Descriptive Epidemiology of the Radiographic Findings in Pediatric Osteomyelitis with a Focus on Plain Films: A Five Year Experience at a Tertiary Children’s Hospital

Natalia Liu • Thomas G. Fox, MD
Riley Hospital for Children • Indiana University School of Medicine • Indianapolis, Indiana

Background:

OM is the gold standard in the radiographic diagnosis of pediatric osteomyelitis (OM). Plain films (i.e. x-rays) are routinely recommended in the work-up of suspected musculoskeletal infection but have low sensitivity in acute disease. Here we describe the x-ray findings in a cohort of pediatric patients with acute and sub-acute osteomyelitis.

Methods:

• Retrospective chart review of patients with hematogenously-acquired acute and sub-acute osteomyelitis from 2011-2015
• Analysis of x-ray findings in association with disease severity and MRI results

Inclusion Criteria

• Diagnosis of acute or sub-acute OM
• MR-defined OM
• Inpatients
• Long bone infection
• Surgical implantation (hands and feet)
• Hematogenous acquisition
• No significant underlying medical disease

Exclusion Criteria

• Incorrectly billed
• No MRI on OM
• OM on soft tissue, i.e. non-long bones
• Head and neck infections
• Contraindication to MRI (e.g. pacemaker, ferromagnetic prosthesis)
• Recent surgery or trauma at affected site
• Lower extremity OM in spina bifida pts
• Osteoid osteoma: plain film diagnostic
• CRMO: Critics disease
• Age <3 months
• Congenital anomalies

Inflammatory Markers (acute patients)

<table>
<thead>
<tr>
<th>Inflammatory Marker</th>
<th>Mean</th>
<th>Median</th>
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<tbody>
<tr>
<td>ESR (mm/hr)</td>
<td>62.3</td>
<td>65</td>
</tr>
<tr>
<td>CRP (mg/dL)</td>
<td>10.9</td>
<td>7.5</td>
</tr>
<tr>
<td>WBC (k/cumm)</td>
<td>13.7</td>
<td>12.4</td>
</tr>
</tbody>
</table>

Complications of OM via MRI

Pathogen | % with complicated MRI
---------|-------------------------
MRSA (20) | 63.6%
MSSA (34) | 45.5%
S. pyogenes (5) | 75%
S. pneumoniae (1) | 100%
Streptococci (11) | 29.4%

Conclusions:

Patients with longer duration of symptoms were more likely to have complications on plain film. A surprising number of patients with acute disease had abnormal bony findings on x-ray. Bony findings on x-ray may be associated with bony findings on MRI. Plain films may continue to play a valuable role in the diagnostic workup of OM.

References:


Acknowledgements: Drs. John Christenson, Boaz Karmazyn, Matt Wanner for their support and valuable insights.

Breakdown of 2011-2015 Patients

Identified from billing database: 368

Patients excluded: 276

Patients included: 92

Acute: 80
Sub-Acute: 9

Femur, 24
Tibia, 28
Humerus, 16
Radius, 7
Multi-long OM, 2

MRSA Prevalence in OM Cases 2006-2015

Blood Culture and Direct Sample Results for Acute Patients

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>% of Positive Culture</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRSA (100)</td>
<td>1.2%</td>
</tr>
<tr>
<td>MSSA (33)</td>
<td>27.2%</td>
</tr>
<tr>
<td>S. pyogenes (5)</td>
<td>24.7%</td>
</tr>
<tr>
<td>S. pneumoniae (1)</td>
<td>20.0%</td>
</tr>
<tr>
<td>Staphylococci (11)</td>
<td>10.0%</td>
</tr>
</tbody>
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X-Ray Findings vs Duration of Symptoms

5-7 days of symptoms (56 total)

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>ST changes (30)</td>
<td>20%</td>
</tr>
<tr>
<td>Bony changes (5)</td>
<td>3%</td>
</tr>
</tbody>
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7-14 days of symptoms (19 total)

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>ST changes (9)</td>
<td>16%</td>
</tr>
<tr>
<td>Bony changes (3)</td>
<td>30%</td>
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</tbody>
</table>

X-Ray Findings vs Complicated MRI

89 total patients (acute and sub-acute)

49 w/ normal XR (58.3%) vs 35 w/ abnormal XR (41.7%)

20 w/ ST changes (57%) vs 15 w/ bony changes (43%)

12 w/ complicated MRI (60%) vs 11 w/ complicated MRI (73.3%)

29 w/ complicated MRI (63.2%)

Presence of complicated MRI by pathogen

Pathogen | % with complicated MRI
---------|-------------------------
MRSA (20) | 63.6%
MSSA (34) | 45.5%
S. pyogenes (5) | 75%
S. pneumoniae (1) | 100%
Streptococci (11) | 29.4%