Evaluation and Management of Pediatric Neck masses

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Grand Rounds Presentation
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Pediatric Neck Masses

- Congenital masses
- Benign lesions
- Vascular and lymphatic malformations
- Infectious and inflammatory conditions
- Malignant lesions
Embryology and Anatomy

- Branchial System: 6 pairs of pharyngeal arches separated by endodermally lined pouches and ectodermally lined clefts.
- Each arch consists of a nerve, artery, and cartilaginous structures.
- The remaining neck musculature gains contributions from cervical somites.
Branchial system

- First Branchial arch

  Maxillary and mandibular (Meckel’s) process regress to leave the malleus and incus.

  Ossification around Meckel’s cartilage gives rise to the mandible, sphenomandibular ligament, and anterior mallear ligaments.

  Muscles- temporalis, masseter, pterygoids, mylohyoid, ant belly of digastric, tensor tympani, tensor veli palatini
Branchial system

- First Branchial Arch
  - Nerve- 5th cranial nerve
  - Artery- maxillary artery
Branchial system

- **First Branchial Pouch**
  - persists as the Eustachian tube, middle ear, portions of the mastoid bone.

- **First Branchial Cleft**
  - persists as the external auditory canal, and tympanic membrane
Branchial system

- **Second Branchial Arch**
  - Reichert’s cartilage contributes to the superstructure of the stapes, the upper body and lesser cornu of the hyoid, the styloid process and stylohyoid ligament.
  - Muscles - platysma, muscles of facial expression, posterior belly of digastric, stylohyoid, and stapedius
  - Nerve - 7th cranial nerve
  - Artery - stapedial artery
Branchial system

- Third Branchial Arch
  - Lower body of the hyoid and greater cornu.
  - Muscles- stylopharyngeus, superior and middle pharyngeal constrictors.
  - Nerve- 9th cranial nerve
  - Artery- common carotid and proximal portions of the internal and external carotid.
Branchial system

- Third Branchial Pouch
  - Inferior parathyroids
  - Thymus gland and thymic duct
Branchial system

- Fourth and Sixth Branchial arches fuse to form the laryngeal cartilages.

- Fourth Arch
  - Muscles- cricothyroid, inferior pharyngeal constrictors
  - Nerve- Superior Laryngeal Nerve
  - Artery- Right Subclavian, Aortic arch

- Fourth Pouch- superior parathyroid glands and parafollicular thyroid cells
Branchial system

- Sixth Branchial Arch
  - Muscles: remaining laryngeal musculature
  - Nerve: Recurrent Laryngeal Nerve
  - Artery: Pulmonary Artery and ductus arteriosus
Branchial system

- Epipericardial ridge- mesodermal elements of the sternocleidomastoid, trapezius, and lingual and infrahyoid musculature.
  - Nerve- hypoglossal and spinal accessory nerve
- Cervical Sinus of His
Thyroid Gland

- Endoderm of the floor of mouth between the 1\textsuperscript{st} and 2\textsuperscript{nd} arches.
- Descends as a bilobed diverticulum from the foramen cecum
First Branchial Cleft Cysts

- Type I
  - Ectodermal Duplication anomaly of the EAC with squamous epithelium only.
  - Parallel to the EAC
  - Pretragal, post auricular
  - Surgical Excision
First Branchial Cleft Cysts

- Type II
  - Squamous epithelium and other ectodermal components
  - Anterior neck, superior to hyoid bone.
  - Courses over the mandible and through the parotid in variable position to the Facial Nerve.
  - Terminates near the EAC bony-cartilaginous junction.
  - Surgical excision- superficial parotidectomy
Second Branchial Cleft Cysts

- Most Common (90%) branchial anomaly
- Painless, fluctuant mass in anterior triangle
- Inferior-middle 2/3 junction of SCM, deep to platysma, lateral to IX, X, XII, between the internal and external carotid and terminate in the tonsillar fossa
- Surgical treatment may include tonsillectomy
Fourth Branchial Cleft Cysts

Courses from pyriform sinus caudal to superior laryngeal nerve, to emerge near the cricothyroid joint, and descend superficial to the recurrent laryngeal nerve.
Thyroglossal Duct Cyst

- Most common congenital midline mass
- Ectopic thyroid tissue vs. thyroglossal duct cyst
- Asymptomatic mass at or below the hyoid bone that elevates with tongue protrusion.

