Deep Neck Space Abscesses in Children

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Disclosures:
- I have nothing to disclose.

Objectives
- Understand the etiology of deep neck space abscesses
- Differentiate between different types of deep neck space abscesses
- Understand the common pathogens of DNS abscesses
- Understand appropriate medical management for DNS abscesses
- Understand when surgical drainage is appropriate for DNS abscesses
Deep neck space abscesses

- 4.6/100,000 children
- Most under age 6

**Etiology**

**Pediatric**
- Tonsillitis
- Pharyngitis
- Hematogenous spread
- Suppurative cervical adenitis
- Congenital cysts

**Adults**
- Odontogenic
- Foreign body

Table 2: Etiology

<table>
<thead>
<tr>
<th>Origin of Infection</th>
<th>No. of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharyngotonsillar</td>
<td>277 (82.9%)</td>
</tr>
<tr>
<td>Dental</td>
<td>11 (3.3%)</td>
</tr>
<tr>
<td>Salivary glands</td>
<td>4 (1.2%)</td>
</tr>
<tr>
<td>Foreign bodies</td>
<td>2 (0.6%)</td>
</tr>
<tr>
<td>Previous cervical surgery</td>
<td>1 (0.3%)</td>
</tr>
<tr>
<td>Bacteriemia</td>
<td>1 (0.3%)</td>
</tr>
<tr>
<td>Non identified cause</td>
<td>34 (10.3%)</td>
</tr>
</tbody>
</table>

Age 6 mo – 87 years
Fascial planes
- Risk for spread
- Superficial cervical fascia
- Deep cervical fascia (3 layers: superficial, middle, and deep)
  - Middle layer aka the visceral or buccopharyngeal layer
  - Deep layer-prevertebral or alar fascia
- Retropharyngeal space-skull base to 2nd thoracic vertebrae

Pathogens
- Often polymicrobial
- Wide spectrum of organisms in oral cavity
- Staphylococcus aureus
- Group A Strep
- Anaerobes
  - Fusobacterium, Peptostreptococcus, Porphyromonas
- Haemophilus influenzae
- Tuberculous
Peritonsillar and deep neck infections: a review of 330 cases

Paula Martínez Pascual*, Paloma Pinacho Martínez, Evitar Friedlander,
Carlos Martín Oviedo, Bartolome Scola Yurrita

*Bruguería General (Laboratorio Central) Madrid, Spain

Table 4. Microorganisms distribution in patients with positive bacterial culture.

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>No. of patients with positive bacterial culture (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strep. viridans</td>
<td>46 (32.1%)</td>
</tr>
<tr>
<td>Strep. pyogenes</td>
<td>31 (22.6%)</td>
</tr>
<tr>
<td>Anaerobic bacteria</td>
<td>17 (12.4%)</td>
</tr>
<tr>
<td>Hemophilus spp.</td>
<td>10 (7.6%)</td>
</tr>
<tr>
<td>Strep. spp.</td>
<td>7 (5.3%)</td>
</tr>
<tr>
<td>Staphylococcus spp.</td>
<td>5 (3.8%)</td>
</tr>
<tr>
<td>Enterobacteriaceae</td>
<td>3 (2.3%)</td>
</tr>
<tr>
<td>Gram-negative bacteria (Helicobacter spp.)</td>
<td>2 (1.5%)</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>1 (0.7%)</td>
</tr>
<tr>
<td>Staphylococcus saprophyticus</td>
<td>1 (0.7%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cervical space involved</th>
<th>No. of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peritonsillar</td>
<td>215 (65.2%)</td>
</tr>
<tr>
<td>Parapharyngeal</td>
<td>91 (27.6%)</td>
</tr>
<tr>
<td>Retropharyngeal</td>
<td>11 (3.3%)</td>
</tr>
<tr>
<td>Submandibular</td>
<td>3 (0.9%)</td>
</tr>
<tr>
<td>Base of tongue</td>
<td>3 (0.9%)</td>
</tr>
<tr>
<td>Ludwig angina</td>
<td>2 (0.6%)</td>
</tr>
<tr>
<td>Cervical anterior space</td>
<td>2 (0.6%)</td>
</tr>
<tr>
<td>Multiple space</td>
<td>3 (0.9%)</td>
</tr>
</tbody>
</table>

History

- Sore throat
- Often treated with antibiotics
- Other symptoms depending on specific site
Lab work
- CBC with diff
- Electrolytes
- Coagulation studies
- Blood cultures
- Cultures of aspirate (aerobic, anaerobic, fungal and acid fast in immunocompromised or when clinical suspicion)

