Evaluation of a Neck Mass

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Outline
- Anatomy of the neck
- Important questions to ask about history
- How to examine the patient with a neck mass
- Differential diagnosis based on location
- Differential diagnosis based on etiology/pathophysiology
- Imaging/diagnostic tests
- Evaluation of incidentally discovered thyroid nodules

Goals
- Understand the anatomy and zones of the neck
- Know the “important stuff” to ask in the history
- Understand how to examine the patient presenting with a neck mass
- Be able to formulate a differential diagnosis based on location of the mass
- Know what kind of imaging to obtain for further work-up
- Know what to do when you find a thyroid nodule on physical exam or incidentally on another imaging modality
Zones of Lateral and Central Neck

Mass in the Neck
- First diagnostic modalities are a good history and physical examination
- Mass excision is NOT the first step
- Timing of FNA biopsy and CT scans: do imaging first so potential bleeding doesn’t confuse the imaging
- Know the imaging capabilities of your hospital and use the best that is offered
- CT: good anatomy, bone structure; MRI: soft tissue detail, skull base tumors; Sonograms: cheap

History
- How old are you? > 40 years, look for cancer!
- How long has the mass been there?
- Did it develop suddenly or over a period of time?
- Is the mass painful? Ear pain?
- Do you have any tooth pain or poor dentition?
- Are you having any difficulty swallowing?
- Is there any history of trauma?
- Is there just one mass present or more than one?
- Have you had any fevers or chills?
- Have you had a similar mass in the past?
- Are you having any trouble breathing?
- Hemoptysis?
- Has there been a change in your voice?
- Is there any history of cancer?
- Have you had any recent surgery involving the neck?
- Do you have a history of tobacco or alcohol use?
Physical Exam
- The mass should be palpated and its quality assessed
- Is it firm, matted, non-tender and fixed?
- Or is it mobile and fleshy?
- Is it tender, surrounding erythema/skin changes, fluctuance, or the sensation of fluid?
- Are there multiple lesions?

Cervical Lymph Nodes
- Oral examination (headlight needed)
- Lips, gingivae, retromolar trigone, teeth, hard palate, cheek mucosa, mobile tongue, floor of the mouth.
Diagnostic Pearls
- 90% of pediatric masses are inflammatory
- 90% of adult masses are metastatic
- Rule of 80% (for non-thyroid neck masses in adults)
  - 80% are neoplasms
  - 80% are malignant
  - 80% of parotid tumors are benign
  - 80% of parotid tumors are mixed tumors

Differential Dx: By Location
- Midline
  - Thyroid nodule/cancer
  - Thyroglossal duct cyst
- Lateral
  - Hyperplastic lymph node
  - Branchial cleft cyst
  - Metastatic thyroid cancer
  - Vascular anomaly
  - Lipoma
  - Carotid body tumor
  - Metastases from unknown primary

Differential Dx: By Location
- Parotid
  - Cystic hygroma, hemangioma, lymphadenitis, parotitis, lymphoma, neoplasm, sjögren syndrome
- Post-auricular
  - Lymphadenitis, branchial cleft cyst (1st), epidermal cyst
- Submental
  - Lymphadenitis, cystic hygroma, thyroglossal duct cyst, dermoid, sialadenitis
- Submandibular
  - Lymphadenitis, cystic hygroma, neoplasm, sialadenitis, sialolithiasis, sialoceles
**Differential Dx: By Location**

- **Sternocleidomastoid**
  - Lymphadenitis, branchial cleft cyst (2nd, 3rd)
- **Supraclavicular**
  - Cystic hygroma, lipoma, lymphoma, metastasis, normal fat-pad, cervical rib, scoliosis, pneumatocele of upper lobe
- **Suprasternal**
  - Thyroid, lipoma, dermoid, thymus, mediastinal mass

**Breakdown by Etiology**

<table>
<thead>
<tr>
<th>Table 1. Common Neck Masses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Neoplastic</strong></td>
</tr>
<tr>
<td>Thyroid</td>
</tr>
<tr>
<td>Adenoma</td>
</tr>
<tr>
<td>Larynx</td>
</tr>
<tr>
<td>Angioma</td>
</tr>
<tr>
<td>Chordoma</td>
</tr>
<tr>
<td>Endothelial</td>
</tr>
<tr>
<td>Hemangioma</td>
</tr>
<tr>
<td>Medulloblastoma</td>
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<tr>
<td>Plasmacytoma</td>
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</table>

