Pediatric Head and Neck
Lumps and Bumps

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Disclosure

I do not have any commercial interests.
Objectives

• To discuss the management of congenital pediatric head and neck masses with special focus on embryological surgery

• To understand the surgical management of pediatric thyroid disorders

• To develop an understanding of the surgical aspects of pediatric tracheostomy.

Kids are not just little adults...

• Variation in sizes
• Dynamic development physiology
• Longer life expectancy
Pediatric Neck Masses

- midline
  - Thyroglossal duct cyst
  - Dermoid cyst
  - Plunging ranula
  - Thymic cyst
  - Teratoma of the neck

- lateral
  - branchial cleft
  - lymphangioma
  - lymph node
  - salivary gland
Embryology
Thyroglossal Duct Cysts

- Thyroid primordium passes anterior, posterior or through hyoid bone
- May form cysts and fistulas at any site along this route
- Present since birth
- Moves upwards with protrusion of tongue
- Rapidly enlarges in URTI
- Filled with Mucoid

Management

- Perform a Ultrasound/CT scan to look for thyroid
- Surgery
- Sistrunks operation:
  - Cyst
  - Tract
  - Central portion of the hyoid
  - Cuff of muscle from the tongue base
- Major complication: Recurrence
- Recurrence drops to 3% from 50%, if Sistrunks performed.
**Treatment**

**Congenital Neck Masses - Midline Dermoid Cyst**

- Present from birth
- Ectoderm and mesoderm
- Anywhere in neck, 23% in FOM
- May enlarge rapidly after URTI
- Does NOT elevate with tongue
- Excision of cyst only
- Filled with keratinous material
**Congenital Neck Masses- Midline**  
**Plunging Ranula**

- Extravasation pseudocyst of blocked *sublingual gland*

**Dx**
- CT or MRI* (T2 best)

**Tx**
- Transoral excision  
  (Resect the sublingual gland)

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**Congenital Neck Masses-Lateral**  
**Embryology of lateral neck**
## Congenital Neck Masses - Lateral

<table>
<thead>
<tr>
<th>Arch</th>
<th>Nerve</th>
<th>Muscle</th>
<th>Skeletal structure</th>
<th>Artery</th>
</tr>
</thead>
<tbody>
<tr>
<td>First (mandibular)</td>
<td>Trigeminal (V)</td>
<td>Mastication muscles, mylohyoid, ant. Digestive, tensor tympani, tensor veli palati</td>
<td>Muscles, Incus, portion of mandible</td>
<td>Maxillary</td>
</tr>
<tr>
<td>Second (hyoid)</td>
<td>Facial (VII)</td>
<td>Facial expression muscles, stapedius, stylohyoid, post. Digestive</td>
<td>Stapes, styloid, lesser cornu hyoid, upper body hyoid</td>
<td>Stapedial</td>
</tr>
<tr>
<td>Third</td>
<td>Glossopharyngeal (IX)</td>
<td>Stylopharyngeus</td>
<td>Greater cornu hyoid, lower body hyoid</td>
<td>Common and internal carotid</td>
</tr>
<tr>
<td>Fourth</td>
<td>Superior laryngeal (X)</td>
<td>Cricotrachealis of pharynx, cricothyroid</td>
<td>Laryngeal cartilages</td>
<td>Subclavian on right; Arch of aorta on left</td>
</tr>
<tr>
<td>Sixth</td>
<td>Recurrent laryngeal (X)</td>
<td>Intrinsic laryngeal muscles</td>
<td>Laryngeal cartilages</td>
<td>Pulmonary artery on right, ductus arterioso on left</td>
</tr>
</tbody>
</table>

## Branchial Cleft Anomalies

- Can present as cysts, sinuses and fistulae
- 2-3% are bilateral
- 2\textsuperscript{nd} cleft cyst is the most common type
  - ~95% of cases

### Cysts
- Presentation - Middle age (10-30 y.o.)
- F=M
- 2x more common than fistulas & sinuses combined

### Sinuses & Fistulas
- Presentation - Childhood (<10 yrs old)
- F>M (2:1)
- 1/3 bilateral
- 3rd & 4th branchial sinuses & fistulae
  - Left >>> Right (unknown why)
Course of a Branchial Anomaly