Imaging
- Lateral neck x-ray for screening
  - 83% sensitive compared to 100% sensitivity with CT with contrast
- CT 89% accuracy in determining drainable fluid collection
- Ultrasound
  - Operator dependent
- MRI

Normal:
- ≤ 6mm (young child), 7mm at C-2
- 14mm at C-6 for kids, 22mm at C-6 for adults

Diep et al; 2016
Different deep neck spaces

Peritonsillar
- average age is 25
- 65% of patients age 20-40
- Signs/Symptoms: Sore throat, dysphagia, fever, trismus, unilateral otalgia, voice changes, malodorous breath
- Trismus suggests involvement of the parapharyngeal space
- Diagnosis-usually clinically
- ~16% of adults and 7% of children will experience recurrence
Needle versus I &D: Cochrane Review 2016

- 11 studies (674 participants)
- Primary outcome: recurrence (all but 1 study)
- recurrence rate higher in the needle aspiration group compared with incision and drainage
- other outcomes not consistently measured
- Adverse events only reported by 3 studies
- Pain
  - Reported by 2 studies to be lower in needle aspiration group
  - 1 study found similar pain between groups 5 days out

Retrospective review (age>15 years; mean age 36.3 years)

- 182 patients
  - 82 patients in the aspiration group
  - 100 patients in the incision group
- median length of stay of 3.0 days (interquartile range 2–4) in the aspiration group versus 2.0 days (IQR 2–3) in I&D group (p=0.009)
- Repeat procedure: 46.3% of needle aspiration patients versus 10% of I&D (p<0.001)
- 12 patients (14%) of the aspiration group and 4 patients (4%) of the incision required drainage under anesthesia (p=0.001)
- No difference in complications
- Limitations: patients not randomized; based on provider treatment preference
Intratonsillar abscess

- 9% of all "tonsillar abscesses"
- ITA
  - Less trismus, otalgia, and dysphagia
  - Signs/symptoms: sore throat (100%), fever (90%), and odynophagia (81%) (Ulualp et al; 2013)
  - Less likely to experience acute progression from their initial symptoms
  - Less drainage attempts
  - Lower recurrence rate than PTA
  - Conclusion- consider medical management
Parapharyngeal
-Inverted pyramid: skull base to hyoid
-Sx: Fever, neck pain, trismus, decreased neck ROM and medialized tonsil

Jain et al; 2018

Retropharyngeal
-between buccopharyngeal and alar layers of fascia
-aka between the back of the throat and esophagus
-Fused down the midline
-Lymph nodes on each side
  -drainage from nose, sinuses, pharynx
  -Regress with age
-Sx: neck pain, neck swelling, fever, irritability, dysphagia, drooling, "breathing difficulty", difficulty with neck extension
-Exam: unilateral bulge in posterior pharynx

Jain et al; 2018
Retropharyngeal abscess

Underwent transoral drainage
GAS + cultures
Retropharyngeal Abscess

- Extends from skull base to diaphragm
- Presentation is nearly identical to retropharyngeal abscess
- Caused from extension from adjacent space

Danger Space
Prevertebral Abscess
- Clivus to cocccus
- Back, shoulder, neck pain made worse by deglutition
- Dysphagia or dyspnea
- Cause: Pott’s abscess, trauma, osteomyelitis, extension from retropharyngeal and danger spaces

Submandibular and Sublingual Space
- Floor of mouth to superficial layer of deep cervical fascia
- Mandible to hyoid
- Separated by mylohyoid
  - Spaces communicate posteriorly
- Can spread to parapharyngeal and visceral spaces
- More common in adults (odontogenic origin)
- Other causes: sialadenitis, lymphadenitis, trauma and URI
Ludwig’s Angina
- Rare in children
- 85% odontogenic origin
- Signs: fever, induration, tenderness, “brawny” appearance of skin and floor of mouth
- Tongue elevation may lead to asphyxiation
- Diagnosis: clinical
  “Evaluation should not compromise airway management”

Antibiotics
- penicillin in combination with a b-lactamase inhibitor (such as amoxicillin with clavulanic acid)
- b-lactamase–resistant antibiotic (such as cefoxitin, cefuroxime, imipenem or meropenem) combination with a drug that offers anaerobic coverage (such as clindamycin or metronidazole)
Steroids

- Cons
  - Immunosuppressive effects
  - Elevate WBC
  - Mask symptoms
- Pros
  - Pain control
  - Decrease edema

