

Pediatric Head and Neck Imaging

Overview



JOHNS HOPKINS
M E D I C I N E

Overview

- Congenital and acquired cysts
- Vascular malformations
- Solid tumors

Head and Neck Cysts in Children

- **Congenital**

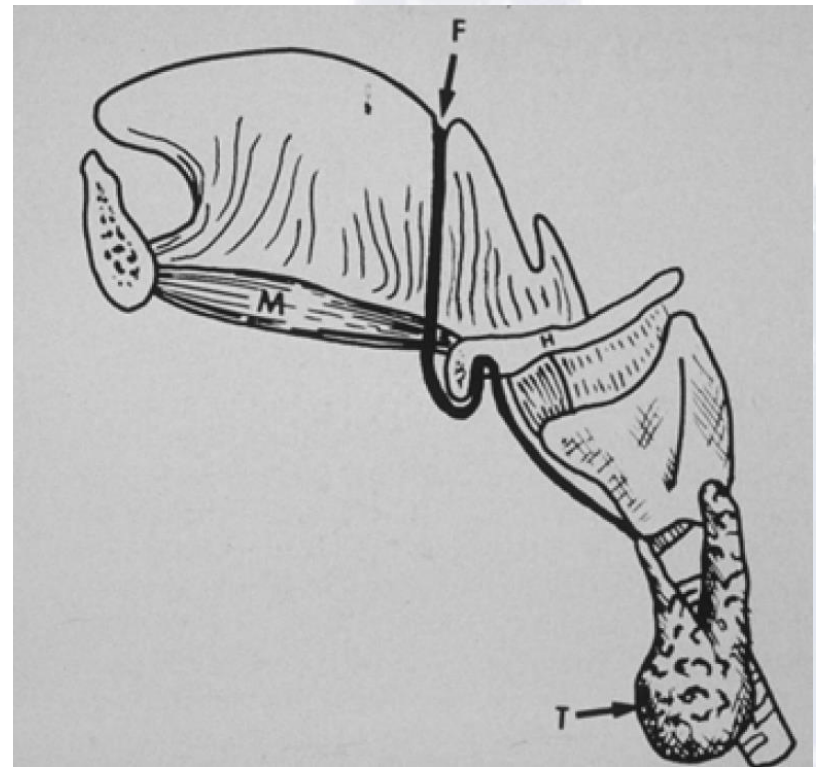
- Thyroglossal duct cyst
- Branchial remnant
- Lymphatic malformation
- Thymic cyst
- Dermoid
- Foregut duplication cyst

- **Acquired**

- Ranula
- Thyroid
- Parathyroid
- Laryngocele
- Glandular cysts

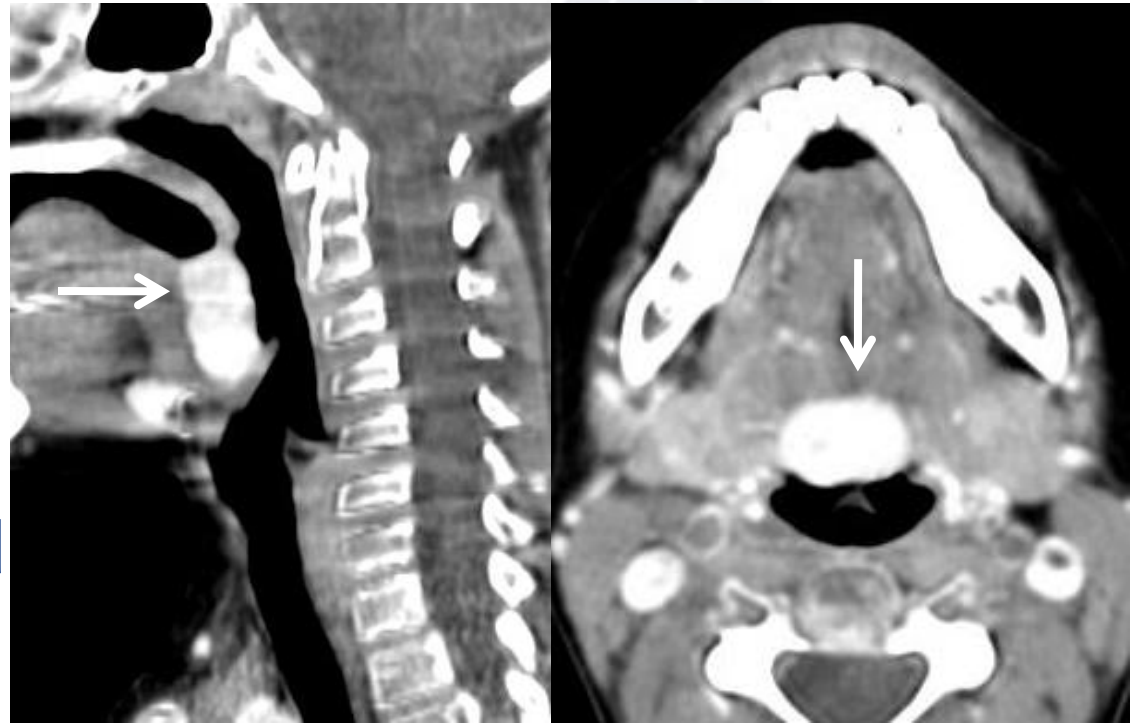
Thyroid Anomalies

- Ectopic Thyroid
- Thyroglossal duct cyst

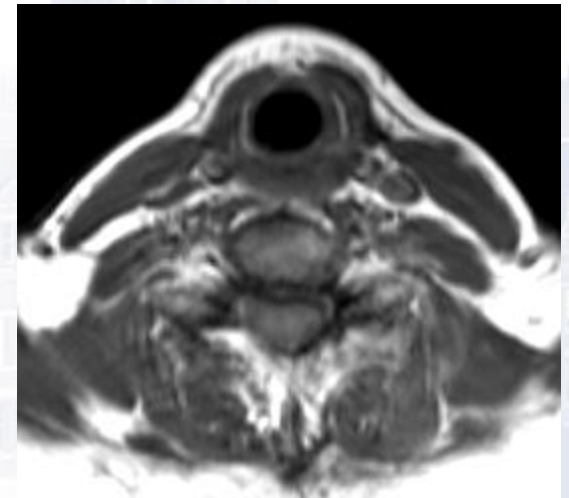
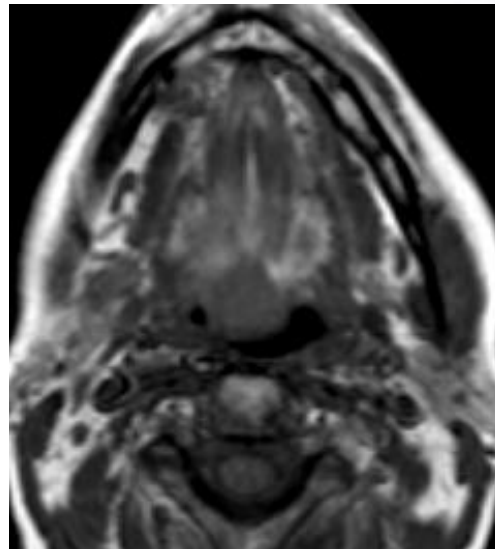
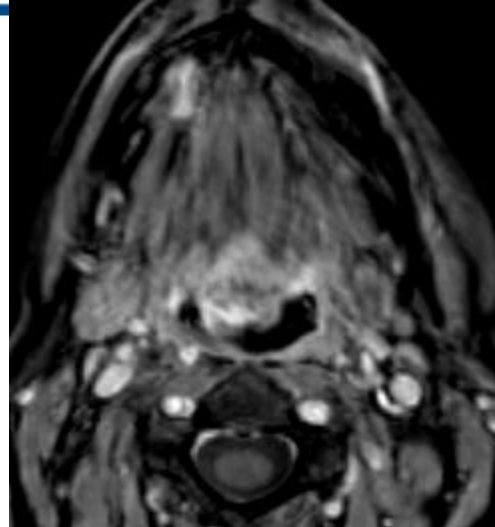
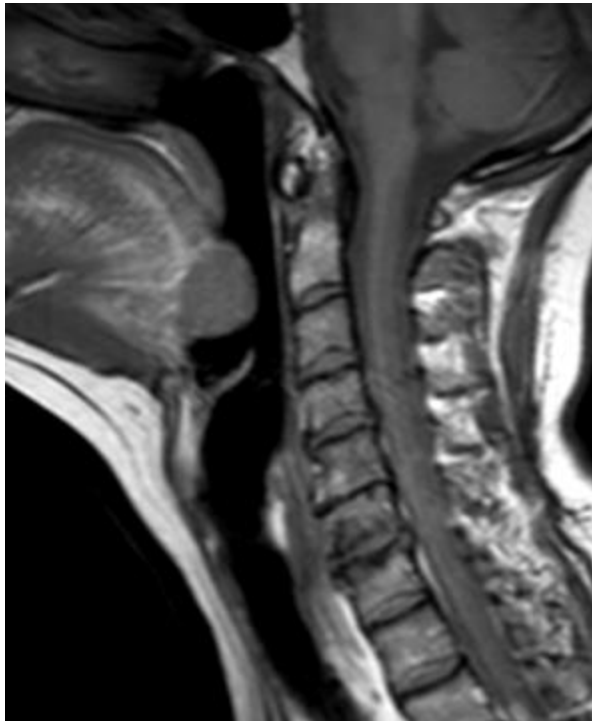


Lingual Thyroid

- Midline BOT mass
- Hyperdense
- Avid enhancement
- Only thyroid tissue in about 80%
- Subject to all thyroid diseases

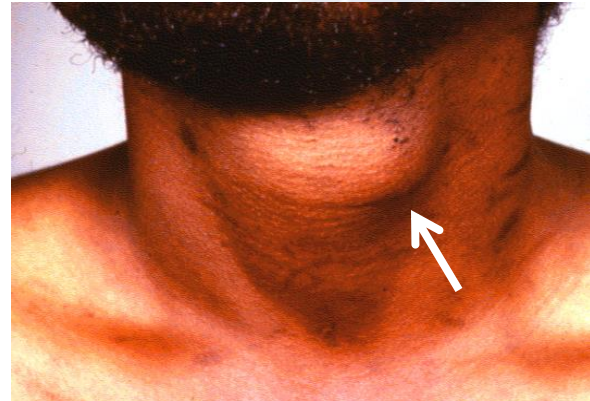


Lingual Thyroid

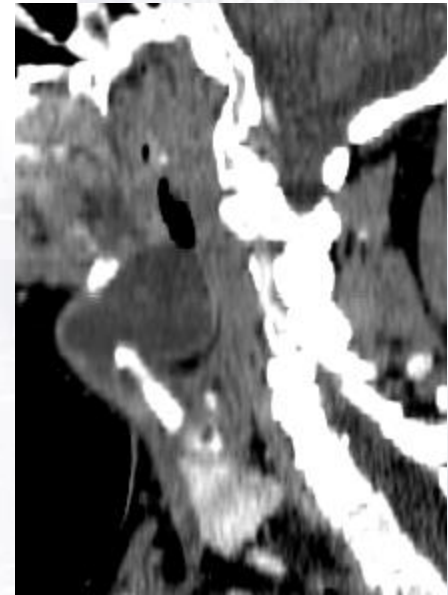
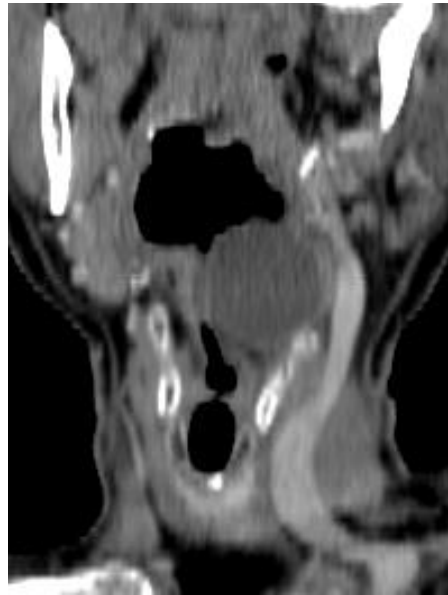


