Welcome to the DCMC Emergency Department Radiology case of the month!

In conjunction with our pediatric radiology specialists from ARA we hope you enjoy these monthly radiological highlights from the case files of the Emergency Department at DCMC. These cases are meant to highlight important chief complaints, cases, and radiology findings that we all encounter every day.

If you enjoy these reviews we invite you check out Pediatric Emergency Medicine Fellowship Radiology Rounds, which are currently offered quarterly and are held with the outstanding support of the pediatric radiology specialists at Austin Radiologic Association.

If you have any questions or feedback regarding the Case of the Month format, feel free to email Robert Vezzetti, MD at rmvezzetti@seton.org.

This Month: Neck swelling...quite the pain in the neck! (Yes, pun intended). Neck swelling is a common symptom that we see in the Pediatric ED and Pediatrics in general. Most of the time, it’s a self-limited process. Other times, not so much. Which patients need imaging may not be as clear-cut. Even more importantly, which imaging test to obtain. We will try to answer these questions and more...Enjoy!

PEM Fellow Conference Schedule Jan 2015

7th 9-10: Mass Casualty/Bioterrorism....Remick/Yee
10-12: Disaster Medicine Sim............Remick

14th 9-10: Vaccines/Wound Prophylaxis...Whitaker
10-11: M&M.........................Vezzetti/Gardiner
11-12: Sexual Abuse...............Woolridge

21st 9-10: TBD
10-11: Biostatistics...............Wilkinson
11-12: Toxicology Rounds..........Earp/Yanger

28th 9-11: Board Review (HEENT).....Floyed
11-12: Pediatric Cardiology I......Iyer/Ruttan
12-1: ED Staff Meeting

Guest Speaker: Dale Woolridge, MD. Univ of Arizona

All lectures are held in the DCMC Sig Auditorium unless otherwise noted. Simulations are held at UMC Brackenridge in the Clinical Education Center.

All are welcome to attend!

NEW YEAR’S FACT:
It is believed that the Babylonians were the first people to make New Year’s resolutions and since then, people have been breaking them.
It is often remarked that "Auld Lang Syne" is one of the most popular songs that nobody knows the lyrics to. "Auld Lang Syne" literally translates as "old long since" and means "times gone by." The song asks whether old friends and times will be forgotten and promises to remember people of the past with fondness, "For auld lang syne, we'll tak a cup o' kindness yet."

CASE 1: A 3 year old female presents to the Pediatric Emergency Department at DCMC with a complaint of left sided neck swelling. The swelling started last night (minimal) but this morning it was much more enlarged and has progressively become larger. There is a history of subjective fever at home. There is no history of sore throat, difficulty swallowing, cough, congestion, or trauma. There is no history of pets, travel, or sick contacts. The child is fully immunized. On exam, you find an afebrile well-appearing child who is in no acute distress. Her exam is nonfocal with the exception of swelling to an area inferior and anterior to her left ear. There is tenderness but no erythema or fluctuance. The swelling extends to, and beyond, her mandible. Her oropharynx does not show erythema or asymmetry. Her neck shows some mild, nontender, left sided cervical lymphadenopathy along the anterior chain. Is this an abscess? Is there cellulitis? What about a congenital issue, like a branchial cleft remnant? Is imaging warranted?

CASE 2: A 14 month old female is referred to the ED for an evaluation of fever to 103 for the past 4 days. She initially saw her pediatrician and was diagnosed with a viral illness. The fever persisted and her mother noted the child did not want to move her neck to the right and had decreased oral intake. She was re-evaluated by her pediatrician, who obtained bloodwork. This showed a WBC of 19; a strep test was negative, as was a chest xray. Her physician was concerned for meningitis. In the ED, she has a temp of 101 but is otherwise well-appearing and in no distress. Her exam is entirely nonfocal except for pharyngeal erythema and she is refusing to look to the right. If she does, she cries and looks quite uncomfortable. She also has shotty, questionably tender right sided lymphadenopathy without obvious edema or erythema. Does this child have meningitis? What else could be occurring? Can imaging help in this case? Chances are yes, but what test to do? Should have given this chart to the Fellow....

