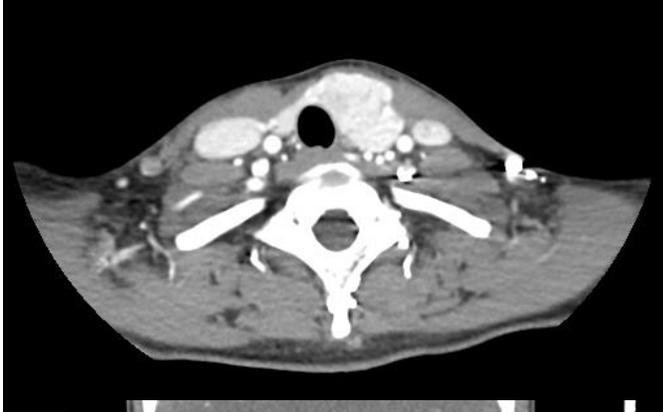
OROPHARYNX SCC



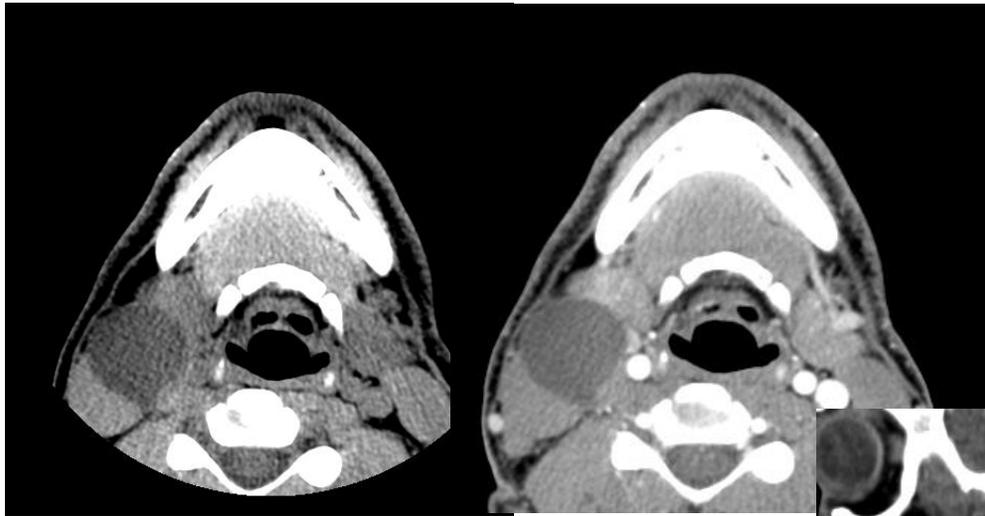
OROPHARYNX SCC



THYROID CA



LYMPH NODE MIMICS



2ND BRANCHIAL
CLEFT CYST

HOW WELL DOES MRI PREDICT THE PRESENCE OF NECK DISEASE IN SQUAMOUS CANCER OF HEAD AND NECK?

- “ MRI in patients with head and neck cancer may trigger surgery that is associated with a significant morbidity
- “ 24 patients, Eligible patients had a squamous cell CA, underwent a MRI scan and neck surgery within 100 days of scan
- “ 71% of MRI suggested nodal disease. 8% were equivocal and 21% negative
- “ MRI stated necrosis in 88% and extracapsular extension (ECE) in 8%.