Thyroglossal Duct Cyst

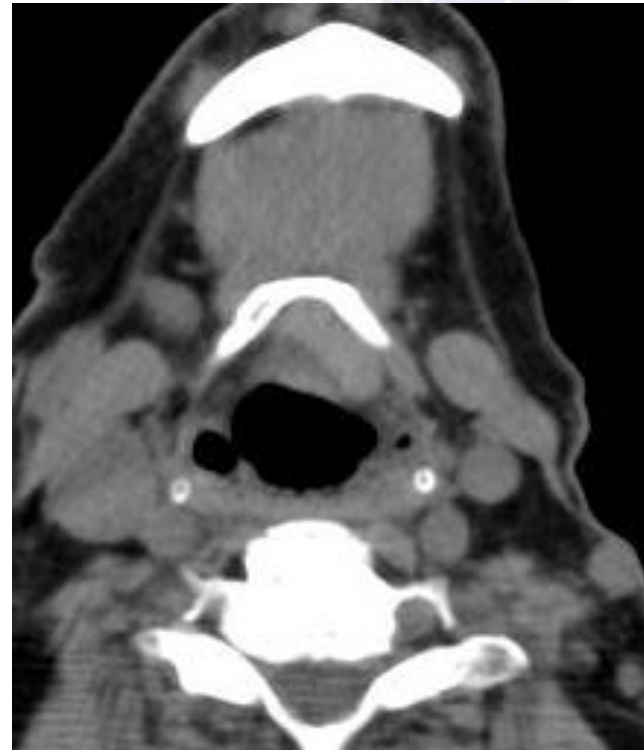
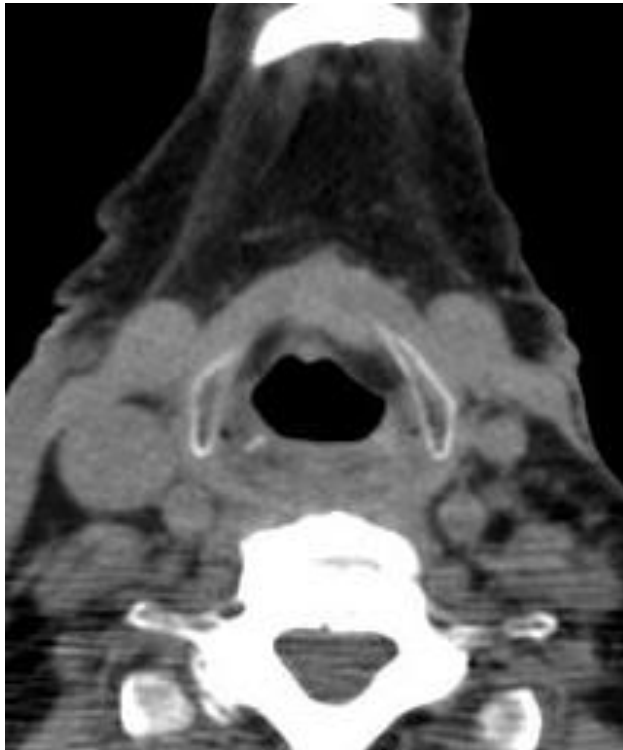
- Foramen cecum to thyroid bed
- Majority around the hyoid
- $\frac{3}{4}$ midline, $\frac{1}{4}$ off-midline
- Embedded in strap muscles
- Can get infected
- Rare cancer



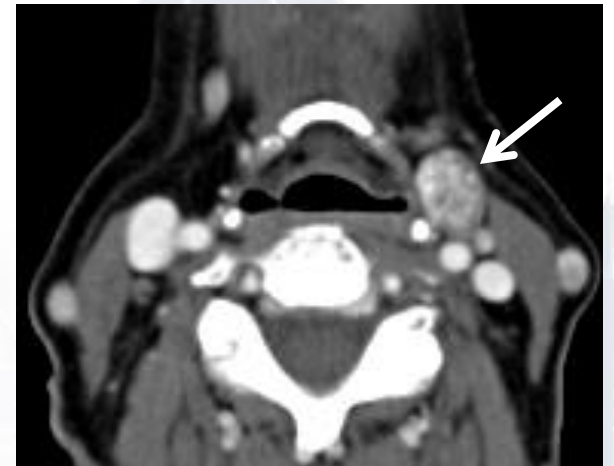
TDC



Hyperdense TDC



Ectopic Papillary Thyroid Carcinoma



Branchial Cleft Cysts (BCC)

Extent

- Fistula
- Sinus Tract
- Cyst

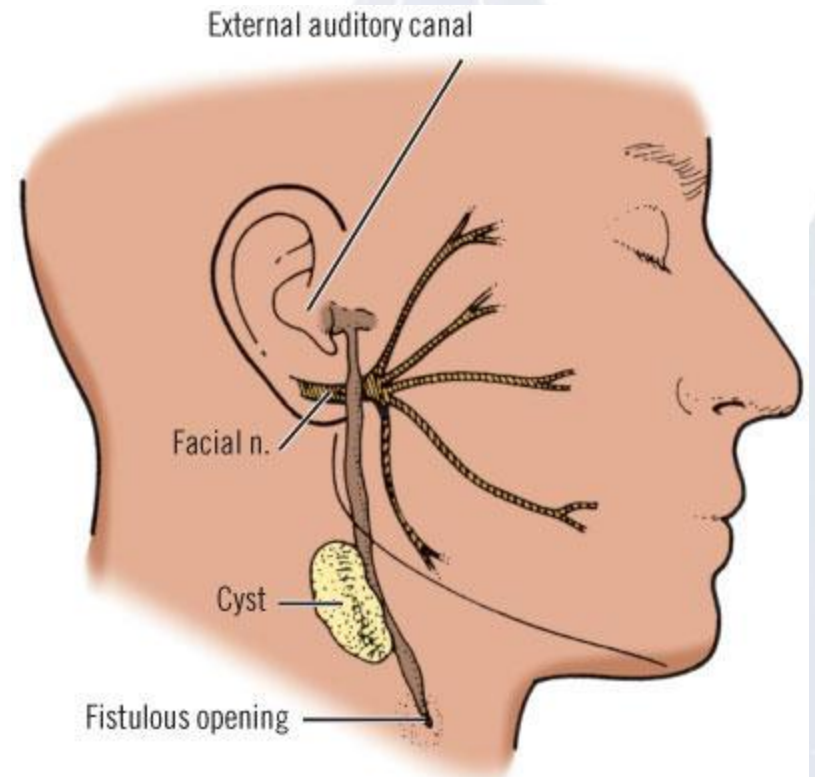
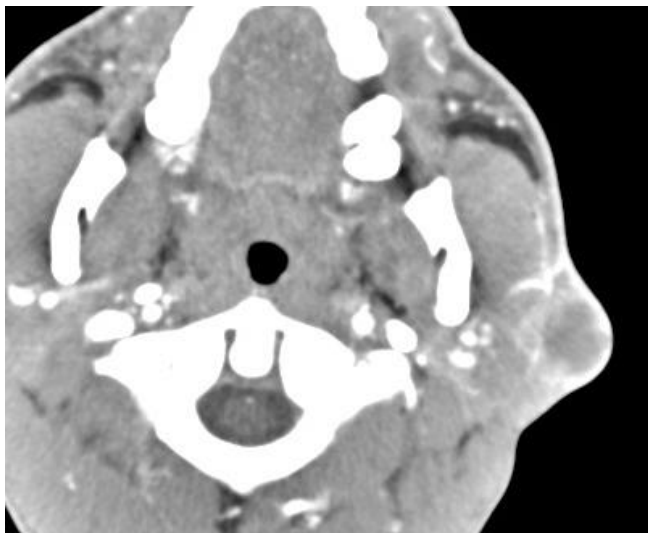
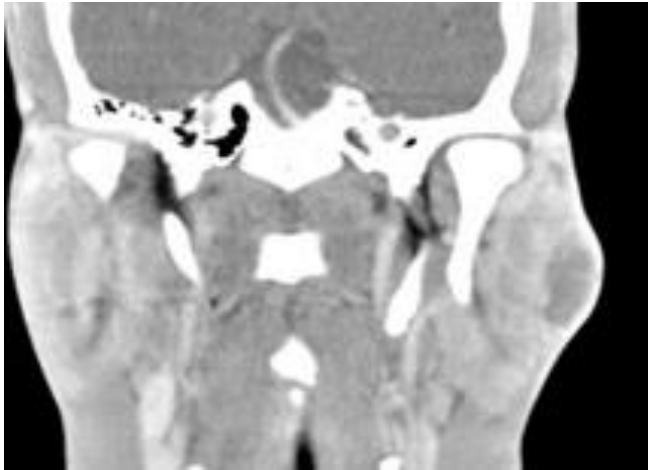
Location

- 1st BCC
- 2nd BCC
- 3rd BCC
- 4th BCC

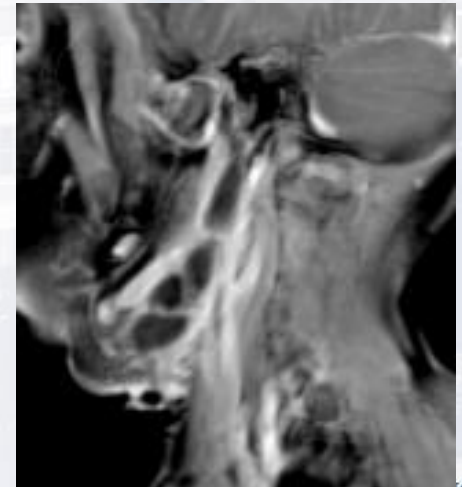
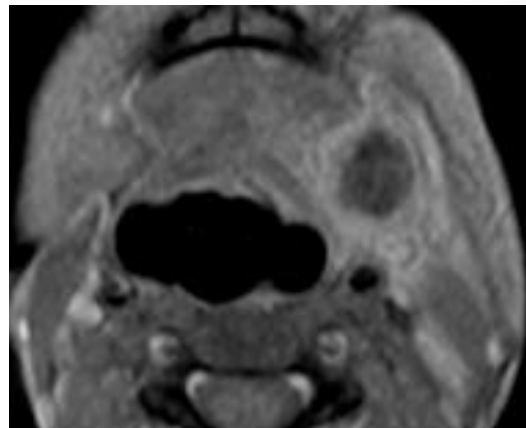
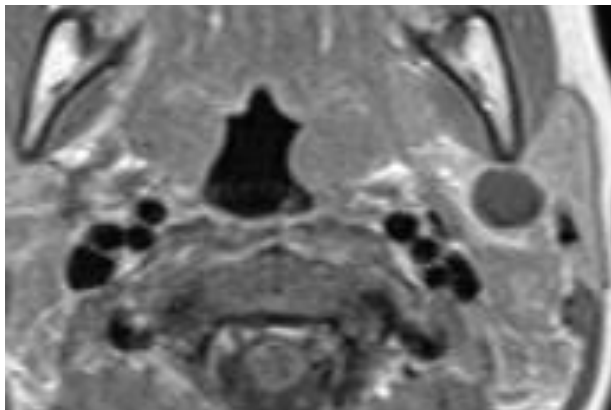
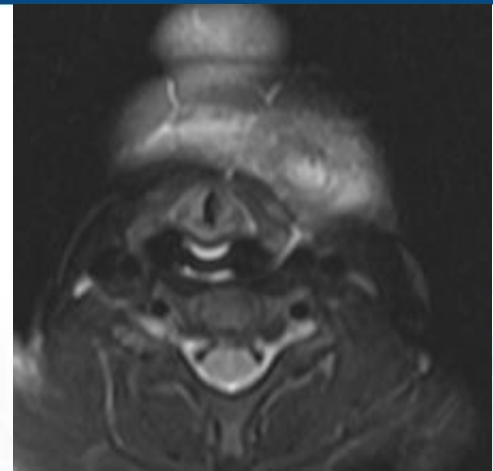
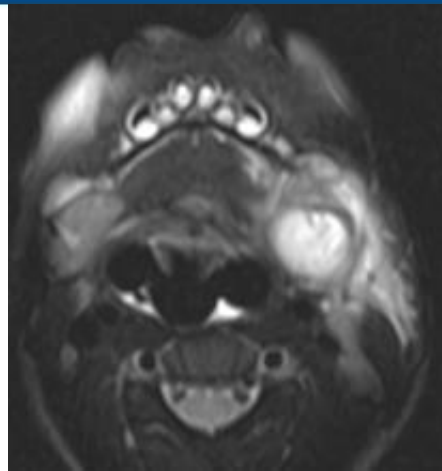
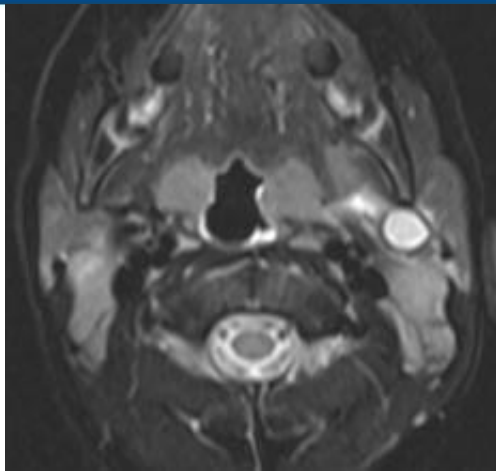
Branchial Cleft Cysts

- 90% arise from the 2nd branchial apparatus
- More common in children but presentation in young adults is common
- Painless lateral neck masses
- May present after an upper respiratory tract infection
- May get Infected
- May bleed