CASE 3: A 4 year old child comes to the Emergency Department for swelling to the left side of her neck for the past 1–2 days. She reports a fever of 102 and throat pain. She has had no travel or sick contacts and her mother denies cats/kitten exposure. On exam, she is afebrile and her vitals are otherwise appropriate for her age. Her exam is nonfocal except for tender, left sided neck swelling. There is no underlying fluctuance and there does not appear to be any erythema. Her oropharynx is clear as well. You obtain some labwork, which shows a WBC of 10 and a unremarkable differential. You wonder if this child needs any imaging, or if antibiotic treatment with close observation is appropriate. She is sent home on Augmentin, but returns 2 days later with worsening neck swelling and pain. This time, you decide that imaging may be indicated and, like other cases we have see, you wonder if an ultrasound is a good first step, or if you should jump to CT. Also, do you need to consider a different antibiotic regimen?

You’ll notice the theme here with these cases is an infectious cause of neck swelling. In future issues, we will look at non-infectious and congenital causes of neck swelling in children.

### Table - Anatomical clues to the diagnosis of neck masses

<table>
<thead>
<tr>
<th>Location/morphology of mass</th>
<th>Possible cause</th>
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<tbody>
<tr>
<td>Midline</td>
<td>Thyroglossal duct cyst, dermoid, teratoma</td>
</tr>
<tr>
<td>Anterior to sternocleidomastoid muscle</td>
<td>Branchial cleft remnant anomalies</td>
</tr>
<tr>
<td>Posterior to sternocleidomastoid muscle</td>
<td>Lymphangioma/cystic hygroma</td>
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<tr>
<td>Near thyroid</td>
<td>Diffuse thyroid enlargement or thyroid nodule</td>
</tr>
<tr>
<td>Preauricular</td>
<td>Parotid or submandibular gland pathology</td>
</tr>
<tr>
<td>Lymph node clusters</td>
<td>Inflammatory or neoplastic lymphadenopathy</td>
</tr>
</tbody>
</table>
CASE 1

A CT scan was obtained in this child. It demonstrates an enlarged parotid gland and scattered lymphadenopathy, likely reactive. There is no abscess. This is consistent with parotitis.

Here are nice examples of clinical parotitis. It can be difficult to determine if the area is just confined to the parotid gland or if lymph nodes are involved as well. Additionally, an abscess may be present. (Adults can get this too!)

Causes of Parotitis (Acute)

1. Bacterial: infrequent, most commonly caused by Staph aureus, strep pyogenes, alpha-hemolytic strep. Occurs most commonly in neonates with bacterial spread via stensen’s duct and is usually bilateral.
2. Viral: more common (remember mumps?), can also be caused by enteroviruses, Influenza, Adenovirus.
3. Chronic: Typically seen with calculi of Stensen’s ducts. There may be associated autoimmune disease, such as collagen vascular diseases and diabetes.
4. Tumor: tumors of Stensen’s duct can cause obstruction, leading to parotitis.

Ultrasound can be helpful in detecting parotitis. Parotitis on an ultrasound shows a heterogenous pattern, whereas a normal parotid gland shows a homogenous pattern.

Sometimes you can milk pus from the parotid gland through stensen’s duct.

Johann Mikulicz-Radecki (1850-1905), a professor of surgery in Breslau, Poland, encountered a 42-year-old farmer who had experienced lachrymal gland swellings followed by enlargement of the submaxillary and parotid glands. The enlarged lacrimal glands interfered with his vision and were excised by Mikulicz. The submaxillary glands were also excised, but the parotid glands were not removed. Mikulicz recorded in his publication that this was a benign disease and was not related to tuberculosis, leukemia, or malignant lymphoma. He believed the causative factor to be infection. No other patient with an identical disease has been described." From: Parotitis. In Medscape. By: Jerry Templer, MD and Benjamin Daniel Liess, MD.
OK, so this child does not want to move her neck to the right. She has an erythematous oropharynx without any asymmetry. What else causes a child not to want to move the neck? She does not appear to have torticollis. An abscess?

