Imaging Evaluation of the Pediatric Neck Mass

Nucharin Supakul, MD
Riley Hospital for Children
Indiana University School of Medicine, USA
AIMC, Ramathibodi Hospital, Thailand
March 23, 2018
Nothing to Disclose
“Believe you can and you’re halfway there.”

– Theodore Roosevelt
Outline

- What are our choices?
- How to choose proper imaging modality and design proper protocol?
- Challenging cases
What are our choices?
Plain radiograph
- Lateral soft tissue neck
- Calcification?

Computed Tomography (CT):
- **Pros**: widely available, no sedation needed
- **Cons**: radiation exposure

Magnetic Resonance Imaging (MRI)
- **Pros**: high tissue resolution
- **Cons**: not widely available, need sedation/ GA

Ultrasound (US)
- Operator dependent
- Cystic vs Solid
- Flow vascularity

What are our choices?
As Low as Reasonably Achievable

**Rational:**
- Don’t do exams that are not indicated.
- Choose non-ionizing radiation when possible.
- When doing the exams using radiation, tailor to clinical question and size of child.

**Why?**
- Children: unique
- Much more sensitive to radiation induced cancer than adults
- Younger: more sensitive
- Girls more sensitive than boys (breast)
Proper Imaging technique and protocol
## ACR Appropriateness Criteria (revised 2012)

### Variant 6: Child (up to age 14) presenting with a solitary neck mass or multiple neck masses (afebrile).

<table>
<thead>
<tr>
<th>Radiologic Procedure</th>
<th>Rating</th>
<th>Comments</th>
<th>RRL*</th>
</tr>
</thead>
<tbody>
<tr>
<td>US neck</td>
<td>9</td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>CT neck with contrast</td>
<td>8</td>
<td></td>
<td>⭐⭐⭐⭐⭐</td>
</tr>
<tr>
<td>MRI neck without and with contrast</td>
<td>7</td>
<td>See statement regarding contrast in text under “Anticipated Exceptions.”</td>
<td>O</td>
</tr>
<tr>
<td>MRI neck without contrast</td>
<td>6</td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>CT neck without contrast</td>
<td>5</td>
<td></td>
<td>⭐⭐⭐⭐⭐</td>
</tr>
<tr>
<td>CT neck without and with contrast</td>
<td>2</td>
<td></td>
<td>⭐⭐⭐⭐⭐</td>
</tr>
<tr>
<td>CTA neck with contrast</td>
<td>2</td>
<td></td>
<td>⭐⭐⭐⭐⭐</td>
</tr>
<tr>
<td>MRA neck without and with contrast</td>
<td>2</td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>MRA neck without contrast</td>
<td>2</td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>Arteriography cervicocerebral</td>
<td>1</td>
<td></td>
<td>⭐⭐⭐⭐⭐</td>
</tr>
<tr>
<td>FDG-PET/CT neck</td>
<td>1</td>
<td></td>
<td>⭐⭐⭐⭐⭐</td>
</tr>
</tbody>
</table>

**Rating Scale:** 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate

*Relative Radiation Level*
# ACR Appropriateness Criteria (revised 2012)

## Clinical Condition:
Neck Mass/Adenopathy

**Variant 7:**
Child (up to age 14) presenting with a solitary neck mass (febrile).

<table>
<thead>
<tr>
<th>Radiologic Procedure</th>
<th>Rating</th>
<th>Comments</th>
<th>RRL*</th>
</tr>
</thead>
<tbody>
<tr>
<td>US neck</td>
<td>9</td>
<td>For palpable neck mass, except retropharyngeal, where CT would be preferred.</td>
<td>O</td>
</tr>
<tr>
<td>CT neck with contrast</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MRI neck without and with contrast</td>
<td>7</td>
<td>See statement regarding contrast in text under “Anticipated Exceptions.”</td>
<td>O</td>
</tr>
<tr>
<td>MRI neck without contrast</td>
<td>6</td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>CT neck without contrast</td>
<td>5</td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>CT neck without and with contrast</td>
<td>2</td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>CTA neck with contrast</td>
<td>2</td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>MRA neck without and with contrast</td>
<td>2</td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>MRA neck without contrast</td>
<td>2</td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>Arteriography cervicocerebral</td>
<td>1</td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>FDG-PET/CT neck</td>
<td>1</td>
<td></td>
<td>O</td>
</tr>
</tbody>
</table>

*Rating Scale: 1, 2, 3 Usually not appropriate; 4, 5, 6 May be appropriate; 7, 8, 9 Usually appropriate

*Relative Radiation Level
Team work

- Tech Note
- Marker

Super Technician

Superb Nurse

Clinical picture

Physical examination
Challenging cases
History and clinical examination

Onset

Congenital

Infection/Inflammation

Neoplasm

Associated symptoms

Location
Midline

- Thyroid
- Thyroglossal duct cyst
- Thymus
- **

Off midline/ Lateral

- Sternocleidomastoid muscle: Fibromatosis coli
- LNs: lymphadenitis, lymphoma, metastasis
- Branchial cleft cyst
- Salivary gland tumor
- **

** vascular malformation: Tran spatial
Case 1

2 month-old head tilted and palpable mass
Case 2

2-year-old, palpable midline neck mass, painless.
Case 3

3-month-old with bilateral neck swelling and fever
Case 4
4-year-old, palpable mass
Case 5

3-year-old, palpable mass
Summary

- **Modality of Choice**
  - US: Newborn, Infant
  - CT with contrast/ MRI without and with contrast

- **Protocol**
  - Team work: Super tech, superb nurse
  - Tech note, clinical picture, physical examination
  - Marker

- **Challenging cases**
  - Clinical history, onset, location
  - Midline location: Thyroid and its derivatives
  - Off midline/ lateral: Structural based (muscle, salivary gland, LN, branchial cleft cyst)
  - **Vascular malformation: Tran spatial**