Retrospective chart review
- 153 children
- All patients received IV antibiotics
- Most had dual therapy
  - Clindamycin (98.0%), ceftriaxone (88.9%), and vancomycin (18.3%)
- 53 (34.6%) received dexamethasone
Age at presentation (P < .001)
- Lateral neck: 3.0 years
- Peritonsillar: 10.6 years
- Retropharyngeal: 4.5 years
- Parapharyngeal: 5.4 years

Dexamethasone use by subsite P < .001
- 3 (5.7%) lateral neck
- 24 (45.2%) peritonsillar
- 16 (30.2%) retropharyngeal
- 10 (18.9%) parapharyngeal

Surgical drainage (P = .096)
- 35/62 (56%) lateral neck
- 15/40 (38%) peritonsillar
- 14/32 (44%) retropharyngeal
- 5/18 (28%) parapharyngeal
- MRSA (25), MSSA (11), and Strep Pyogenes (10)
Table 2. Incidence of Incision and Drainage for Steroid and Non-Steroid Groups.

<table>
<thead>
<tr>
<th></th>
<th>Steroid</th>
<th>No Steroid</th>
<th>Incidence</th>
<th>P-Value</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>19/53</td>
<td>53/106</td>
<td>32/159</td>
<td>.04*</td>
<td>[1.29, 109.2]</td>
</tr>
<tr>
<td>Lateral Neck</td>
<td>1/3</td>
<td>28/52</td>
<td>29/55</td>
<td>.177</td>
<td>[-1976, 68.35]</td>
</tr>
<tr>
<td>Parapharyngeal</td>
<td>3/10</td>
<td>2/28</td>
<td>5/38</td>
<td>.65</td>
<td>[-0.4, 11.89]</td>
</tr>
<tr>
<td>Peritonsillar</td>
<td>2/24</td>
<td>25/52</td>
<td>27/76</td>
<td>.64*</td>
<td>[1.12, 26.47]</td>
</tr>
<tr>
<td>Retropharyngeal</td>
<td>7/16</td>
<td>34/52</td>
<td>41/70</td>
<td>1</td>
<td>[3.33, 19.76]</td>
</tr>
</tbody>
</table>

Table 3. Length of Stay for Steroid and Non-Steroid Groups.

<table>
<thead>
<tr>
<th></th>
<th>Steroid</th>
<th>No Steroid</th>
<th>Length of Stay (days)</th>
<th>P-Value</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>2.85</td>
<td>3.84</td>
<td>3.86</td>
<td>.09</td>
<td>[-2.94, 9.63]</td>
</tr>
<tr>
<td>Lateral Neck</td>
<td>2.65</td>
<td>3.65</td>
<td>3.65</td>
<td>.15</td>
<td>[-7.59, 14.64]</td>
</tr>
<tr>
<td>Parapharyngeal</td>
<td>2.64</td>
<td>4.64</td>
<td>4.64</td>
<td>.16</td>
<td>[-8.48, 15.66]</td>
</tr>
<tr>
<td>Peritonsillar</td>
<td>2.14</td>
<td>3.79</td>
<td>3.79</td>
<td>.05</td>
<td>[-0.25, 4.18]</td>
</tr>
<tr>
<td>Retropharyngeal</td>
<td>4.01</td>
<td>3.41</td>
<td>3.41</td>
<td>.05</td>
<td>[-0.15, 7.71]</td>
</tr>
</tbody>
</table>

Tansey et al; 2020
Medical vs Surgical treatment
- Wong et al. (2012)
  - 54 children
  - Half had abscess ≤25 mm
  - Younger children more likely to need surgical drainage
  - Conclusion: reasonable to do trial of high dose IV antibiotics with close observation in stable older children

Medical versus Surgical treatment
- Cheng et al. (2013)
  - 178 children with retropharyngeal or parapharyngeal infection
  - Risks for failure of medical therapy
    - Age <51 months
    - ICU admission
    - Abscess >2.2 cm on CT
Defining the role of surgical drainage in paediatric deep neck space infections
Mark D. Wilkie | Sujata De | Mohanlalamar Krishnan

- 93 Children age 16 and under with retropharyngeal or parapharyngeal abscess
- All received broad spectrum abx and IV dexamethasone
- Age, WCC and CRP were NOT predictive of the need for drainage
- Radiological abscess diameter WAS a predictive of surgical drainage
  - Diameter > 2.5 cm
- No significant difference in LoS between groups
- In those managed surgically, outcome and LoS did not depend on yield of pus.