- Ultrasound

- Thyroid Scan in patients that do not demonstrate a normal thyroid by US.
Thyroglossal Duct Cyst

- Simple Excision leads to high recurrence rate
- Sistrunk Procedure
- Patients at high risk for recurrence - Modified Sistrunk Procedure
Cervical Thymic Cysts

- Failure of involution of the cervical thymopharyngeal ducts.
- Firm, mobile masses found in the lower aspects of the neck.
- CXR, CT scan
Dermoid and Teratoid Cysts

- Developmental anomalies composed of different germ cell layers.
- Isolation of pluripotent stem cells or closure of germ cell layers within points of failed embryonic fusion lines.
- Classified according to composition.
Dermoid Cysts

- Mesoderm and Ectoderm
- Midline, paramedian, painless masses that usually do not elevate with tongue protrusion.
- Commonly misdiagnosed as Thyroglossal Duct Cysts.
- Treatment is simple surgical excision
Teratoid Cysts and Teratomas

- All three germ cell layers - Endoderm, mesoderm and ectoderm.
- Larger midline masses, present earlier in life.
- 20% associated maternal polyhydramnios.
- Unlike adult teratomas, they rarely demonstrate malignant degeneration.
- Surgical excision.
Laryngoceles

- Congenitally from an enlarged laryngeal saccule.
- Classified as internal, external, or both
- Internal
  - Confined to larynx, usually involves the false cord and aryepiglottic fold.
  - Hoarseness and respiratory distress vs. neck mass.
Laryngoceles

- **External and Combined Laryngoceles**
  - Soft, compressible, lateral neck mass that distends with increases in intralaryngeal pressures.
  - Through the thyrohyoid membrane at the entrance of the Superior Laryngeal Nerve.
- CT scan
- Asymptomatic vs. Symptomatic laryngoceles.
Vascular Lesions

- Hemangiomas are the most common pediatric tumor.

- Rapid Growth, quiescence, involution.
  - Not present at birth
  - 70% resolution by age 7.

- CT w/ contrast or MRI w/ Gadolinium.

- If associated w/ stridor, must rule out Subglottic hemangioma.
Lymphangiomatas

- Classified as capillary, cavernous, and cystic
- Large, soft, compressible masses
- Posterior vs. anterior triangle location
- CT scan
- Spontaneous regression is rare and surgical excision is the treatment of choice.
Plunging Ranula

- Simple ranula - unilateral oral cavity cystic lesion.
- Plunging ranula - pierce the mylohyoid to present as a paramedian or lateral neck mass.
- Cyst aspirate - high protein, amylase levels
- CT scan/MRI
- Treatment is intra-oral excision to include the sublingual gland of origin.
Sternomastoid Tumor of Infancy (Pseudotumor)

- Firm mass of the SCM, chin turned away and head tilted toward the mass.
- Hematoma with subsequent fibrotic replacement.
- Ultrasound
- Physical therapy is very successful.
- Myoplasty of the SCM only if refractory to PT.
Infectious and Inflammatory Lesions

- 40% of infants have palpable LAD
- 55% of pediatric patients.
- Most commonly involving the submandibular and deep cervical nodes.
Bacterial Cervical Adenitis

- Tender, enlarged nodes
- Organisms: *Staphylococcus*, *Group A Streptococcus*
- Treatment: Beta-lactamase resistant antibiotic
- Fine Needle Aspiration
Deep Space Neck Abscess

- Most commonly involves the retropharyngeal and parapharyngeal spaces.
- Polymicrobial Organisms
- CT scan
- Intra-oral vs. External surgical drainage.
- Lemierre’s syndrome
  - *Fusobacterium necrophorum*
Tuberculous Mycobacteria

- Classically present with a single enlarged node, fevers, malaise.
- PPD is usually strongly reactive.
- CXR to rule out pulmonary disease.
- Treatment is similar to pulmonary TB
  - 3-6 months of isoniazid, ethambutol, streptomycin, rifampin combination therapy
Nontuberculous Mycobacteria

- More common than tuberculous mycobacteria
- Atypical presentations - usually without fever or systemic symptoms.
- CXR rarely positive.
- PPD is usually normal to intermediate reactivity.
- Treatment is less definitive.
Cat Scratch Disease

- *Bartonella henselae*
- Fever, malaise, cervical LAD
- Warthin-Starry Stain- pleomorphic gram negative rods
- 10% of patients may require I&D
- Antibiotic therapy is anecdotal.
Viral Adenitis

- Most common infectious process in the neck.
- Rhinovirus, adenovirus, enterovirus.
Infectious Mononucleosis

- Ebstein Barr Virus
- Exudative, necrotic tonsillitis
- Heterophile Antibodies, EBV IgG & IgM
- CMV/HIV can present with similar cervical lymphadenopathy.
Kawasaki Syndrome

- Multisystem vasculitis of unknown etiology
- Diagnosis includes 5 of 6 criteria:
  - Fever >5 days, conjunctival injection, reddening/desquamation of palms/soles, injected oral cavity, polymorphous rash, cervical LAD
- Permanent Cardiac Damage in 20% of untreated cases.
- Treatment in the acute phase is with high dose aspirins and immunoglobulins.
Bibliography