• **Inferior and medial** to the structures derived from the corresponding arch

• **Superior and lateral** to the structures derived from the following arch

• **All anomalies lie deep to the platsma**
  • Derived from the 2nd arch downgrowth (operculum) that forms the cervical sinus of His and buries the rest of the arch structures

• **All pass superior to CN 12**
  • Not associated with the branchial apparatus
  • Develops inferior to all arches

1\text{st} Branchial Cleft Cyst

• **Work Classification**
  • **Type I**
    • Preauricular mass
    • Ectoderm
    • Sinus tract is anterior and medial to the EAC
      • Preauricular region $\rightarrow$ Lateral to CN VII $\rightarrow$ Parallels EAC $\rightarrow$ Ends in EAC or middle ear

• **Type II**
  • More common than Type I
  • Presents at the angle of mandible or submandibular region
    • Angle of mandible $\rightarrow$ Lateral or medial to CN VII $\rightarrow$ Ends in concha or bony-cartilaginous junction of EAC.
Management - 1st Branchial Anomaly

- **Preservation of CN 7**
  - Standard parotidectomy approach
  - Landmarks such as the tragal pointer may be abnormal and can not be relied upon to locate CN 7
  - Facial nerve monitoring
    Recommended for cases of recurrent infection and multiple previous excisions

2nd Branchial Anomalies

- Most common branchial cyst
- Presents as a mass just anterior and medial to the SCM in the neck
- **Tract**
  - Anterior neck -> Along carotid sheath -> Between external and internal carotid arteries -> **superficial** to CN IX and XII -> Opens into tonsillar fossa
3rd Branchial Anomalies

- Closely associated with the thyroid gland
  - If patient with recurrent thyroid abscesses, consider diagnosis

- Usually on the left

- Tract:
  - Lateral neck (similar or lower location than 2nd) -> Deep to carotids -> **Deep** CN IX, superficial to CN XII, **Superficial** to superior laryngeal nerve -> Pierces thyrohyoid membrane -> Opens into apex of pyriform sinus
Endoscopic Cauterization of Pyriform Sinus Opening

- Literature describes this for treatment of 4th sinus tracts, but has been performed with 3rd cleft anomalies

- Recommendation
  - Performed alone
  - Performed with surgical resection of cyst and tract

4th Branchial Anomalies

- Sinus/fistula theoretical tract
  - Ascends posteriorly along the common carotid artery
  - Loops over CN 12
  - Passes medial to the ICA & ECA
  - Descends into mediastinum medial to the common carotid artery
    - Left - Loops under aortic arch
    - Right - Loops under subclavian artery
4th Branchial Anomalies

- Ascends just lateral to the RLN (6th arch structure)
- Enters pharynx Inf to the thyroid cartilage (4th arch structure) and Sup to the cricoid cartilage (6th arch structure)
- Fistula opens into apex of piriform sinus or upper esophagus

- Cyst
  - Anywhere along tract

Does 4th Branchial Anomalies Exist?

- Controversy as to whether 4th branchial anomalies exist
  - Some recommend all piriform fistulas to be classified as 3rd pouch remnants

- Never been report of a complete tract (only postulated)

- Both 3rd & 4th anomalies enter piriform sinus
  - The piriform sinus is derived from the 3rd & 4th pouches

- Ectopic thymic and parathyroid tissue has been reported in conjunction with the tracts
  - Thymopharyngeal duct (3rd) vs Pharyngobranchial duct (4th)
Does 4th Branchial Anomalies Exist?

- Distinguishing 3rd from 4th branchial anomalies
  - Presence of thyroid tissue in the wall of tract
    Lateral thyroid rests support hypothesis of 4th pouch origin

- Location of the sinus opening in the piriform fossa
  4th - Apex of piriform or upper esophagus
  3rd - More superiorly in piriform

Hemangioma

- Most common HN neoplasm in children
- Cutaneous and mucosal
- Present first few months, grow 12 mos

Dx
- CT or MRI
- Bronchoscopy if stridor or beard distribution

Tx
- Observation - 90% involute eventually
- Propranol or sx if involve vision, eating etc.
Management of Thyroid Nodule in Children

