Acute Haematogenous Osteomyelitis in Children. Retrospective Review of 57 cases

Dinesh Dhar M.S.

Summary
Background: To review and share our experience about the management and complications of acute haematogenous Osteomyelitis at our hospital.

Methods: 57 children with confirmed diagnosis of acute haematogenous Osteomyelitis, hospitalised in Rustaq hospital, Oman between March 1998 and April 2005 were retrospectively reviewed.

Results: The prevalence of age, sex, bone affected, type of organism isolated and complications were established. Elevated ESR, CRP along with Ultrasonographic changes seen in soft tissues are the most valuable supportive investigations. It was observed that early decompression of the bone/soft tissue under cover of combinations of antibiotics led to resolution of disease in majority of patients.

Conclusion: Surgery should be performed with minimal damage of the covering periosteum and soft tissue. Antibiotics should be continued for a period of 6-8 weeks according to sensitivity. Clinician should always keep in mind gram negative and fastidious organisms in negative cultures for antibiotic selection.

Keywords: Acute hematogeneous osteomyelitis, organisms, children.

Introduction
Acute haematogenous osteomyelitis is a serious disease characterized by an infection of bone marrow, its cortex and periosteum. Various classification have been proposed. For clinical decision making differentiation of acute from chronic, haematogenous from contiguous and unifocal from multifocal osteomyelitis is helpful.

Acute haematogenous osteomyelitis in children classically occurs in the metaphysis of a long bone due to vascular anatomy and in infants there is propensity to develop concomitant septic arthritis. The most common infecting organism has been reported to be staphylococcus aureus in over 80% of cases but studies from USA, have suggested that the bacterial spectrum is changing. In about one third of cases no causative organism can be isolated.

It is now believed that fastidious organisms like Kingella Kingae might be responsible for a considerable proportion of cases of osteomyelitis with negative routine cultures. Introduction of modern diagnostic techniques, combining antibiotics and surgery in treatment have reduced the rate of complication.

The present study focuses on acute hematogenous osteomyelitis (AHOM), the most common presentation of osteomyelitis in childhood in Oman. Most of the literature about this condition is from Western Countries and over the years mortality and morbidity has changed for the better. We undertook this study in order to share our experience about the management of this condition and its complications in our prevailing circumstances.

This paper reports our experience with 57 patients who were admitted with a clinical diagnosis of acute haematogenous osteomyelitis in Rustaq Hospital which is the regional referral hospital for South Batinah Region of Oman.

Patients And Methods
Patients were identified from Medical records of all Paediatric admissions by ICD code of the discharge diagnosis between March 1998 to April 2005. All patients fulfilling the criteria as detailed below were included in our study if they were 12 years old or younger.

1. Suspicious and/or characteristic clinical signs and symptoms of bone infection of less than 2 weeks duration and/or
2. Positive blood or tissue culture and/or
3. Typical radiological findings (deep soft tissue swelling and/or periosteal reaction, and/or bony destruction) at some stage during hospitalization and/or
4. Surgical finding of Pus in bone

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All patients with history of penetrating wound or those with skull or spine infection were excluded from this study.

The following data were extracted from the medical records of each patient who met the inclusion criteria. Age, Sex, date of admission, history of presenting complaints, other symptoms, risk factors, clinical signs, history of any medication, Laboratory, radiological, bacteriological findings and duration of antibiotics use, type and time of any surgical procedures, complications, discharge diagnosis and outcome.

Osteomyelitis was considered “acute” if the history of complaint was shorter than 2 weeks and considered “haematogenous” in origin in the absence of penetrating wounds adjacent to the site of disease.

Erythrocyte sedimentation rate (ESR) > 20 mm in the first hour, WBC > 12 x 10^9/L, C-reactive protein CRP > 20 mg/L were considered abnormal. Blood Culture (BC) typically consisted of one sample drawn on admission. Specimens of Tissue Culture (TC) were obtained by aspiration or open surgical drainage. Radiological findings were considered “characteristic” according to the radiologist’s report.