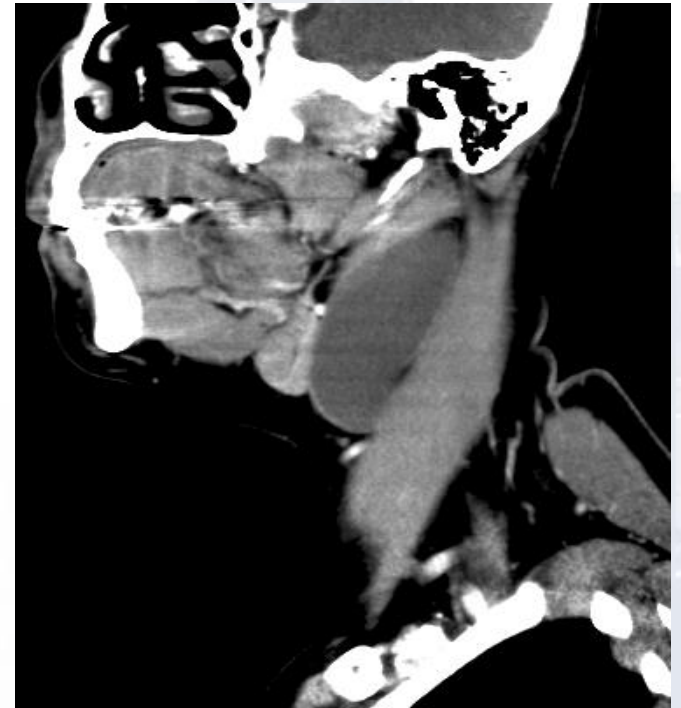
1st BCC



1st Branchial Sinus/Fistula Tract

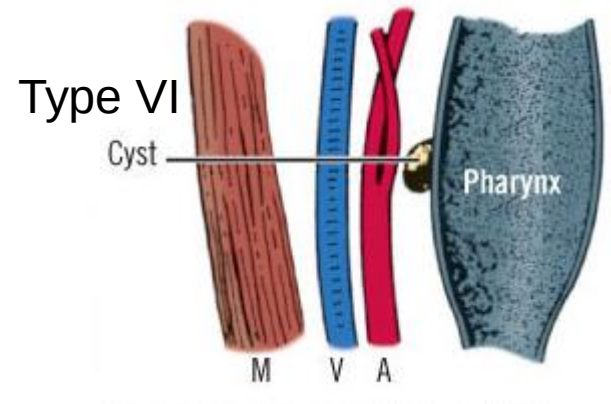
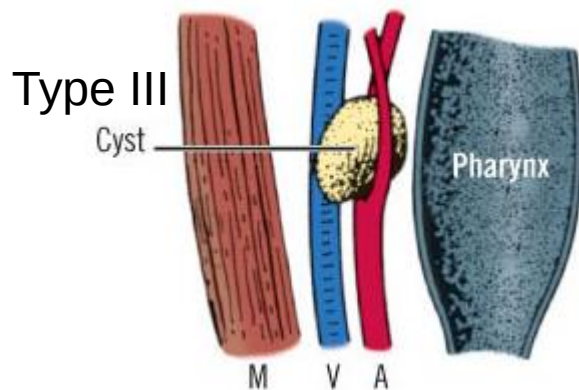
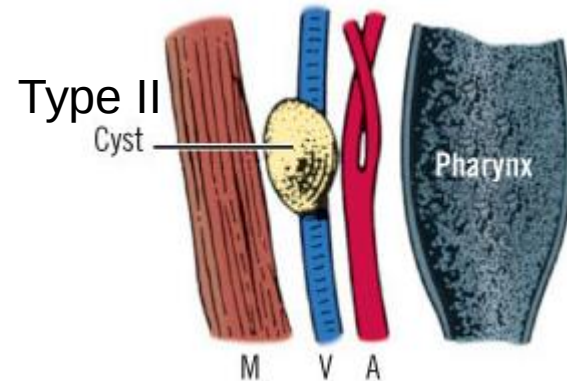
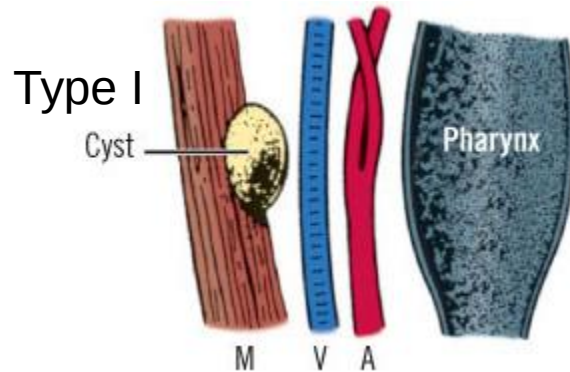


2nd BCC

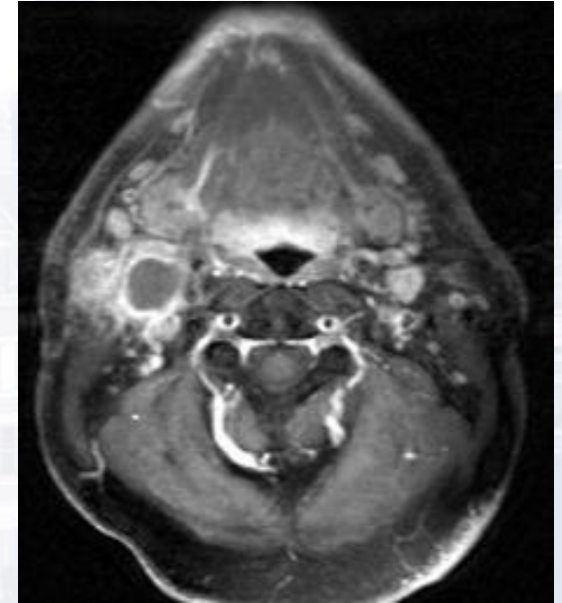
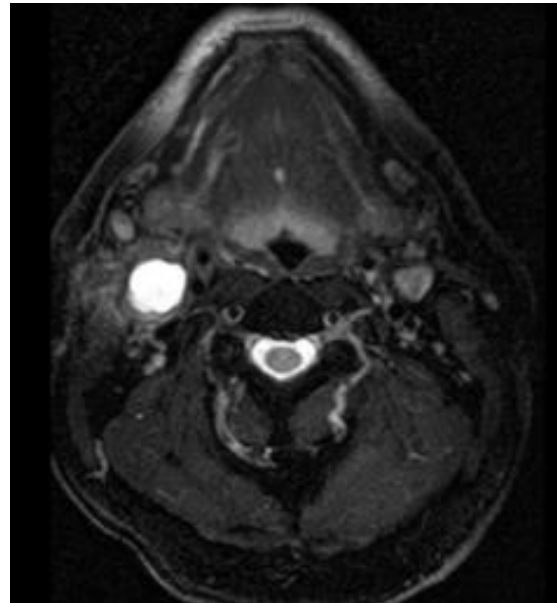
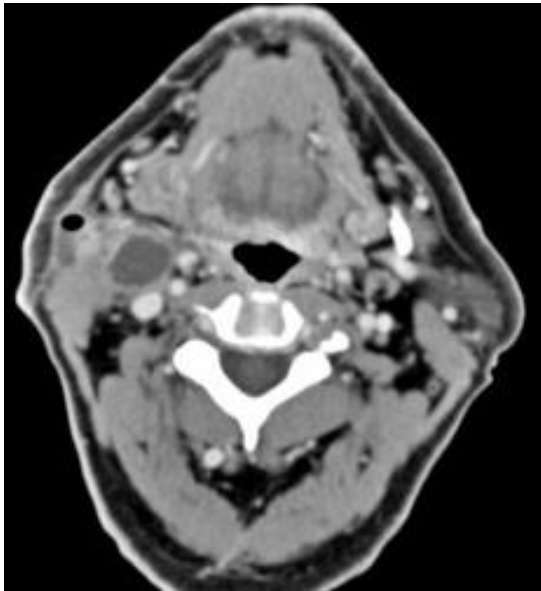


2nd BCC

Bailey Classification



Infected 2nd BCC



4th (or 3rd) Branchial Complex (arch) (pouch) Sinus

- Fistula/sinus arising from the apex of the left piriform sinus
- **Left** sided thyroid/perithyroid abscess
- Endoscopy/barium swallow



Ranula

- Mucoccele of the sublingual/minor salivary gland
- epithelial lined retention cyst
- **Simple Ranula:** confined to the sublingual space above the mylohyoid muscle
- **Diving/Plunging Ranula:** ruptured cyst extends beyond the confines of the sublingual space into the submandibular space

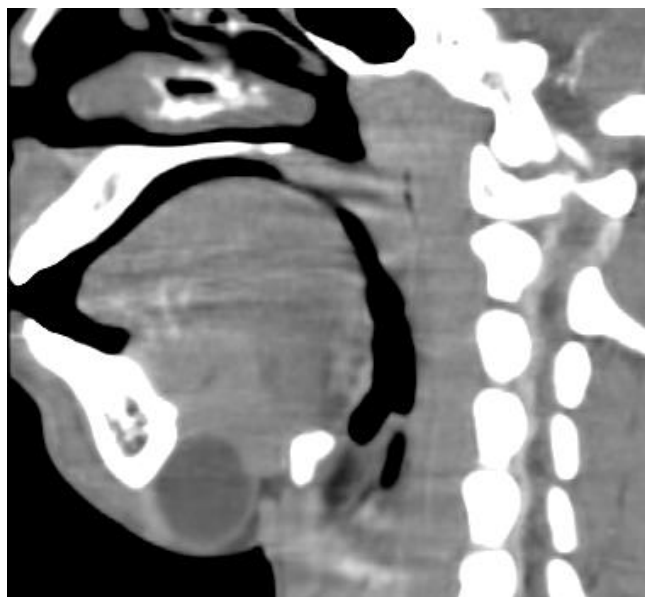
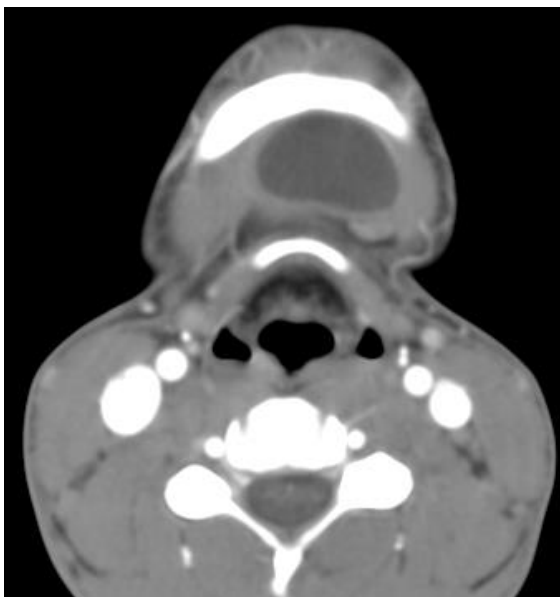


Dermoid (Epidermoid)

- Contain two germ cell layers (mesoderm and ectoderm)
- Midline
- FOM, tongue
- Fat and fluid can be present

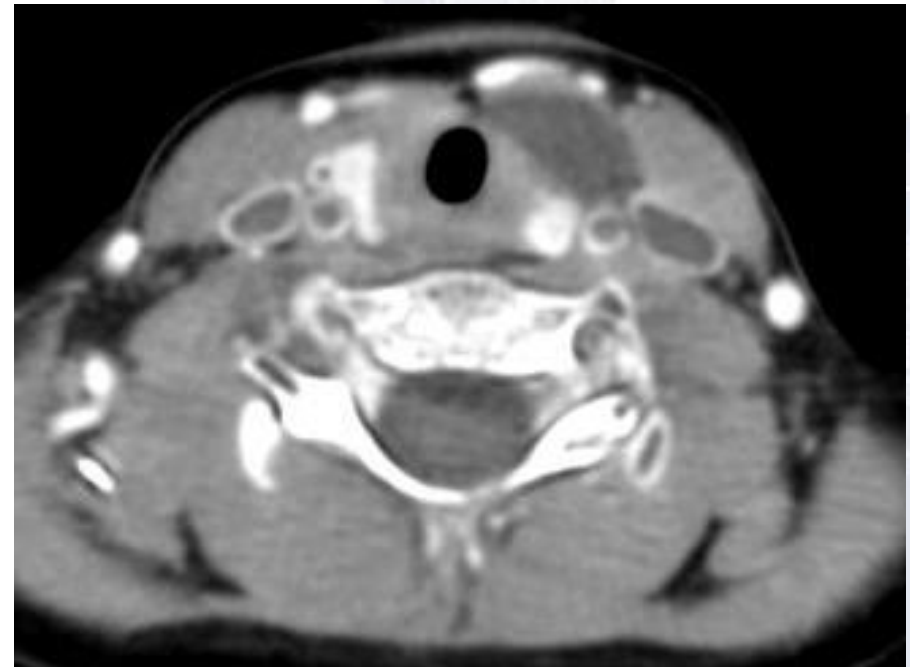


Dermoid (Epidermoid)