**Congenital**

- Branchial cleft cysts: 20% of pediatric masses
- Thyroglossal duct cysts: 40% diagnosed during adulthood
- Hemangioma
- Laryngocele
- Ranula
- Teratoma cyst
- Dermoid cyst
- Thymic cyst
Branchial Cleft Cyst Tracks

- **1st**
  - Type I: located near the external auditory canal, usually inferior and posterior to the tragus (base of the ear)
  - Type II: at the angle of the mandible and may involve the submandibular gland
- **2nd (95%)**: skin of the lateral neck, between the internal and external carotid arteries, and into the palatine tonsil; anterior border of SCM
- **3rd**: skin of lateral neck, posterior to carotid arteries, pierces thyrohyoid membrane to enter the larynx, terminates on the lateral aspect of the pyriform sinus; deep to SCM
- **4th**: skin of lateral neck, follows recurrent laryngeal nerve (around the aorta on the left and around the subclavian artery on the right), ends at pyriform sinus

Branchial Cleft Cyst

- Most (95%) from 2nd branchial cleft
- Manifests as a sinus, fistula, or cyst
- Nontender, smooth, round mass located along the anterior border of, or just deep to, the sternocleidomastoid muscle
- Kids: acute and painful enlargement of the cysts secondary to an upper respiratory infection

Thyroglossal Duct Cyst

- 70% of all congenital neck masses
- Cystic remnant along the course of the thyroglossal duct between the foramen cecum of the tongue base and the thyroid
- 50% of patients present before 20 years old
- Midline mass just below hyoid bone
- Asymptomatic, infection, 1-2% malignancy rate
Other Congenital Neck Masses
- Hemangioma
- Laryngocele: herniation of the saccule of supraglottic larynx; external laryngocele can protrude through thyrohyoid membrane and present as an anterior neck mass. Glassblower?
- Ranula: mucocele from obstruction of sublingual glands; submental mass extending from floor of mouth
- Teratoma
- Dermoid
- Thyroid cyst

Inflammatory
- Lymphadenopathy
  - Viral: mono, EBV, HIV
  - Bacterial: staphylococcus, TB, cat scratch (Bartonella)
  - Parasitic
  - Fungal: histoplasmosis, blastomycosis, coccidiomycosis
  - Granulomatous: sarcoid, foreign body reaction
- Two week trial of antibiotics
- Follow-up for further investigation

Neoplastic
- Thyroid/parathyroid
- Salivary glands
- Carotid body tumor
- Schwannoma
- Lymphoma
- Lipoma
- Epidermoid inclusion cyst
- Metastatic squamous cell carcinoma
- Virchow’s node
Thyroid/Parathyroid
- Thyroid nodules
  - VERY common
- Compressive symptoms?
  - Dysphasia
  - Choking sensation when supine
  - Hoarseness
- Family history of thyroid cancer?
- Radiation exposure?
- More on this later...
- Parathyroid adenoma
  - Rare to palpate

Salivary Gland Neoplasms
- 80% in parotid gland, 80% benign
- 10-15% in submandibular gland, 50% benign
- Rest in minor salivary glands, < 40% benign
- Benign:Malignant ratios
  - Parotid: 3:1
  - Submandibular: 1:1
  - Minor and sublingual: 1:9

Salivary Gland Neoplasms
- Parotid gland
  - Pleomorphic adenoma: 53%, benign BUT undergo malignant transformation after 10 years (Carcinoma ex pleomorphic adenoma = BAD player)
  - Warthin’s tumor: 28%, benign, older men, smokers, 10% bilateral, tail of parotid (more women recently)
  - Mucoepidermoid carcinoma: 9%
  - Adenocarcinoma: 1.5%
- Submandibular gland
  - Pleomorphic adenoma: 36%
  - Adenoid cystic carcinoma: 25%
  - Mucoepidermoid carcinoma: 12%
Carotid Body Tumor

