Surgical Debridement Provided for Fast Recovery in Metaepiphyseal Haematogenous Osteomyelitis with Adjacent Subperiostal Abscess Formation in Two Children

Starlinger J*, Ringl H, Weissinger M and Hajdu S

1Department of Trauma Surgery, Medical University Vienna, General Hospital Vienna, Währinger Gürtel 18-20, 1090 Vienna, Austria
2Department of Orthopaedic and Orthopaedic Surgery, Hospital Waldviertel Zwettl, Propstei 5, 3910 Zwettl, Austria
3Department for Radiology, Medical University Vienna, General Hospital Vienna, Währinger Gürtel 18-20, 1090 Vienna, Austria

Abstract

Background: Primary metaepiphyseal haematogenous osteomyelitis (HOM) with subperiostal abscess formation at initial admission is a rare but serious condition. A considerate treatment strategy is crucial to avoid damage to the adjacent physis.

Methods: Charts and radiographic data of two cases were reviewed and reported in a retrospective study approved by the Institutional Review Board.

Results: Two children presented with limping, painful restriction of movement and very mild laboratory findings. No trauma was remembered. Conventional radiography showed no abnormalities, but subsequent MRI revealed metaepiphyseal HOM as well as an adjacent subperiostal abscess collection.

Conclusion: Antibiotic therapy and immediate surgical debridement provided for uncomplicated healing.

Introduction

Primary metaepiphyseal HOM (haematogenous osteomyelitis) in children is rare and is reported to occur acute, subacute or chronic [1-5]. Causes remain unclear but a history of a fall and/or previous illnesses (e.g., angina, tooth infection) is discussed. Diagnosis is often delayed as symptoms are rather unspecific (e.g., fever, weakness, joint effusions, malaise, local bone pain). Clinical investigation many reveal no findings other than local tenderness and painful limping. Laboratory findings often tell nothing more than an elevated ESR (erythrocyte sedimentation rate), elevated levels of CRP (C-reactive protein) or abnormalities in white blood cell count.

Conventional X-rays might be regular at the early stages of HOM. Subsequently, MRI is necessary to or confirms HOM or rule out other serious causes of bone pain, such as Ewing sarcoma or Langerhans cell histiocytosis. In OM MRI shows bone marrow edema in the early stages, a fluid collection within the bones as well as increased contrast uptake at the boarders of the inflammation in an advanced OM. In rare cases of metaepiphyseal HOM a subperiostal abscess formation is present at initial presentation. As the infection spreads through the medullar canal the intramedullary pressure increases. Subsequently, infection spreads through Havers and Volkmann’s canals progressing into the subperiostal space [6]. A subperiostal abscess lies between periost and cortex and is adjacent to an acute or subacute OM. According to the pathophysiological concept by Dresing et al. [6], the physis is a barrier causing the abscess to spread to the periostal space. As the abscess formation enlarges, ruptures of this collection into the adjacent soft tissue have been reported [7]. Furthermore, a chronic course of a subperiostal formation in childhood OM is reported to ultimately cause pathologic fractures [8].

No consensus exists whether metaepiphyseal HOM heals with conservative treatment alone. Antibiotic therapy alone is reported to be sufficient in the early course of HOM [9-11] Ezra et al. [11] treated eight patients with the same underlying pathology conservatively, and they noted no difference in duration of treatment compared to Sorensen et al. [4]. In their opinion operative
treatment is reserved for cases with persistent infection. In contrast Sorensen reported on three patients with primary epiphyseal HOM who underwent curettage besides antibiotic administration recovered without complications. Nevertheless, in cases of progressive OM with adjacent periosteal abscess formation, debridement is recommended by some authors [12]. Complications after HOM are acute bacterial bone and joint infections harming the adjacent physis and ultimately resulting in concomitant growth disturbance [13]. Therefore, early diagnosis is crucial especially in HOM that comes close to the physis to prevent long-term complications.

The aim of this study is to report our therapeutic approach emphasizing surgical repair in seldom cases of a subperiosteal abscess formation in metaepiphyseal HOM.

Case Presentation

Case 1

An eight-year-old boy presented with pain and swelling of his right wrist. Neither the boy nor his mother remembered a previous trauma. About two weeks ago he suffered from tonsillitis and bronchitis and therefore received antibiotic therapy. At admission body temperature was elevated. Laboratory tests showed a CRP-level of 9 mg/l and ASLO (Anti-streptolysin) titre of 433 U/ml. At control after two days CRP was 10.7 mg/l. As pain did not subside under antiphlogistic therapy a MRI scan was performed six days after initial presentation (Figure 1).

Our diagnosis was a metaepiphyseal OM of the distal radius and ulna with a subperiosteal abscess formation adjacent to the distal radius.