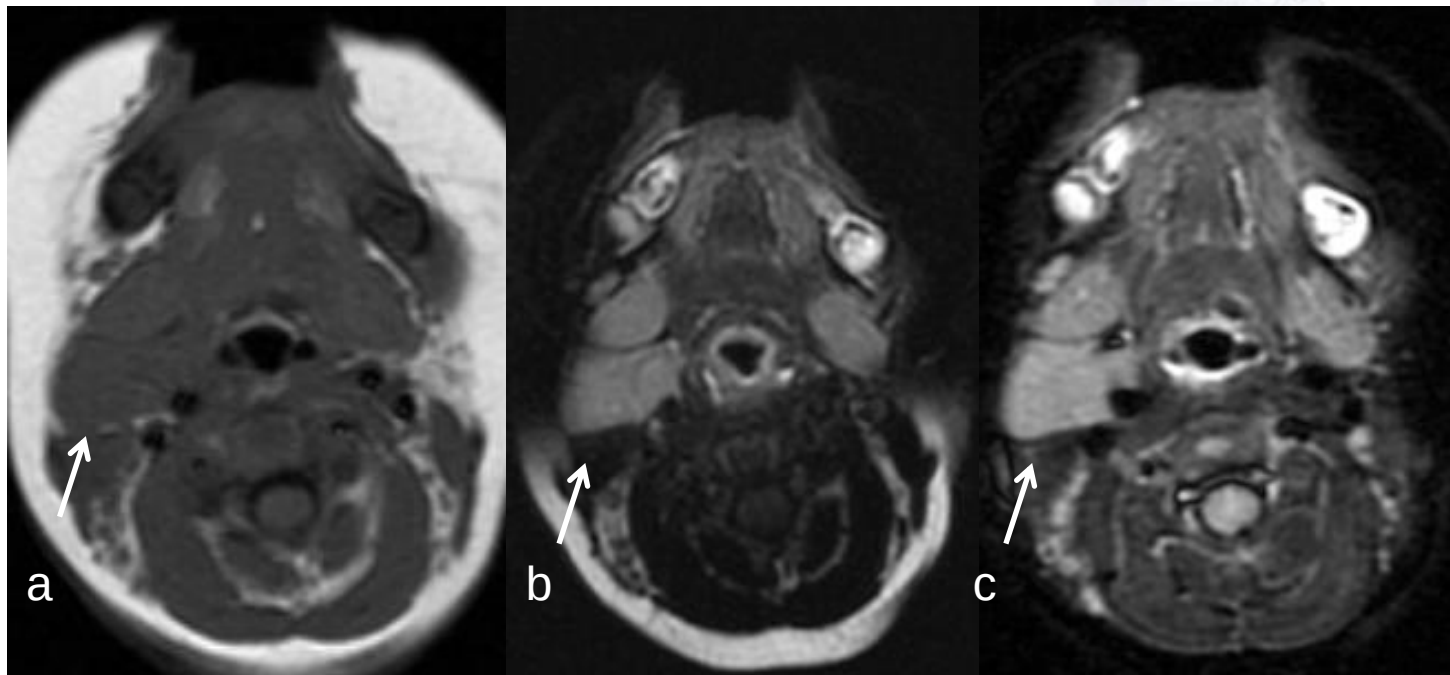


Thymic Cyst

- Technically 3rd branchial arch anomaly
- More common on the left
- Ectopic thymus

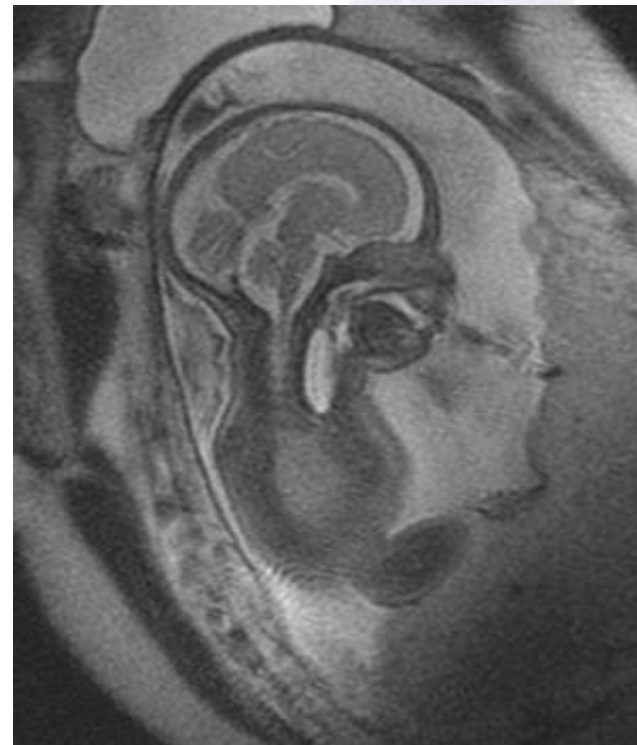
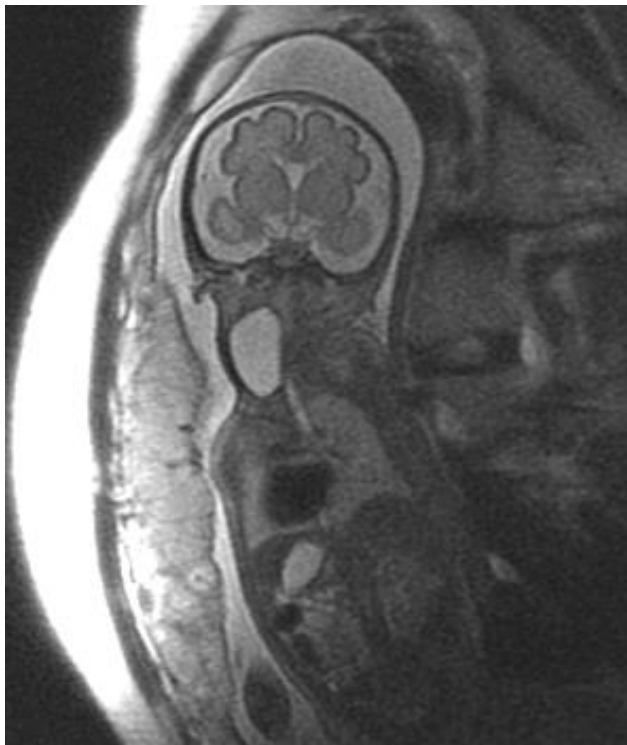


Ectopic Thymus



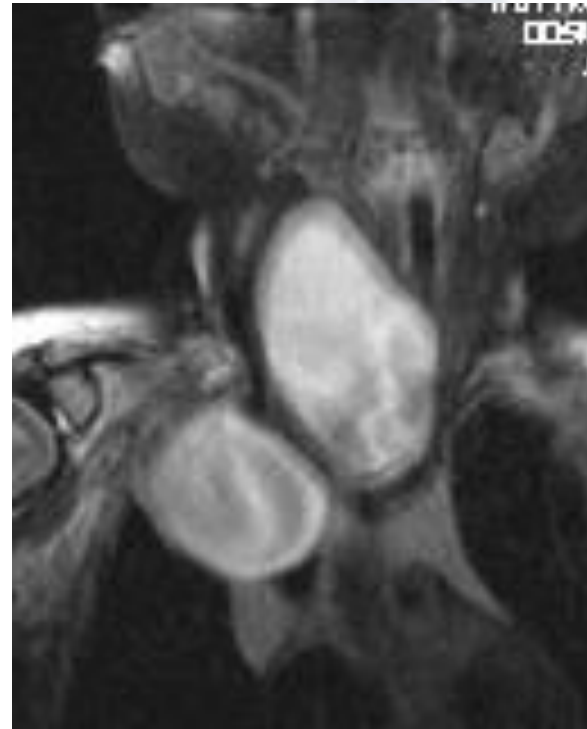
Foregut Duplication Cyst

Esophageal duplication cyst

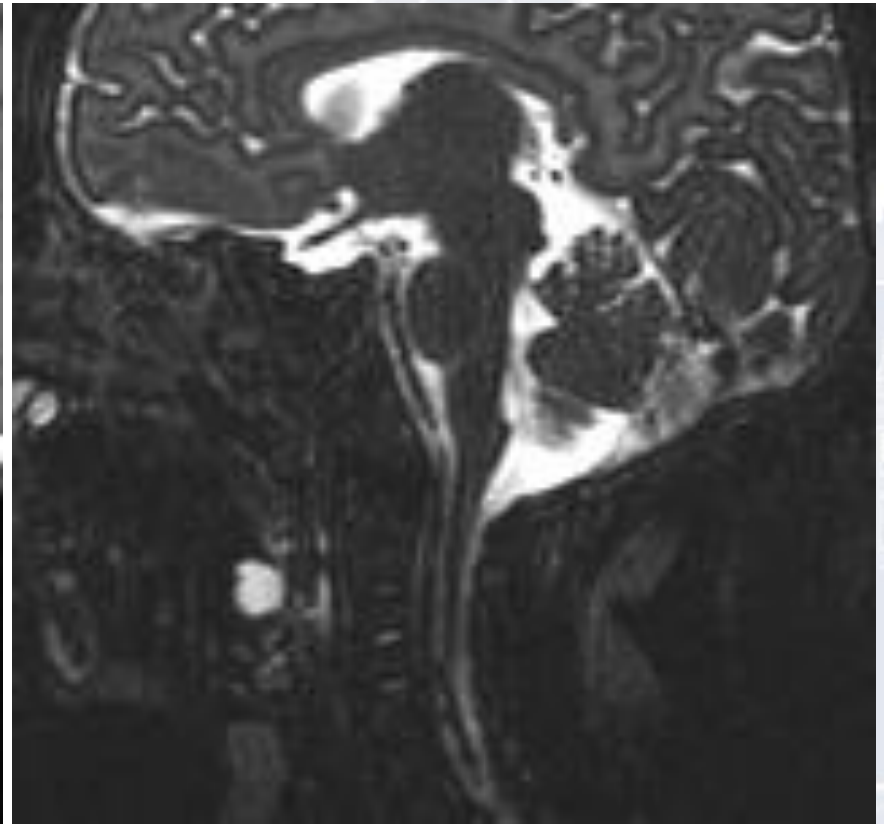
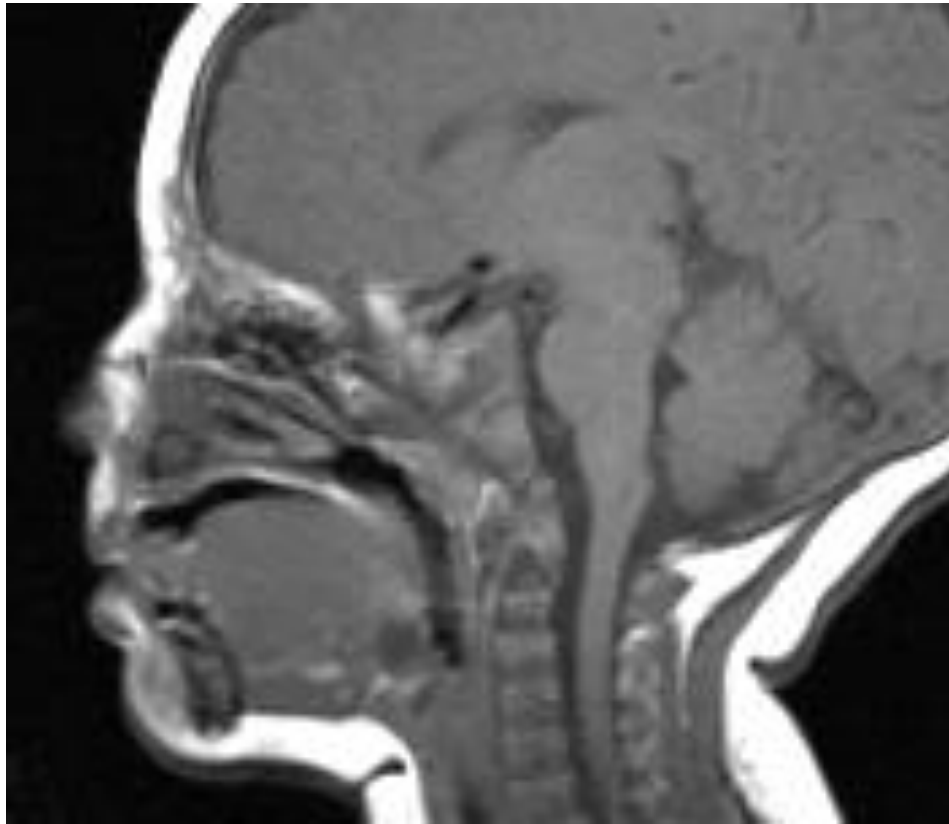


Foregut Duplication Cyst

Bronchial cyst



Vallecular Cyst



Solid Neck Masses in Children

- **Benign**

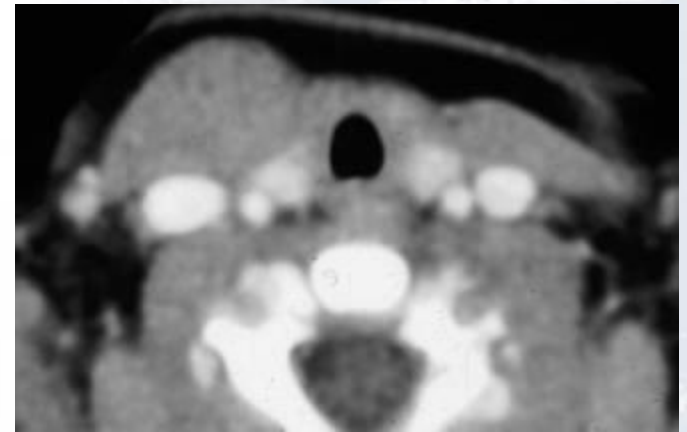
- Fibromatosis colli
 - Lipoblastoma
 - Adenitis
 - **Vascular lesions**
 - Neurofibroma
 - Ectopic thymus
 - Ectopic thyroid
 - Teratoma
 - Infantile myofibromatosis (myofibroblastic tumor)

- **Malignant**

- Lymphoma
- Rhabdomyosarcoma
- Other sarcomas
- Neuroblastoma
- Teratoma
- Metastatic adenopathy

Fibromatosis Colli

- Sternocleidomastoid tumor of infancy
- Hemorrhage/ischemia/fibrosis?
- Difficult delivery
- Palpable neck mass, torticollis
- 10-14 days postpartum
- 75% right sided
- May enlarge 2-4 mo, regress 4-8 mo.