In situations like this, you could obtain a soft tissue neck x-ray, but this can be nonspecific and if there appears to be soft tissue swelling or a mass, then further imaging will be needed.

The physician elected to do a soft tissue neck CT with contrast. The films are seen on the left.

The top film has several findings:
- There is a right retropharyngeal abscess (2.1 cm).
- There is a left retropharyngeal phlegmon.
- There is airway narrowing from the phlegmon.

**Abscess vs Phlegmon**

An abscess is a fully organized collection (red arrow) of exudate. This is easily seen on the CT scan as fluid collection with ring enhancement (blue arrow).

A phlegmon is fluid that is loosely organized and does not have ring enhancement. Think of this as the beginning of an abscess (purple arrow).

Both are treated with antibiotics, sometimes IV antibiotics. Larger abscesses are usually drained. Smaller abscesses and phlegmons often respond to antibiotics and observation alone.

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The retropharyngeal space is posterior to the pharynx. Its boundaries are:
- Buccopharyngeal fascia anteriorly
- The prevertebral fascia posteriorly
- The carotid sheaths laterally
- It extends superiorly to the base of the skull and inferiorly to the mediastinum

This is a potential space that blood or pus can accumulate in. The CT to the right shows the location of the space.

1 Parapharyngeal space. 2 Masticator space. 3 Mucosal space. 4 Carotid space. 5 Parotid space. 6 Mucosal space. 7 Perivertebral space (anterior portion). 8 Retropharyngeal space.


Identifying and promptly treating a retropharyngeal abscess is extremely important, as there are life-threatening complications associated with this infection, including mediastinitis (mortality rate 50%), internal jugular vein thrombosis, pericarditis, and invasion of surrounding structures.

Organisms typically implicated in RPA are Gram-positive and Gram negative bacteria, but also anaerobes. First line antibiotics include Clindamycin, Unasyn, and Zosyn. Vancomysin is recommended in severe disease. Ultimately, most RPA’s need to be surgically managed as well. Ensuring a patent airway is paramount, and it is recommended not to agitate a toxic appearing child.

The incidence of RPA in the US has doubled according to a study. Another study reviewed mortality rates among children with PRA in 2003; there were no fatalities. Children’s National Medical Center reported 4 children who developed mediastinitis; all were treated aggressively and all survived.
Another entity that is commonly seen in the Pediatric ED is a peritonsillar abscess. This is often seen in school-age children. On this CT, you can see the well-defined abscess. This is a contrast-enhanced CT; contrast is used when looking for infectious processes.

This child is a 3-year-old who presented with fever, poor oral intake, and fussiness. He, too, did not want to move his neck to the right. He was also sent in originally for a meningitis evaluation. His exam showed asymmetry in the right aspect of his posterior oropharynx.

Management includes antibiotics (Clindamycin, Zosyn) and ENT consult for drainage if large enough. One trick of the trade: Decadron, as this often helps with pain/swelling!

Ok, so you decide to attempt an ultrasound but the child is very tender to palpation and does not tolerate the procedure well enough to get a good look, even with pain medication. Her mother has had enough and wants to know if there is another test. In light of that, you explain to her that you could obtain a CT, which she agrees to. The good news is that the child falls asleep after obtaining IV access (guess she's really tired), and you get a CT. At least you didn't need sedation!

Here are the scan pictures. Notice anything abnormal? There is fairly significant lymphadenopathy (Yellow arrow) along with what appears to be a necrotic lymph node (Blue arrow); there is not definable abscess, though. Now what? What causes this and does this child need a different antibiotic regimen?