All patients received intravenous antibiotic therapy, usually combination of cloxacillin/cephradine, Fuscidic acid according to body weight and reviewed with sensitivity reports of blood or pus culture. Progress of patient was monitored by clinical examination and serial blood counts and ESR. Intravenous antibiotic treatment was continued for 2-3 weeks, with or without surgical decompression followed by 3 weeks oral antibiotic therapy.

Results
Fifty Seven patients were admitted with diagnosis AHOM. Of these, 38 patients (66.7%) were Male and 19 patients (33.3%) were Female.

<table>
<thead>
<tr>
<th>Sites</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proximal Femur</td>
<td>08</td>
<td>14%</td>
</tr>
<tr>
<td>Distal Femur</td>
<td>09</td>
<td>15.7%</td>
</tr>
<tr>
<td>Proximal Femur</td>
<td>10</td>
<td>17.5%</td>
</tr>
<tr>
<td>Distal Tibia</td>
<td>15</td>
<td>26.3%</td>
</tr>
<tr>
<td>Distal Fibula</td>
<td>02</td>
<td>3.5%</td>
</tr>
<tr>
<td>Cuneiform</td>
<td>01</td>
<td>1.7%</td>
</tr>
<tr>
<td>Proximal Humerus</td>
<td>06</td>
<td>10.5%</td>
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<tr>
<td>Distal Humerus</td>
<td>05</td>
<td>8.7%</td>
</tr>
<tr>
<td>Distal Radius</td>
<td>01</td>
<td>1.7%</td>
</tr>
<tr>
<td>Total</td>
<td>57</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 1. Sites of infection in 57 patients with AHOM

Their ages varied from 3 months to 12 years (mean age 7.8 years). The sites of infection are shown in Table 1. The mean duration of symptoms prior to hospitalization was 4 days (range 0-7 days). The mean duration of hospitalization was 20 days (5-40 days). 98% patients were admitted within 1 week of complaints. Time of admission as well as duration of hospitalization was independent of patient age and causative organism.

The most frequent sites of AHOM were the Tibia (43.8%) followed by the femur (29.7%). The distribution of involved sites reported in the literature is 14-50% for the femur, 19-31% for the Tibia. On admission, The most frequent signs and symptoms were pain, fever, local signs of infection with restriction of mobility of adjacent joint. Similar findings are published in other cases series. All patients in our series presented with fever of 38 degrees Celsius or more on admission. ESR on admission varied from 20-140 mm in the first hour with mean of 58 mm.

All patients underwent initial Plain Radiograph of the involved bone and Ultrasonography (USG) routinely on admission. No specific radiographic changes were found on admission. However in 52 cases we found Subperiosteal collection in the metaphyseal areas of the involved bone on USG.

Seven patients had specific radiographic changes in the involved bones in due course of time while in hospital. Radionuclide bone scan was not done as it was not available in our hospital. Blood culture was found positive in 46 patients (80.7%). Pus culture was positive in 43 patients (79.6%) and ultrasonography identified subperiosteal fluid collection in 54 patients (94.7%).

Operative bone decompression was performed in 54 patients (94.7%) because of clinical or ultrasonographic evidence of abscess or failure to respond to antibiotic treatment after 24 hours. Staphylococcus aureus was isolated in 52 (91.2%) cases, table 2.

<table>
<thead>
<tr>
<th>Organisms</th>
<th>Number</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Staphylococcus Aureus</td>
<td>52</td>
<td>91.2%</td>
</tr>
<tr>
<td>Salmonella</td>
<td>1</td>
<td>1.7%</td>
</tr>
<tr>
<td>Haemophilus Influenza</td>
<td>2</td>
<td>3.5%</td>
</tr>
<tr>
<td>Klebsella</td>
<td>2</td>
<td>3.5%</td>
</tr>
<tr>
<td>Total</td>
<td>57</td>
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</tbody>
</table>

Table 2. Organisms Isolated from 57 patients with AHOM
Complications
Four patients had recurrences at 3 weeks, one patient developed chronic osteomyelitis of Tibia and one patient has pathological fracture of Proximal Humerus in due course of time. All these patients had staphylococcus aureus infection.