Vascular Anomalies; ISSVA Classification

➤ Vascular Malformations:

No endothelial proliferation

- slow flow
 - Capillary Malformation
 - **Venous Malformation**
 - Lymphatic Malformation
- fast flow
 - Arterial Malformations
 - AVM and AVF
 - Combined

➤ Vascular Neoplasms:

Endothelial proliferation; VEGF, cell nuclear antigen

- **(Infantile) Hemangioma**
- Congenital Hemangioma
 - RICH
 - NICH
- Tufted angioma
- Hemangioendotheliomas (Kaposiform, spindle cell etc.)
- Dermatologic acquired vascular tumors (e.g. pyogenic granuloma)

Clinical Features

- **Venous Malformations**

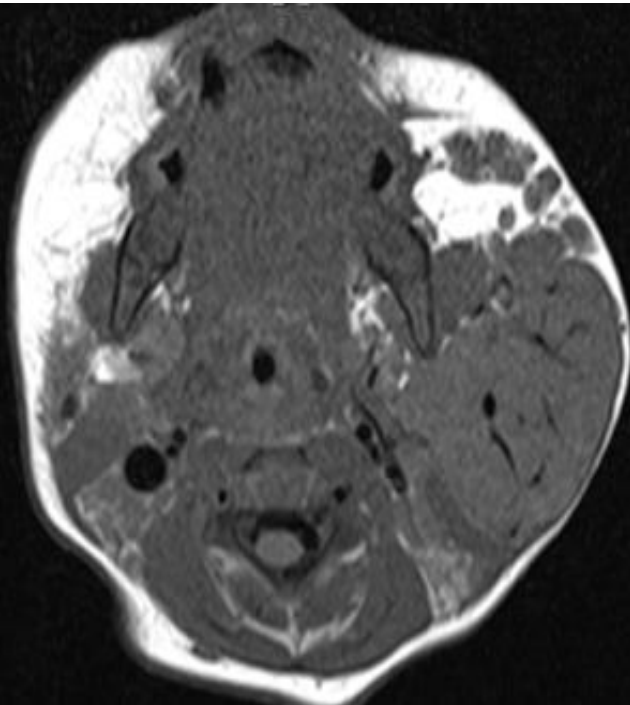
- Present at birth; presentation age varies
- Grow proportionally to the patient
- Do not involute
- GLUT-1 not expressed

- **Infantile Hemangiomas**

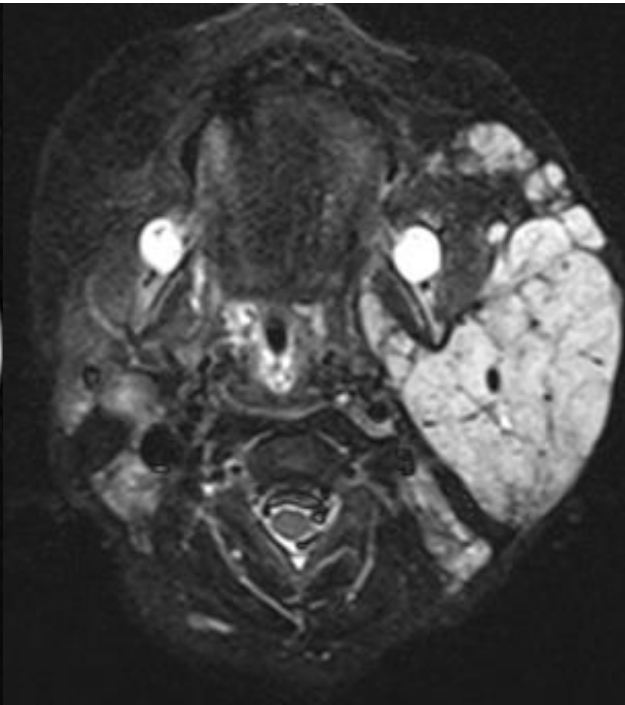
- Not present at birth
- Proliferating phase (age 0-1)
- Involuting phase (age 1-7)
- Involved phase (age 8+)
- GLUT-1 expressed

- PHACE, LUMBAR, Mafucci Synd.

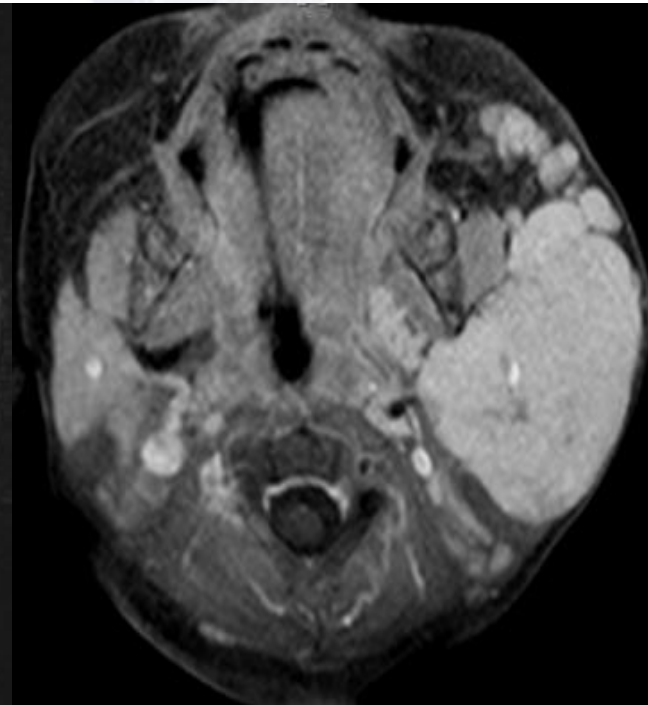
12 week-old boy with enlarging facial mass and associated purplish skin discoloration