Cervical lymphadenopathy is extremely common in children. The most common cause of this condition is reactive hyperplasia, usually from an infectious process. The typical suspects are viruses, but Group A Strep is a common bacterial cause.

Malignancy is always a concern, and 25% of malignant tumors in children occur in the head and neck region.

Sometimes cervical masses may be mistaken for cervical lymphadenopathy. In these cases, consider thyroglossal duct cysts, branchial cleft cysts, dermoid cysts, hemangiomas, even cervical ribs!

Cat scratch disease is a common cause of lymph node swelling, particularly in the axillary region. Bartonella can, however, cause cervical lymphadenopathy. Always ask about cats and travel!
Case Resolutions

Case 1: This child was treated with anti-inflammatory medication (ibuprofen), local heat, and was placed on a 10 day course of clindamycin. In patients with acute, unilateral parotitis, the cause is often viral, and it is not unreasonable to try a few days of symptomatic care and careful observation. In children where the cause is thought to be bacterial or in children not responding to symptomatic care, then antibiotics are recommended. Coverage for Staph, especially penicillin-resistant Staph, is essential, so clindamycin is a good first choice. It is also useful to rule out any obstructive cause of the parotitis (ie stones). Chronic parotitis usually responds to symptomatic treatment as well as treatment of the underlying cause (such as immune issues or stones). This patient responded nicely to clindamycin and recovered uneventfully.

Case 2: This child was admitted to the hospital and had an pediatric ENT consult for evaluation of her abscess. While this was occurring, she was begun on clindamycin and decadron (this is used quite commonly to reduce inflammation and help manage pain). She underwent drainage of the abscess the next day and recovered uneventfully. One note: in patients with phlegmons or a very small abscess, IV antibiotics and decadron without drainage often result in resolution. ENT consultation and very careful observation are essential, though.

Case 3: This child was admitted because of failure of outpatient management and was placed on...you guessed it...clindamycin. While it is not unreasonable to try penicillins when treating what is suspected to be an infectious lymphadenitis, there are children who will not respond to this regimen. She did well. Children with lymphadenopathy certainly can be observed for a period of time without workup or antibiotics, especially if the nodes show no signs of infection, there are no concerning systemic symptoms suggestive of another disease process, and the child is otherwise well. In patients where this is not the case, then workup and treatment as appropriate is indicated.

Teaching Points:
1. Parotitis is not uncommon in children. The cause can be variable, with viral and bacterial etiologies most common. Most cases will respond to symptomatic management. In some cases, antibiotic treatment is recommended with coverage for staph (including penicillin resistant staph) and strep.
2. Imaging for parotitis can be done with ultrasound or CT. Imaging is useful to exclude an obstructive process or in cases where it is not clear if the swelling is parotid in nature.
3. In cases where an infectious cause of neck swelling is suspected, imaging options include ultrasound and CT scanning with IV contrast. Ultrasound does not require contrast and is radiation free, but is limited when assessing the depth or extent of a neck abscess. CT will help visualize surrounding structures and is excellent for viewing surrounding tissue, but requires radiation and IV contrast. Sedation is rarely needed, as the scan is quite quick, but for optimal image quality a patient should be as still as possible.
4. In cases where an abscess is present, appropriate antibiotic treatment (clindamycin in most cases, or zosyn) and ENT consultation is indicated. Decadron is a useful adjunct to help mitigate inflammation and pain in patients.
5. A phlegmon or a very small abscess will often respond to antibiotics alone and careful followup. Outpatient management is possible in these patients, providing ENT followup can be arranged. In patients that are toxic, have respiratory compromise, or do not have reliable followup, hospitalization is indicated.
6. Do not forget about other causes of neck swelling, including Bartonella infection and congenital cysts, hemangiomas, etc.

References:

The Spanish ritual on New Year's eve is to eat twelve grapes at midnight. The tradition is meant to secure twelve happy months in the coming year.