Incidence

<table>
<thead>
<tr>
<th>Thyroid Nodule</th>
<th>&lt; 21 Years</th>
<th>Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palpable</td>
<td>0.05-1.8%</td>
<td>5%</td>
</tr>
<tr>
<td>Autopsy</td>
<td>13%</td>
<td>70%</td>
</tr>
<tr>
<td>Malignant</td>
<td>30-50%</td>
<td>5%</td>
</tr>
</tbody>
</table>
Causes of Thyroid Nodularity

**Benign**
- Follicular Adenomas
- Multinodular goiter (colloid adenoma)
- Hashimoto’s thyroiditis
- Cysts (colloid, simple, hemorrhagic)

**Malignant**
- Papillary Carcinoma
- Follicular Carcinoma
- Medullary Carcinoma
- Anaplastic carcinoma
- Primary lymphoma of the thyroid
- Metastatic carcinoma (breast & renal cell carcinoma)

Risk Factors for malignancy in children

- Female Sex
- Head and Neck radiation (x 10)
- Familial Thyroid Cancer
  - 5%
  - Medullary Carcinoma
    - MEN 2
    - Cowden's disease
    - Carney's complex
    - Familial Adenomatous Polyposis (FAP)
H and P

- Thyroid nodule
- Incidentaloma
- S/S: Hypo/Hyper
- Compression: Dysphagia, Change in Voice

A fiberoptic laryngoscopy is recommended in patients with a thyroid nodule.

EVALUATION

- TSH
  - HIGH → T4, Rx → FNAC
  - NORMAL → FNAC
  - LOW → SCAN

ULTRASOUND
Ultrasound Anatomy of Normal Thyroid gland

Ultrasound features suggestive of malignancy

<table>
<thead>
<tr>
<th>TABLE 2</th>
<th>Ultrasoundographic criteria for thyroid cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criterion</td>
<td>Positive predictive value (%)</td>
</tr>
<tr>
<td>Hypoechoic area</td>
<td>74-84</td>
</tr>
<tr>
<td>Microcalcifications</td>
<td>42-94</td>
</tr>
<tr>
<td>Poorly demarcated border / no halo effect</td>
<td>39-98</td>
</tr>
<tr>
<td>Intranodular vascularity</td>
<td>86-97</td>
</tr>
</tbody>
</table>

*Probability that thyroid cancer will be diagnosed if the criterion is met
**Probability that thyroid cancer will be ruled out if the criterion is not met (9)
FINE NEEDLE ASPIRATION BIOPSY
(Bethesda Classification)

**Table 21**
The Bethesda System for Reporting Thyroid Cytopathology: Implied Risk of Malignancy and Recommended Clinical Management

<table>
<thead>
<tr>
<th>Diagnostic Category</th>
<th>Risk of Malignancy (%)</th>
<th>Usual Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nondiagnostic or Unsatisfactory</td>
<td>1-4</td>
<td>Repeat FNA with ultrasound guidance</td>
</tr>
<tr>
<td>Benign</td>
<td>0-3</td>
<td>Clinical follow-up</td>
</tr>
<tr>
<td>Atypia of Undetermined Significance or Follicular Lesion of Undetermined Significance</td>
<td>4-15*</td>
<td>Repeat FNA</td>
</tr>
<tr>
<td>Follicular Neoplasm of Suspicious for a Follicular Neoplasm</td>
<td>15-20</td>
<td>Surgical lobectomy</td>
</tr>
<tr>
<td>Suspicious for Malignancy</td>
<td>40-75</td>
<td>Near-total thyroidectomy or surgical lobectomy</td>
</tr>
<tr>
<td>Malignant</td>
<td>97-99</td>
<td>Near-total thyroidectomy*</td>
</tr>
</tbody>
</table>

FNA, Fine-needle aspiration.
*Adapted with permission from Ah and Chen.
†Atrial management may depend on factors (eg, clinical, sonographic) besides the FNA interpretation.
‡Estimates extrapolated from histopathologic data from patients with “suspicious for malignancy.”
§In the case of “Suspicious for metastatic tumor” or a “Malignant” interpretation indicating metastatic tumor rather than a primary thyroid malignancy, surgery may not be indicated.