T1W



STIR

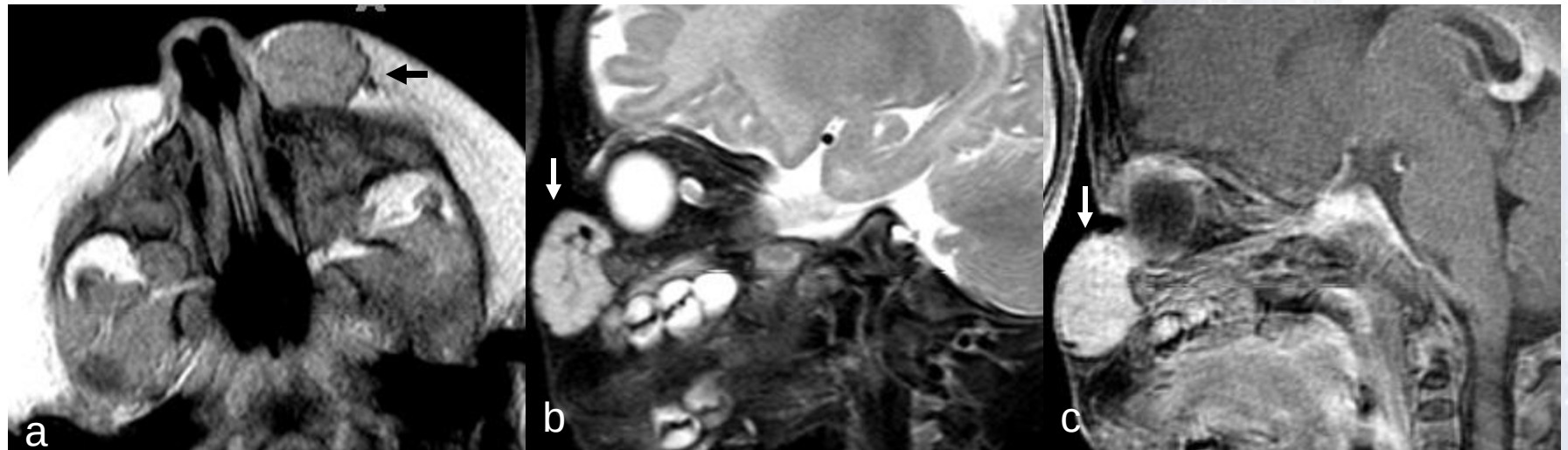


Post-contrast T1W

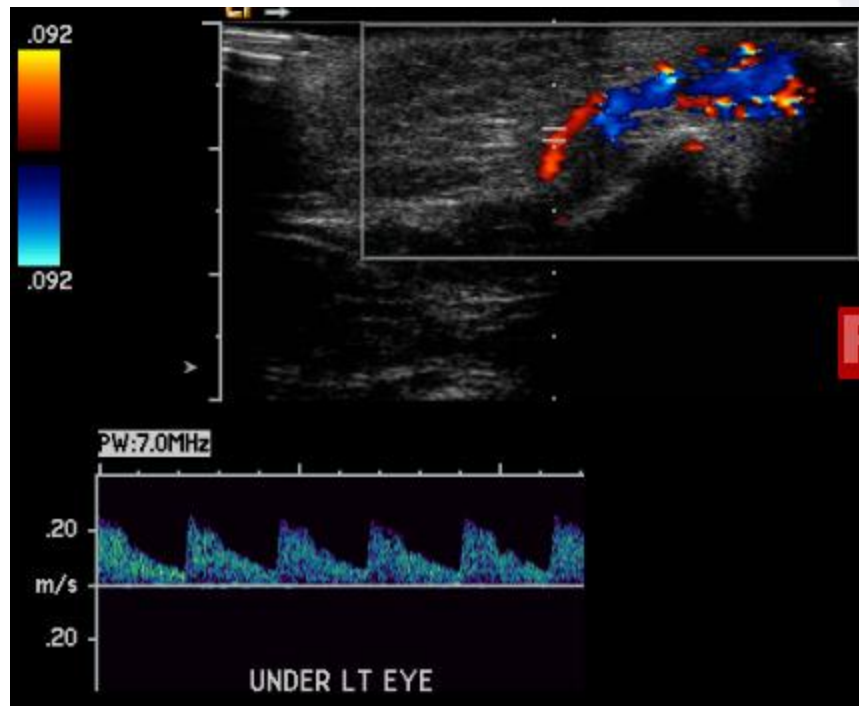
Infantile Hemangioma



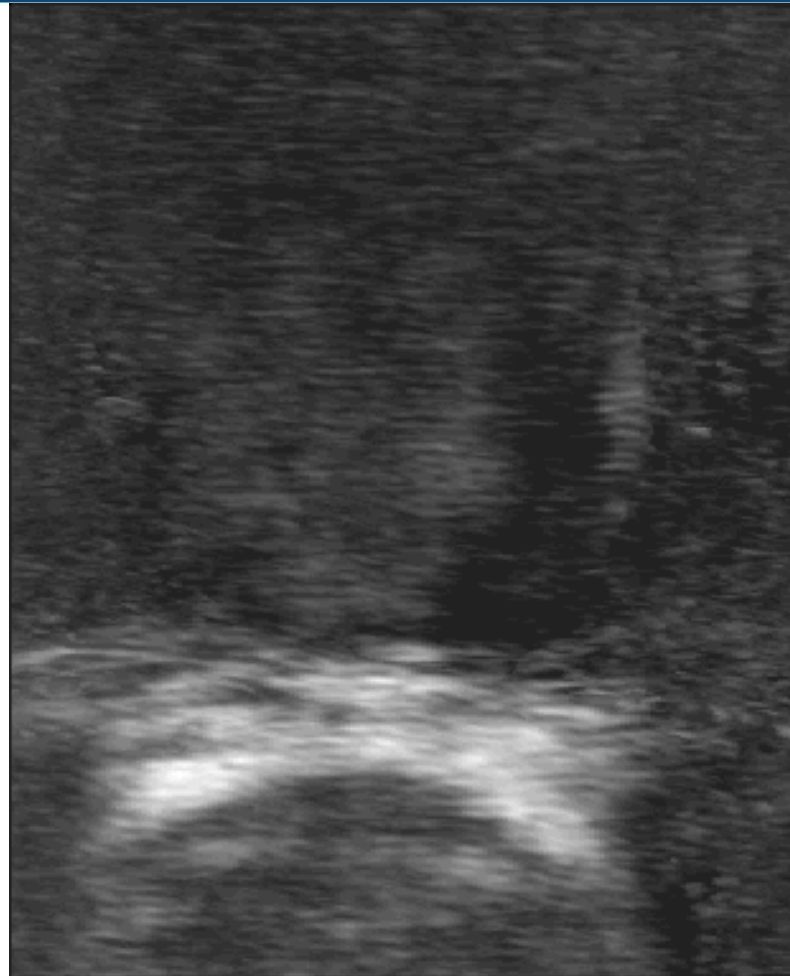
Infantile Hemangioma



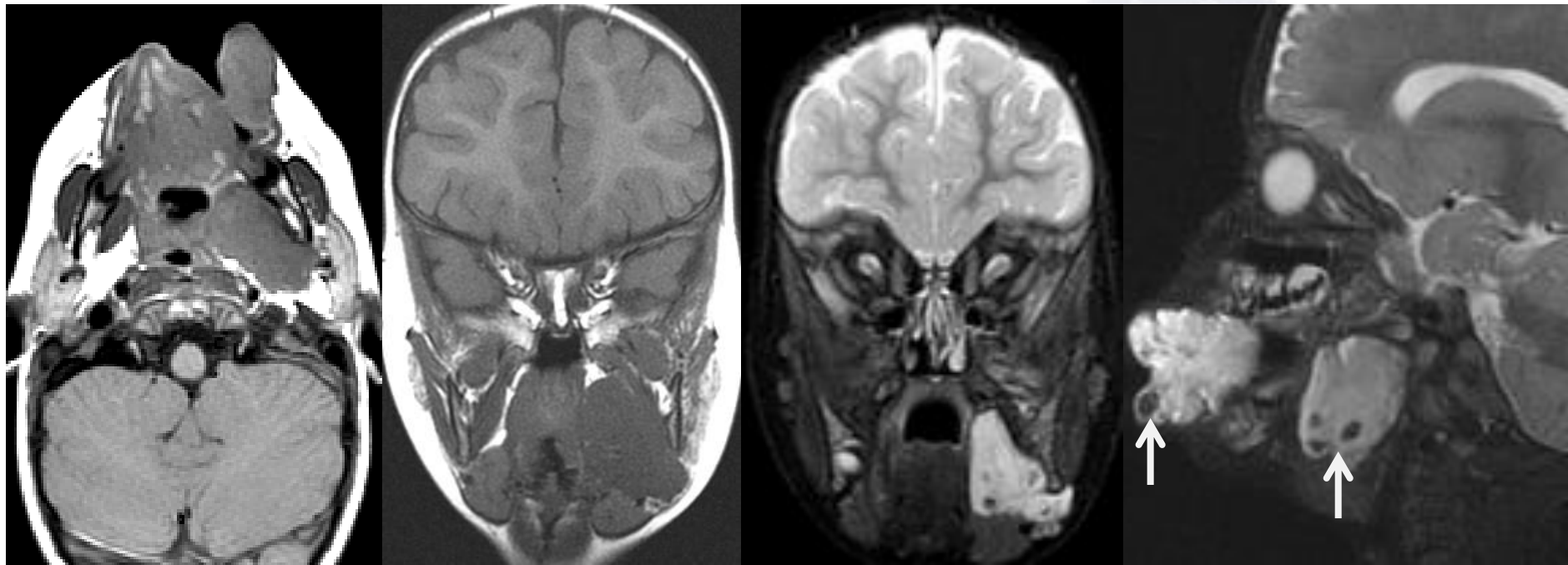
Infantile Hemangioma



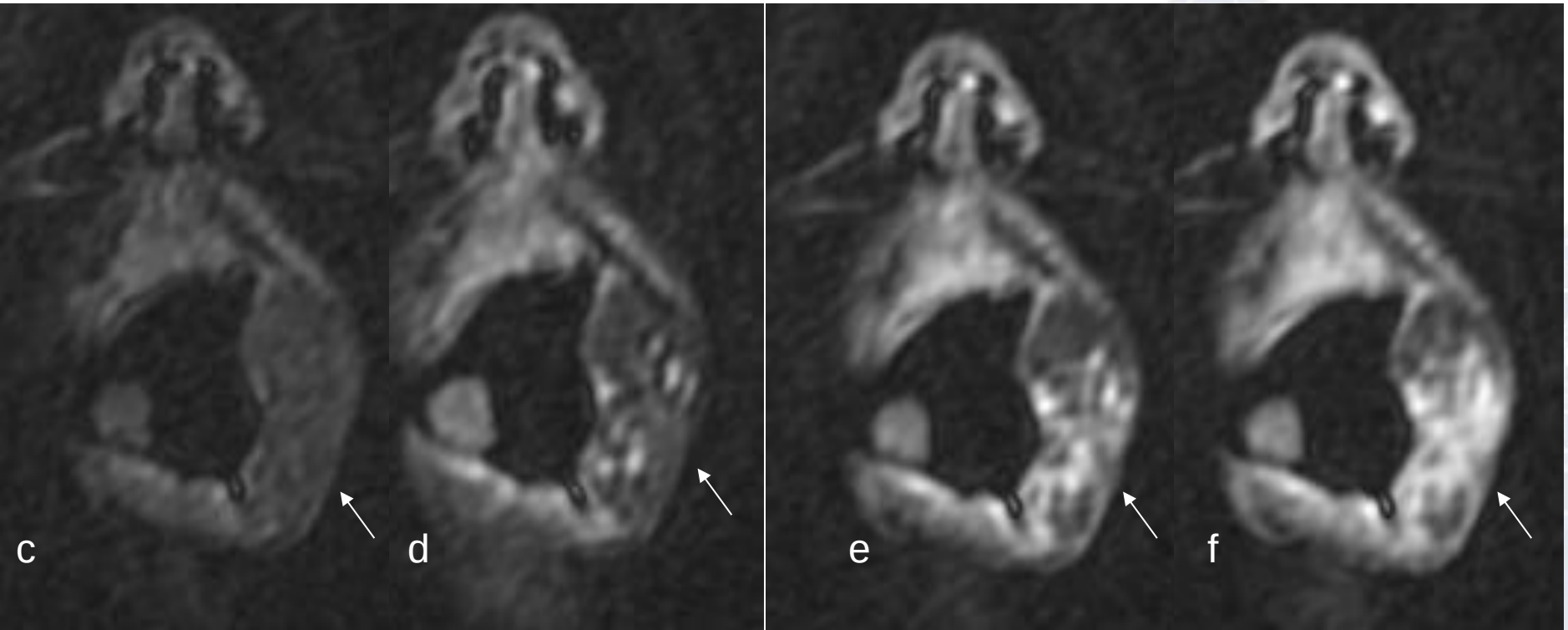
Infantile Hemangioma: Arterial Enhancement



Venous Malformation (VM)

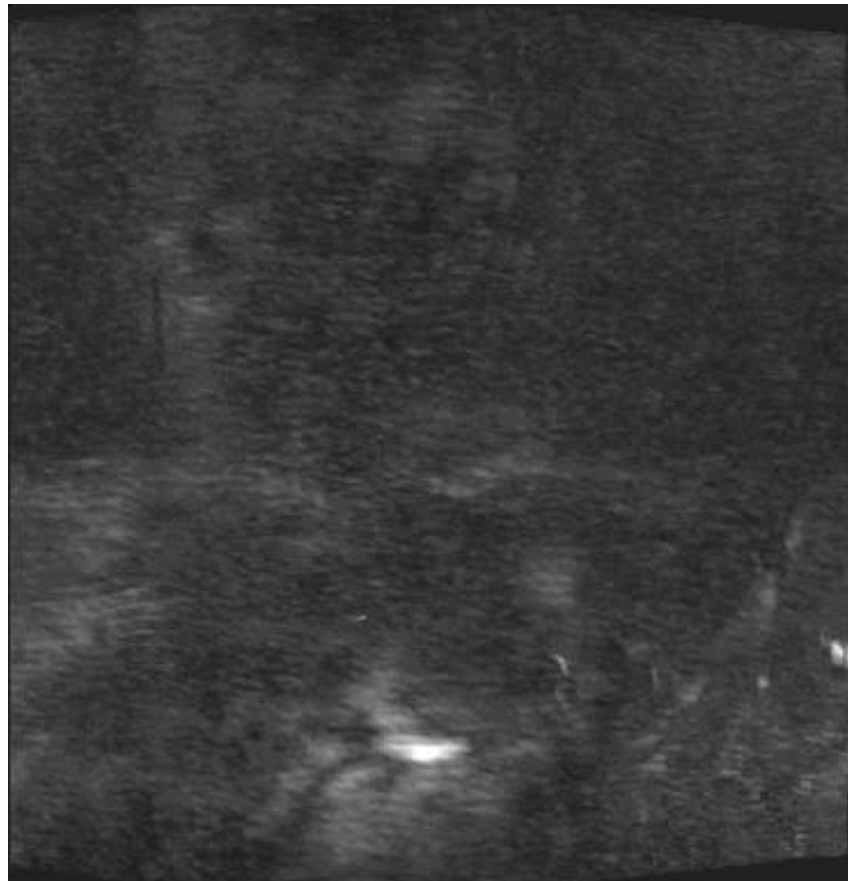


Venous Malformation (VM)

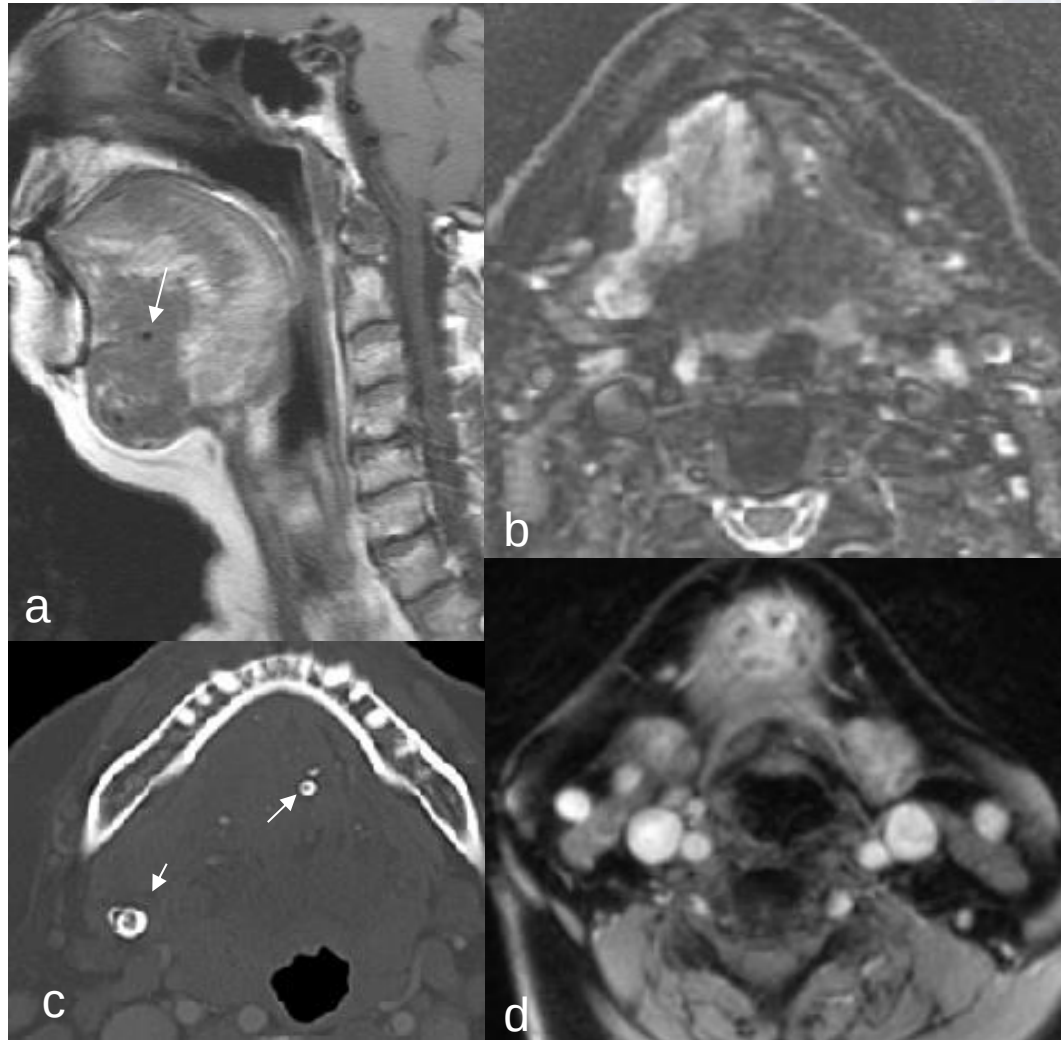


Venous Malformation (VM)