- Develops within adventitia of medial aspect of carotid bifurcation
- Sporadic: 85%
- Familial: 10-50%
- Hyperplastic form common in chronic hypoxia, COPD
- 5% bilateral
- 5-10% malignant (more so in familial)
- Slow-growing, fixed mass
- Usually asymptomatic unless a functional CBT (rare): palpitations, paroxysmal HTN, diaphoresis
- May compresses carotid artery/nerve: pain, tongue paresis, hoarseness, Horner syndrome, dysphasia
- May hear bruit
- Pulsatile mass

Schwannoma

- Benign, slow-growing, encapsulated nerve sheath tumor composed of Schwann cells
- Most commonly involves the vagus nerve and cervical sympathetic chain

Lymphoma

- Most Non-Hodgkin Lymphoma (NHL): 85%
- Most NHLs are from B-cell: 85%
- Median age of Dx: 50-60 years
- Painless lymphadenopathy
- “B symptoms”: extranodal involvement: fevers, night sweats, unexplained weight loss
- Splenomegaly?
- Hepatomegaly?
- Abdominal mass? Burkitt lymphoma
Subcutaneous Masses

- Lipoma
- Epidermoid inclusion cyst (keratinous cyst): trapped keratin within pseudoepithelium
- Sebaceous cysts

Metastatic SCC

- Nasopharynx
- Nasopharynx, oral cavity, pharynx or larynx
- Nasopharynx, oral cavity, pharynx, larynx
- Thyroid, nasopharynx

Virchow’s Node

- Firm, fixed supraclavicular lymph node (level IV)
- Metastatic breast cancer
- Metastatic gastric cancer
Imaging/Diagnostic Tests

- **Imaging**
  - **Ultrasonography (US):** no radiation, inexpensive!
  - Computed tomography (CT): bones, anatomical planes
  - Magnetic resonance imaging (MRI): soft tissues, skull base

- **Diagnosis**
  - Ultrasound-guided fine needle aspiration (FNA)
  - Incisional biopsy
  - Resection

Thyroid nodules

- Found on physical exam
- Found incidentally on other imaging studies (carotid duplex, MRI C-spine, trauma CT head/neck)
- What do we do with these?

Background

- Incidence of thyroid cancer is increasing in the U.S. - 56,460 estimated new cases for 2012
- Since 2004, incidence rates have been increasing by 5.5% per year in men and 6.6% per year in women

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Mt. Sinai Hospital/University of Toronto

Outcomes of incidentally discovered thyroid nodules referred to a high-volume head and neck surgeon

Tomasz S. Koniar, MD - Dept. of Surgery, Maimonides Medical Center, Brooklyn, NY
Department of Surgery, McGill University, Montreal, QC, Canada


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Background

- Incidence of thyroid cancer is increasing in the U.S. - 56,460 estimated new cases for 2012
- Since 2004, incidence rates have been increasing by 5.5% per year in men and 6.6% per year in women

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Mt. Sinai Hospital/University of Toronto

Background

- Incidence of incidental thyroid nodules
  - US for parathyroid disease: 46%\(^1\)
  - Cross-sectional imaging (CT and MRI): 16%\(^2,3\)
  - US for carotid disease: 9-13%\(^4,5\)
  - PET scans: 2-3%\(^6,8\)

Methods

- 729 new patients referred a single surgeon for a thyroid nodule were reviewed between February 2009 and January 2011
- 133 patients referred for an incidental thyroid nodule/s per documented history
Study Group

- 133 /729 patients (18.2%) were found to have an incidental thyroid nodule
- 133 patients: 29% male, 71% female
- Mean age: 50 years

Referral Pattern

<table>
<thead>
<tr>
<th>Referring physician</th>
<th>No. of patients</th>
<th>% of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Care Physician</td>
<td>69</td>
<td>52</td>
</tr>
<tr>
<td>Endocrinologist</td>
<td>33</td>
<td>25</td>
</tr>
<tr>
<td>Otolaryngologist</td>
<td>24</td>
<td>18</td>
</tr>
<tr>
<td>Other*</td>
<td>7</td>
<td>5</td>
</tr>
</tbody>
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* obstetric-gynecologist, neurologist, neurosurgeon, cardiologist, emergency physician.