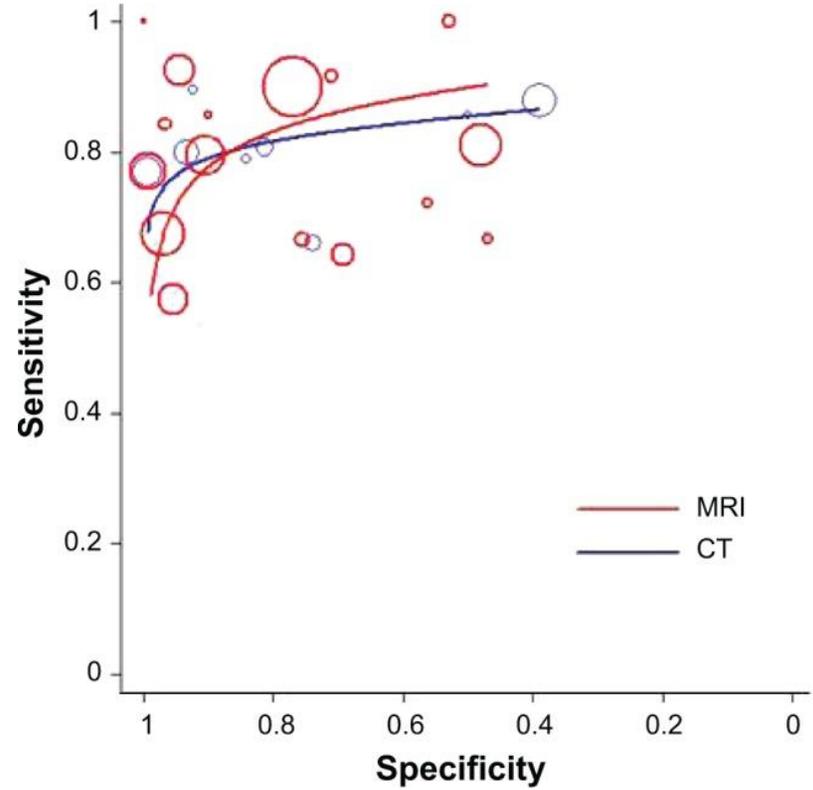
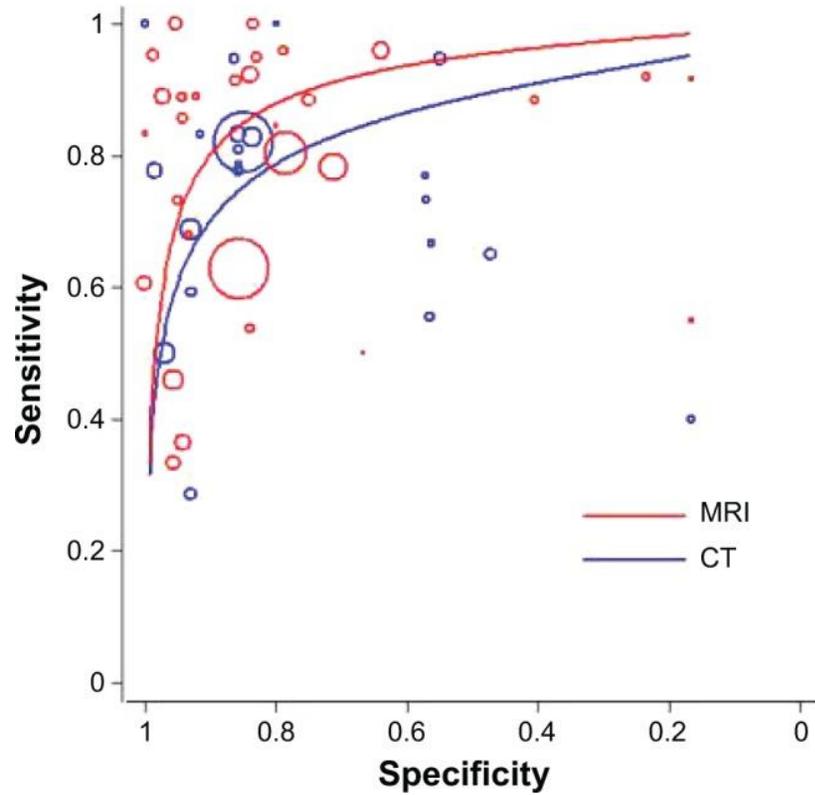
HOW WELL DOES MRI PREDICT THE PRESENCE OF NECK DISEASE IN SQUAMOUS CANCER OF HEAD AND NECK?

Extracapsular extension (% reported in LN positive case)	12%	83%
Necrotic feature	88%	21%
Number of LN(s) stated	83%	88%

Number of cases	Pathology - Positive	Pathology - Negative
MRI - Positive	12	5
MRI - Negative/equivocal	0	7

The specificity of MRI neck for detecting P+ LN was 58% whereas sensitivity was 100%

MRI VS CT



[Onco Targets Ther. 2015; 8: 1291. 1313](#)

CT vs MRI vs PET CT IN RLN*

- “ MRI no obvious advantage over CT
- “ PET-CT markedly inferior to CT and MRI
 - . Maximum diameter < 1.0 cm
 - . Metastatic RLN with necrosis or maximum diameter < 0.5 cm cannot be detected
- “ Setting the maximum diameter of ≥ 0.4 cm as diagnosis criterion for CT or MRI is reasonable

* Evaluation of CT, MRI and PET-CT in detecting retropharyngeal lymph node metastasis in nasopharyngeal carcinoma. Su Y, Zhao C, Xie CM, Lu LX, Sun Y, Han F, Wu HB, Cui NJ, Zeng ZY, Lu TX. Ai Zheng. 2006 May;25(5):521-5