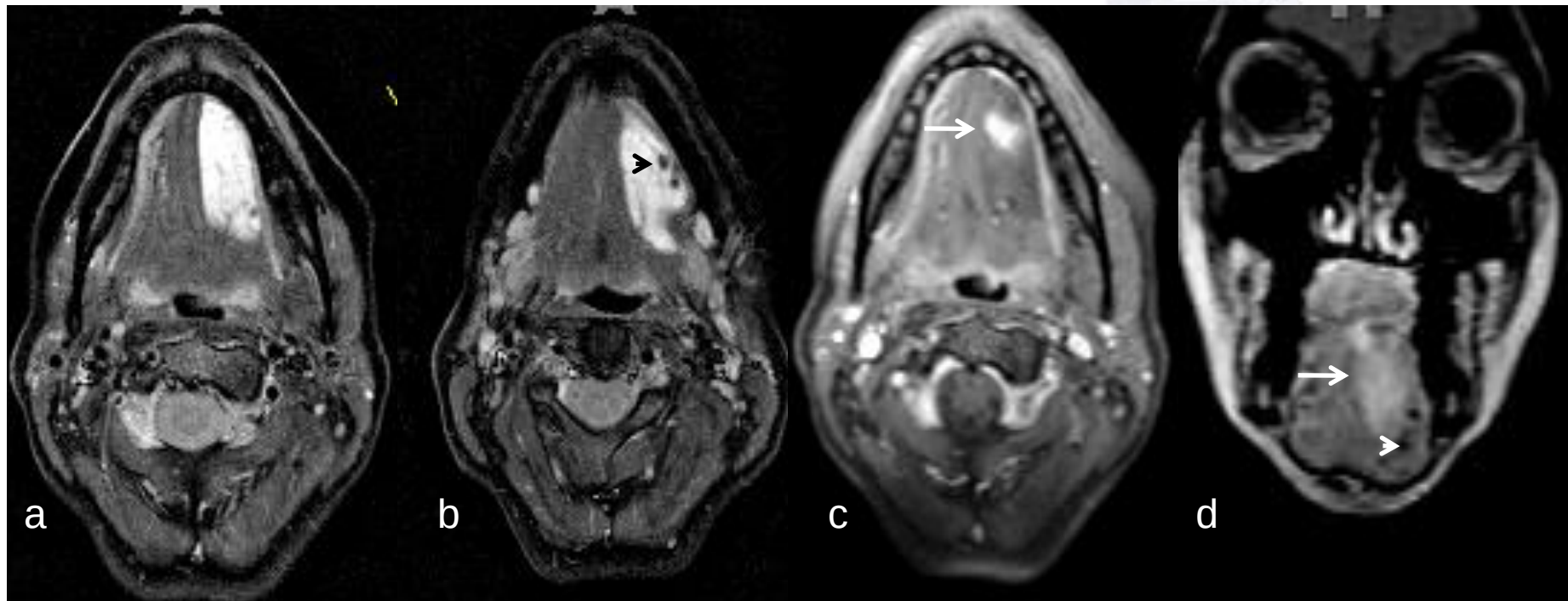
Venous Enhancement



Venous Malformation (VM)



Venous Malformation (VM)



Venous Malformation (VM)



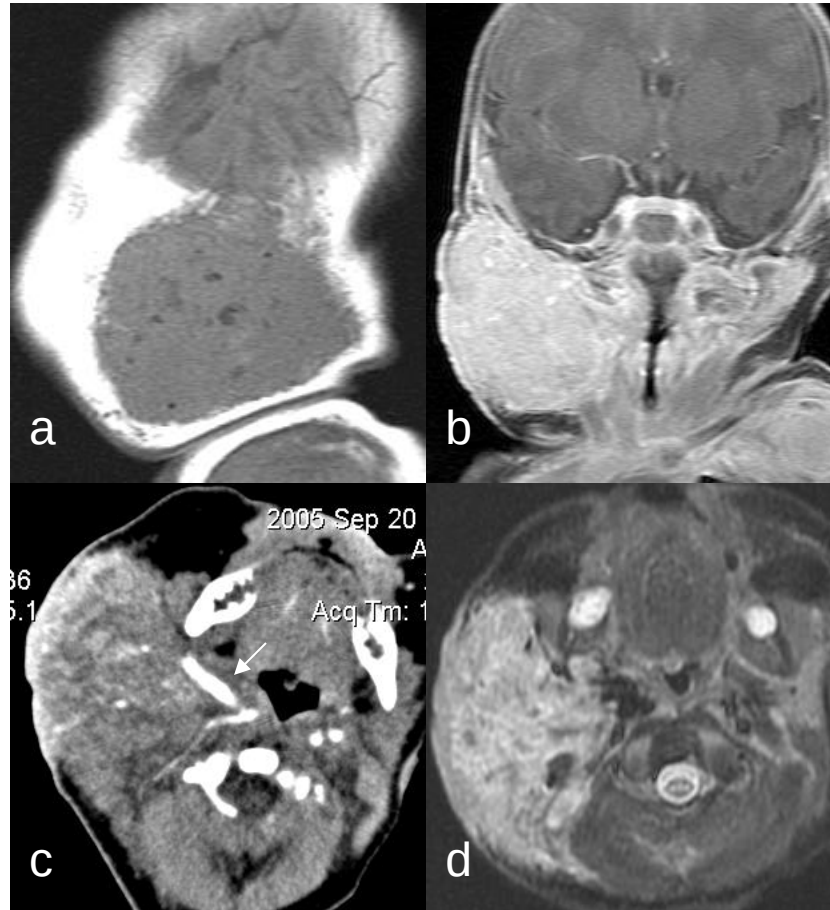
DDx

- **Venous malformation**
 - No large vessels
 - Bright T2 signal
 - Enhancement; gradual, patchy
 - Transspatial; bone, muscle etc. involvement
 - Phleboliths *
- **Infantile Hemangioma**
 - Large vessels in the mass*
 - Bright T2 signal
 - Avid enhancement; early
 - Multiple 20%

Congenital Hemangioma (CH)

- Present and fully formed at birth
- Proliferating phase completed intrauterine
- Rare
- High output cardiac failure
 - Type I: Rapidly Involuting CH (RICH): regresses in 6-14 months
 - Type II: Non-involuting CH (NICH): does not regress

Congenital Hemangioma (CH)



Lymphatic Malformations

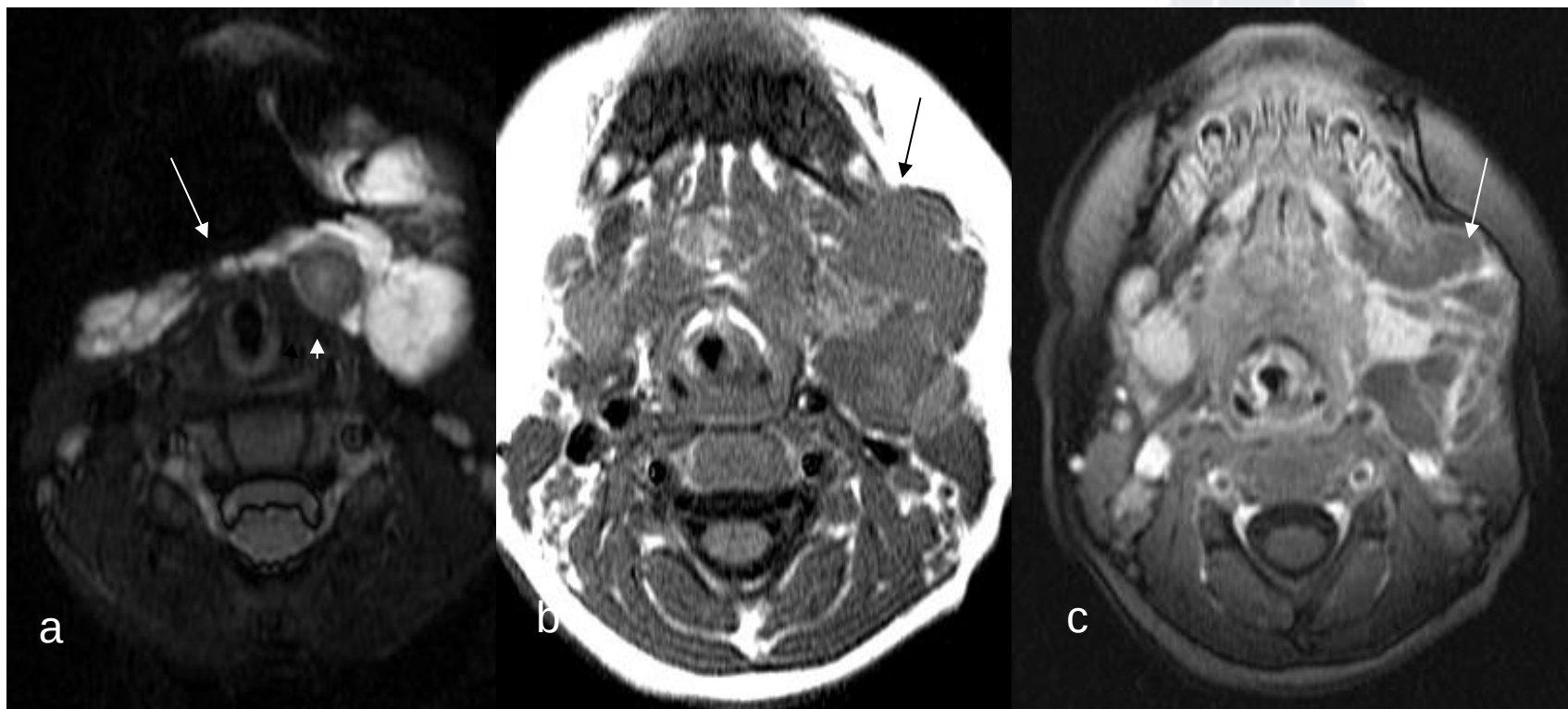
- **Microcystic LM**

- Infiltrative
- Solid
- Enhancement

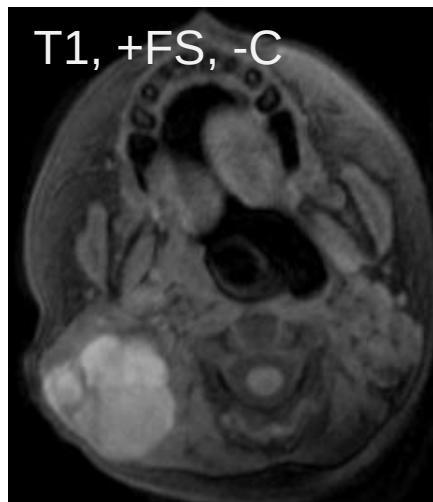
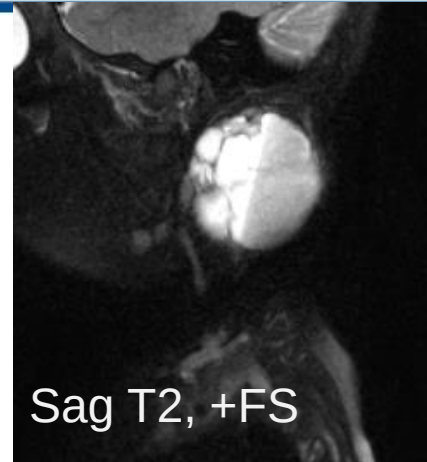
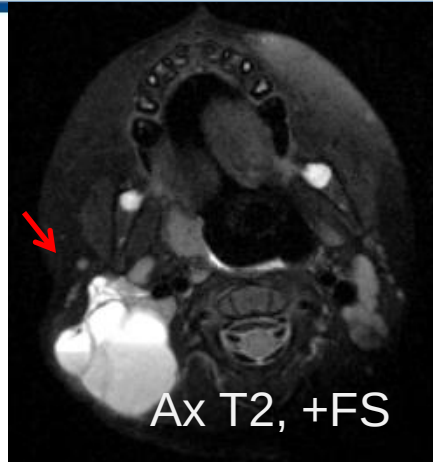
- **Macrocystic LM
(cystic hygroma)**