Intervention- When is it necessary?
- Airway compromise
- Sepsis
- Complications
- No improvement after 48 hrs of IV abx
Complications

- 2.2% risk of life-threatening complications
- Airway obstruction
  - 0.9% (Pascual et al 2018)

Complications

- Retrospective review out of India
- 510 children under 5 (mean age 23.6 mo)
- 15-year period

<p>| Table 1: Distribution of patients in our study (n = 510) |</p>
<table>
<thead>
<tr>
<th>Distribution in (n=510)</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1 year</td>
<td>95</td>
<td>18.8%</td>
</tr>
<tr>
<td>1-2 year</td>
<td>61</td>
<td>11.9%</td>
</tr>
<tr>
<td>2-3 year</td>
<td>48</td>
<td>9.4%</td>
</tr>
<tr>
<td>3-5 year</td>
<td>48</td>
<td>9.4%</td>
</tr>
<tr>
<td>5-7 year</td>
<td>45</td>
<td>8.8%</td>
</tr>
<tr>
<td>7-9 year</td>
<td>42</td>
<td>8.2%</td>
</tr>
<tr>
<td>9-11 year</td>
<td>42</td>
<td>8.2%</td>
</tr>
<tr>
<td>11-13 year</td>
<td>41</td>
<td>8.0%</td>
</tr>
<tr>
<td>13-15 year</td>
<td>40</td>
<td>7.8%</td>
</tr>
<tr>
<td>15-17 year</td>
<td>39</td>
<td>7.6%</td>
</tr>
<tr>
<td>17-19 year</td>
<td>39</td>
<td>7.6%</td>
</tr>
<tr>
<td>&gt;19 year</td>
<td>38</td>
<td>7.5%</td>
</tr>
<tr>
<td>Unknown</td>
<td>35</td>
<td>6.8%</td>
</tr>
<tr>
<td>Total</td>
<td>510</td>
<td>100%</td>
</tr>
</tbody>
</table>
Lemierre’s syndrome

- Suppurative thrombophlebitis of the internal jugular vein
- Signs/symptoms: tenderness over SCM or angle of mandible, pulmonary emboli
- Diagnosed with high resolution US, CT with contrast, MRA/MRV
- Tx
  - Culture directed abx
  - Anticoagulation with thrombus progression or septic emboli
  - Extremely rare surgical ligation or resection

Table 2
Factors affecting complications in children with deep neck space abscess.

<table>
<thead>
<tr>
<th>Age at presentation (n = 500)</th>
<th>Children with complications</th>
<th>Children without complications</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 2 years</td>
<td>46 (7.8%)</td>
<td>18 (3.6%)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>&gt; 2 years</td>
<td>11 (2.2%)</td>
<td>27 (5.4%)</td>
<td></td>
</tr>
<tr>
<td>Site of abscess (n = 518)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiple sites/ Retropharyngeal abscess</td>
<td>47 (9.2%)</td>
<td>22 (4.2%)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Other sites</td>
<td>4 (0.8%)</td>
<td>42 (8.2%)</td>
<td></td>
</tr>
</tbody>
</table>

Jain et al; 2018
**Complications**

- Mediastinitis
  - 1.2% (Pascual et al 2018)
  - mortality rate as high as 40%
- Carotid aneurysm
  - Pulsatile neck mass
  - Pharyngeal bleeding
  - Management: ligation, stenting, occlusion
- Necrotizing fasciitis
  - Subcutaneous tissue necrosis
    - Skin (pale – mottled – purple – gangrenous)
  - Rapid progression
  - Systemic toxicity
  - Tx: Secure airway, aggressive abx, surgical debridement, ICU monitoring/support
- Cavernous Sinus thrombosis

**Management of Airway Compromise**

- Majority successfully managed with intubation
- Rare need for emergent tracheostomy
  - Anticipate in all cases
Recurrent Deep Neck Space Infection

THINK CONGENITAL ABNORMALITY

Imaging should help make the diagnosis

Most Common: second branchial cleft cyst

Others: first, third, fourth branchial cleft cysts, lymphangiomas, thyroglossal duct cysts, cervical thymic cyst

Summary

- Deep neck space abscesses are commonly seen in the pediatric population
- Immediately identify any airway compromise
- PTA can usually be diagnosed clinically
- CT is the most useful imaging modality
- Close observation with antibiotics is appropriate in many patients
Questions?

References