Patients were followed up regularly in the Orthopaedic clinic for a period of 6-8 months on average. Four patients who had recurrence of symptoms responded well to a further course of antibiotics. Staphylococcus aureus was the most common infecting organism, being found in 91.2% patients, Salmonella positive blood culture infection was found in one patient with known Sickel Cell Disease (SCD).

Discussion
Acute osteomyelitis in children is a major orthopaedic problem in all developing countries like Oman, especially in children of low income group, with low resistance due to poor nutrition. Illiteracy, poor hygienic living conditions and traditional treatment methods are predisposing factors in the spread of infections in general.

Moreover patients may report late to hospitals due to lack of transportation and for other social reasons, as was seen in our study where patients reported as late as 3 days after onset of symptoms.

Diagnosis of acute haematogenous osteomyelitis depends on high index of suspicion supported by laboratory and radiological investigation. In our series ESR and CRP were raised in all patients. CRP is a disease process indicator and time sensitive. It is raised immediately after infection and reduces in value as the infection responds to antibiotics and settles down. It shows downward trend as early as 72 hours after decompression of bone. On the other hand ESR takes 7-10 days to start downward trend. CRP is however more helpful as indicator to monitor patients response to treatment.

In our hospital since we do not have facilities for radionuclide bone Scan or MRI facility, we relied on conventional radiography and ultrasonography. Conventional radiography may show soft tissue swelling as early as 48 hours after onset of disease and definitive radiological features of bone destruction appear 7-10 days after onset of infection. In contrast ultrasonography may show subperiosteal exudates as early as 24 hours after onset of disease.

In centers where facilities for radionuclide bone Scan and MRI are available it is possible to identify infection in bone early. Radionuclide bone scan has a sensitivity up to 80-90% and MRI ranging from 85-92%.

46% of our patients had positive blood culture whereas only 43% patients had positive pus culture in this series. The microbiological spectrum was dominated by gram positive cocci. Hence in patients with negative pus culture, the blood culture organism and its antibiotic sensitivity may have a role to play in identifying the bacterial etiology.

Staphylococcus aureus was the most common infecting organism found in our series, 91.2%. This is consistent with other reported series showing the dominance of gram positive cocci in causing infection. However a report by other authors (Craigien 1992) has shown that microbial epidemiology is changing. Therefore one should cover gram negative organisms in the choice of antibiotics and try to search for them in culture. Indiscriminate use of antibiotics before obtaining Blood Culture may also mask bacterial identification on culture.

In our setup in all cases of acute osteomyelitis systemic antibiotics with early decompression of subperiosteal abscess was the mainstay of treatment (54 patients) followed by suction irrigation for a period of 4-5 days with splintage of the limb and monitoring the general condition of patient. Only in 3 cases was drilling of bone required to decompress the intraosseous abscess. Routine drilling of bone was not done since once the abscess has tracked to the subperiosteal space, bone naturally gets decompressed and limits further damage.

Early operations also help to provide specimen for identifying the infecting organism and assessment of antibiotic sensitivity. These reasons justified our approach of treatment in all cases with good results and is in agreement with other studies.

The affected bone was splinted in Plaster slab and weight bearing was avoided till the acute inflammation settled down. Immobilization was extended to 6 weeks if bone drilling were done in the absence of other bony changes.

We have reservation about conservative management of acute osteomyelitis as expressed by many authors in the literature, especially in developing countries with non availability of Radionuclide bone scan / MRI Scans to identify early acute osteomyelitis and compounded by late arrival of patient to hospitals when in most cases subperiosteal exudates are already present.

We suggest that bone decompression should be as early as possible, even on emergency basis.
patients reporting late.

**Conclusion**

Haematogeneous Osteomyelitis continues to be a major orthopaedic problem in developing countries with some long term disability if not treated promptly. Disastrous complications can be presented by a high index of suspicion, prompt treatment with combination high dose antibiotics and early bone /soft tissue decompression. Aetiology shift to gram negative, organism in addition to fungal and fastidious organisms should always be kept in mind in antibiotic selection with negative initial culture reports. Elevated ESR, CRP along with ultrasonographic changes seen in soft tissues are most valuable supportive tools in hospitals where facilities for high tech Radionuclide bone scan and MRI are not present.

**References**