- Cystic
- Limited enhancement
- Hemorrhage
- Proteinaceous debris

Lymphatic Malformations



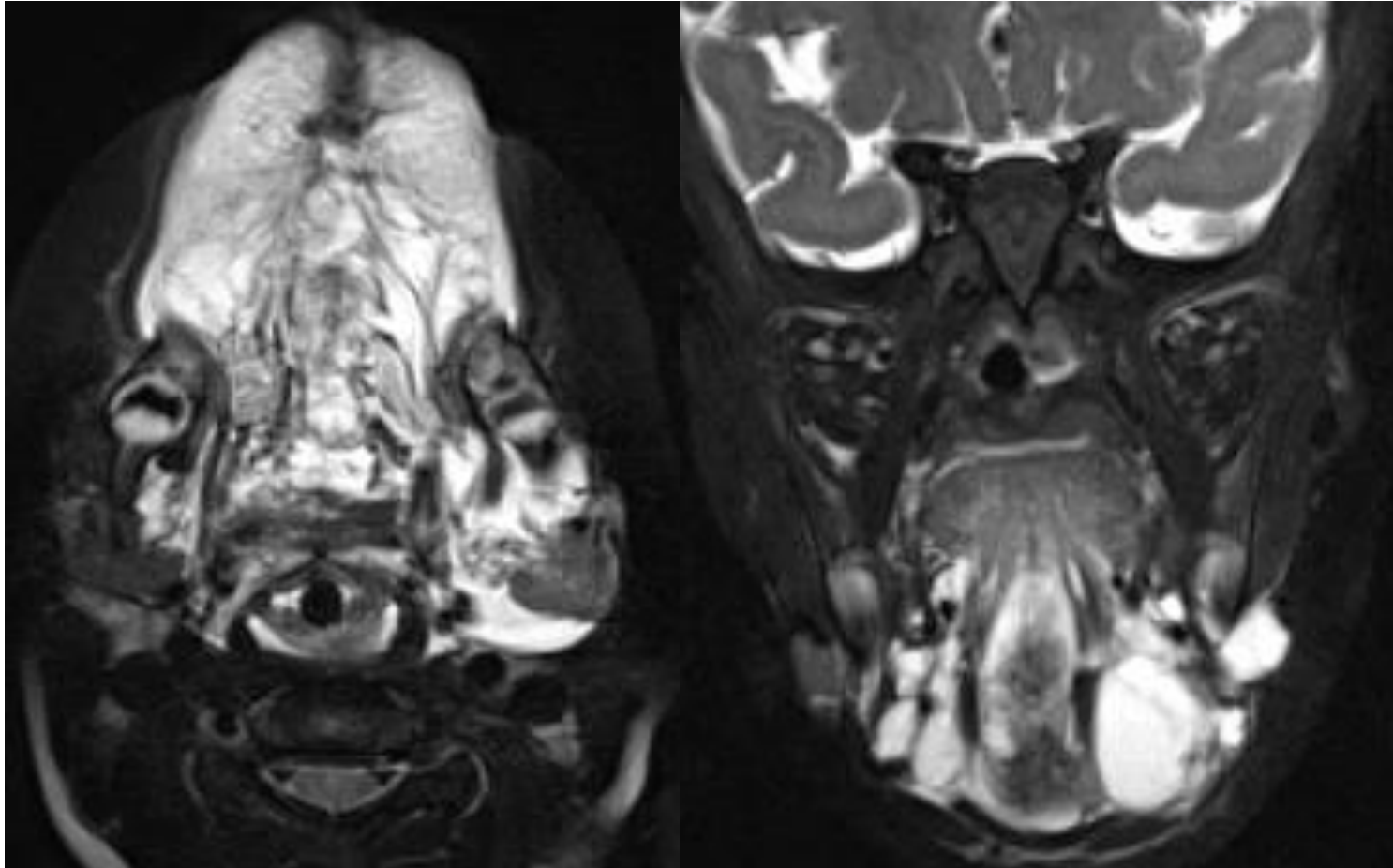
Lymphatic Malformations



2 year old girl with right sided neck swelling

Lingual LM

Microcystic and Macrocystic

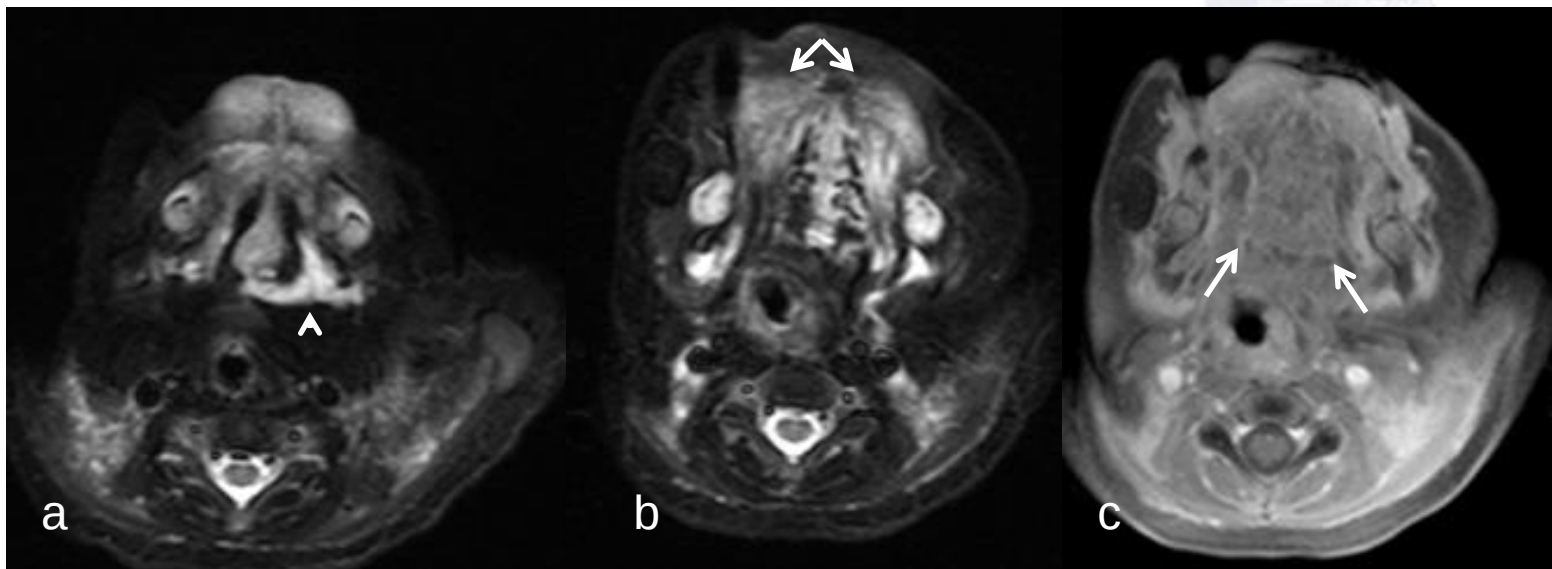


Lymphatic Malformation of the Tongue

- 6% of all H&N masses are LM
- Most tongue masses in children are LM and VM
- Majority of tongue masses in newborn are LM
- Microcystic vs. macrocystic
- Breathing, swallowing difficulty, speech problems, malocclusion etc.
- Degree of involvement

Lingual LM

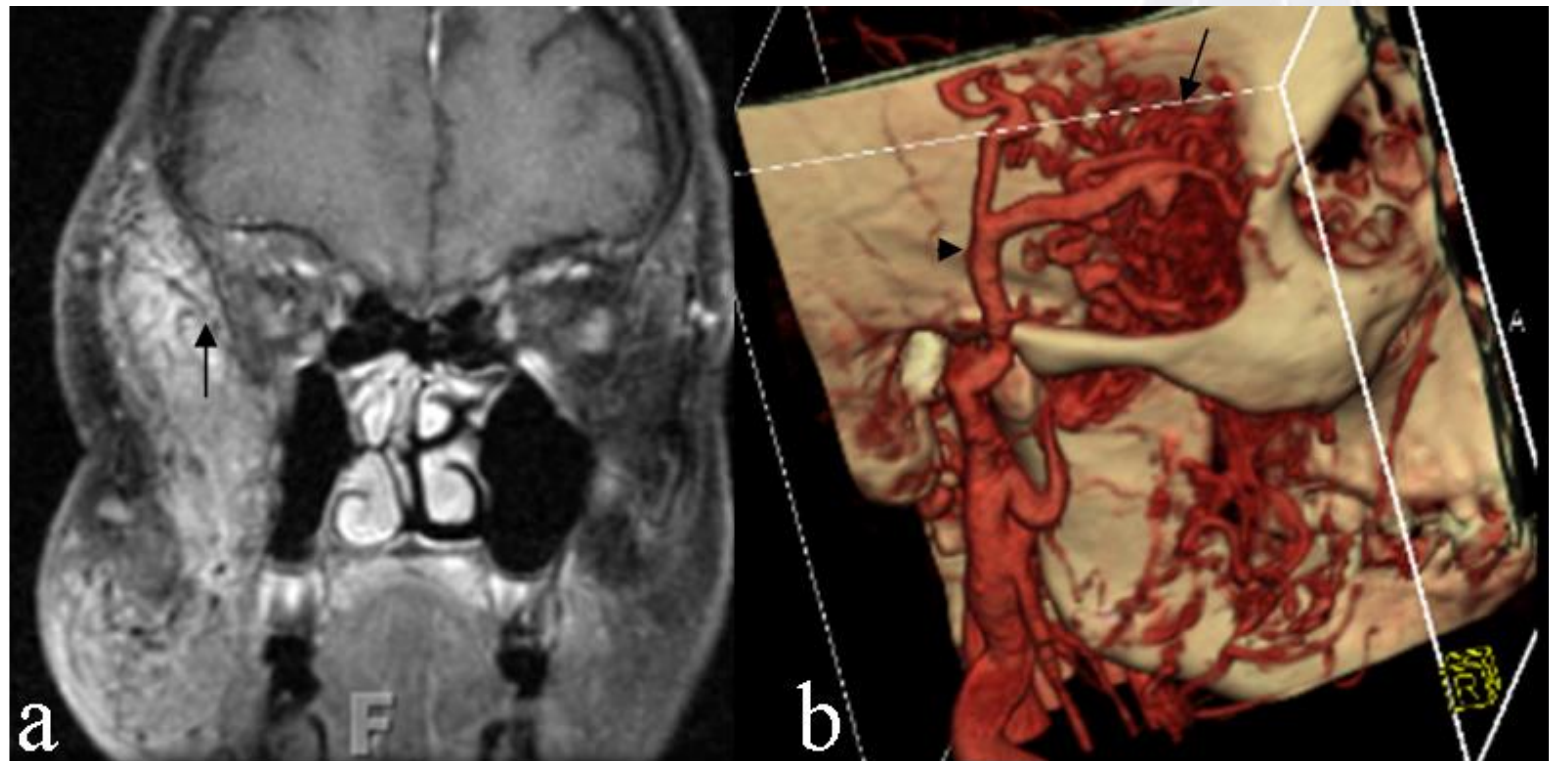
Microcystic



Arterial Malformations

- AVM and AVF
- Multiple vessels
- Relative lack of soft tissue mass
- Rare in head and neck region

Veno-arteriovenous Malformation



Q: Find the **non**-matching pair with regard to vascular lesions of the head and neck

1. Hemangioma; bright T2 signal
2. Venous malformation: bright T2 signal
3. Hemangioma: arterial flow voids
4. Venous malformation: phleboliths
5. Venous malformation: large draining veins
6. AVM: large draining veins
7. Venous malformation: transspatial involvement
8. Lymphatic malformation: cystic masses

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1. Hemangioma; bright T2 signal
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6. AVM: large draining veins
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Head and Neck Cysts in Children

- **Congenital**

- Thyroglossal duct cyst
- Branchial remnant
- Lymphatic malformation
- Thymic cyst
- Dermoid
- Foregut duplication cyst

- **Acquired**

- Ranula
- Thyroid
- Parathyroid
- Laryngocele
- Glandular cysts

PHACES Syndrome

- **P**osterior fossa (DWM)
- **H**emangiomas H&N
- **A**rterial
 - stenosis,
 - occlusion,
 - hypoplasia,
 - aneurysm
- **C**ardiovascular
 - coarctation
 - cardiac anomalies
- **E**ye abnormalities
- **S**upraumbilical and sternal clefts

Tongue Mass Ddx in Children

CYSTIC

- Dermoid/epidermoid
- Foregut duplication
- Macrocystic LM
- Thyroglossal duct cyst
- Vallecular cyst

SOLID

- Microcystic LM
- VM
- Hemangioma
- Lingual thyroid
- Hamartoma
- Rhabdomyoma
- Neurofibromatosis