Radiologic Imaging Modality

<table>
<thead>
<tr>
<th>Imaging modality</th>
<th>No. of patients</th>
<th>% of patients</th>
<th>% malignant</th>
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<tbody>
<tr>
<td>Ultrasound</td>
<td>109</td>
<td>82</td>
<td>28</td>
</tr>
<tr>
<td>CT</td>
<td>13</td>
<td>9</td>
<td>38</td>
</tr>
<tr>
<td>MRI</td>
<td>8</td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td>Chest X-ray</td>
<td>4</td>
<td>3</td>
<td>0</td>
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</table>

CT: computed tomography; MRI, magnetic resonance imaging.
### Reason for Imaging

<table>
<thead>
<tr>
<th>Reason</th>
<th>No. of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thyroid dysfunction</td>
<td>21</td>
</tr>
<tr>
<td>Neck discomfort</td>
<td>18</td>
</tr>
<tr>
<td>Lateral neck mass</td>
<td>14</td>
</tr>
<tr>
<td>Dysphagia</td>
<td>11</td>
</tr>
<tr>
<td>Globe sensation</td>
<td>11</td>
</tr>
<tr>
<td>Fatigue</td>
<td>5</td>
</tr>
<tr>
<td>Shortness of breath</td>
<td>7</td>
</tr>
<tr>
<td>Carotid US</td>
<td>6</td>
</tr>
<tr>
<td>Hyperparathyroid</td>
<td>5</td>
</tr>
<tr>
<td>Hoarseness</td>
<td>5</td>
</tr>
</tbody>
</table>

### FNA Results

<table>
<thead>
<tr>
<th>Biopsy classification</th>
<th>FNA diagnosis</th>
<th>No. of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malignant</td>
<td>Papillary thyroid cancer</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Medullary thyroid cancer</td>
<td>1</td>
</tr>
<tr>
<td>Indeterminate</td>
<td>Suspicious for PTC</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Follicular neoplasm</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Hurthle cell neoplasm</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>AUS/FLUS</td>
<td>21</td>
</tr>
<tr>
<td>Benign</td>
<td>Colloid/hyperplastic nodule, thyroiditis</td>
<td>41</td>
</tr>
<tr>
<td>Nondiagnostic</td>
<td>Insufficient</td>
<td>9</td>
</tr>
</tbody>
</table>

### Surgical Management and Final Pathology

<table>
<thead>
<tr>
<th>Variable</th>
<th>Type</th>
<th>No. of patients</th>
<th>% of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgery</td>
<td>TT</td>
<td>32</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td>TT + CHD</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>TT + CHD + ULND</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>TT + CHD + BLND</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>ST</td>
<td>9</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Neck exploration</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
### Surgical Pathology

<table>
<thead>
<tr>
<th>Pathology</th>
<th>No. of patients</th>
<th>% of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTC</td>
<td>23</td>
<td>42</td>
</tr>
<tr>
<td>Papillary microcarcinoma</td>
<td>13</td>
<td>24</td>
</tr>
<tr>
<td>MTC</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Dedifferentiated</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Benign</td>
<td>16</td>
<td>30</td>
</tr>
</tbody>
</table>

PTC, papillary thyroid cancer; MTC, medullary thyroid carcinoma.

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### Results- Summary

- 18% of all referrals for thyroid nodules were picked up incidentally
- Most referred from PCP
- US by far most common imaging modality
- Thyroid dysfunction and neck discomfort most common reasons for imaging
- 41% managed surgically with 29% found to have thyroid cancer on final surgical pathology

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### Conclusion

- Our malignancy rate (29%) is at the high end of reported malignancy rates of incidentally-discovered thyroid nodules, ranging from 8% to 29%.
- Incidental thyroid nodules should be evaluated in the same fashion as a palpable thyroid nodule, according to the ATA guidelines.
- Many can be observed and followed with serial ultrasounds.

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American Thyroid Association
Guidelines: Bottom Line

- If you palpate a thyroid nodule or find one incidentally on a CT, MRI, Carotid Duplex US
  - Thyroid US
  - TSH
  - Referral to head and neck surgeon or endocrinologist for further work-up
- FNA usually indicated if a solid nodule > 1cm
- FNA indicated if < 1cm with concerning US features such as irregular borders or stippled calcifications

Questions/Comments?

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