Case 2

A nine-year-old girl presented with painful swelling and redness of the lateral malleolus. There was no history of a previous illness or a memorable trauma. Plain radiographs at initial presentation showed no pathologies. Three days later the ankle joint was livid, swollen and painful (WCC 14.300/mm3, CRP 7.0 mg/dl, ASLO titre 1612 U/ml).
With elevated body temperature (37.5°C) beginning erysipelas was suspected. She underwent MRI of her ankle joint (Figure 2).

Our diagnosis was a primary metaepiphyseal OM of the distal fibula with an adjacent subperiostal collection.

**Treatment**

In an effort to limit harm to the physis as well as further joint involvement the abscess formations were treated operatively. Drainage and abscess lavage with normal saline solution was performed. Further drainage of the metapophysitis by two drill holes was performed to release the intramedullary pressure. In case one an antibiotic-instilling drainage was in use for five days post OP. In case two the wound was closed with a modified Manuvac drain which was retained for two days. Postoperatively a cast immobilization was applied until removal of the stitches.

Cultures of the curetted material were positive for *Staphylococcus aureus*. Both children were given intravenous antibiotics (Augmentin 3 g per day) for eight days. Oral antibiotic therapy was continued for further six weeks.

At follow-up both children were pain free and had no limitation in range of motion.

**Discussion**

Metaepiphyseal HOM is a rare but typical childhood condition after a history of bacteremia (e.g. common cold). Metaepiphyseal HOM occurs in an acute, subacute or chronic form. Most of the cases are classified subacute due to the subtle clinical findings and the delayed diagnosing. Like as in case 1, antibiotic treatment during the course of tonsillitis might have masked the early symptoms of the osseous infection. Besides bacteremia a trauma to the physis might be directly related to the pathogenesis. A fall or minor trauma several days ago is not always to be remembered. These causal links were nicely demonstrated by Morrissey et al. who established a rabbit tibial trauma model regarding the development of OM. The model consisted of 3 groups, the first two groups had bacteremia or trauma alone and hardly any developed OM. But in group three, the rabbits that had both, bacteremia and a trauma and developed significant OM [14].

It is unclear, whether the lesions in both cases are truly metaepiphyseal or started as metaepiphyseal lesions then evolving to an epiphyseal lesion. In both of our cases, the sudden onset of symptoms supports the hypothesis of a true primary metaepiphyseal infection. Of note the physis reflects a barrier for fluid and pus. The periosteum is loosely attached to the cortex and as the intramedullary pressure increases a subperiostal collection develops [15,16].

At initial presentation conventional X-rays should be acquired although osseous destruction is reported to be invisible until 7 to 14 days after the onset of the symptoms [6,16]. Correspondingly plain radiographs of our patients showed no evidence of a lytic lesion or periostal reaction. Still, Ezra et al. [11] suggest that careful assessment of plain radiographs alone can reveal the benign features of most lesions with a high degree of reliability thereby making additional imaging redundant. But considerable subperiostal collections, as found in our two patients might then be missed and treatment prolonged. Nevertheless, MRI is reported to be an accurate tool to identify OM [17]. Moreover, MRI shows the extent of bone involvement and is thereby a crucial tool identify cases that profit from surgical repair especially in patients with subperiostial abscesses and soft tissue collections.

MRI should be obtained with a T1 and T2 weighted sequence without fat suppression. In addition a STIR sequence as well as a T1 sequence after the injection of gadolinium should be performed. The T1 sequence shows good anatomic details as well as the fat content of the bone marrow. The STIR sequence is most sensitive for bone marrow edema and fluid collection and the T1 sequence after injection of gadolinium with fat suppression perfectly delineates the boarder of the inflammation.

If MRI is not immediately available ultrasound is useful to detect a subperiostal abscess formation [15]. Ezra et al. [11] recommended ultrasound as an available, noninvasive method. To our opinion ultrasound provides only limited information regarding the extent of the OM. Nevertheless, ultrasound is reported to be useful for needle aspiration of a subperiostal abscess formation in selected cases [15,16].

In all cases of HOM material for bacterial culture has to be obtained by aspirate, intraoperative specimen or blood culture. Cultures of aspirated material are reported to be negative in up to 75% [18,19]. But even in the absence of positive culture patients with epiphyseal OM improve during the course of antibiotic treatment [18]. Therefore, antibiotic regimen has to be started at the onset of symptoms targeting *Staphylococcus aureus*, which accounts for approximately 50%-60% of AHMO [7,18,20].

Current literature is inconclusive whether a metaepiphyseal HOM with abscess formation heals with AB treatment alone or requires surgical repair. In our opinion antibiotics alone may be sufficient in metaepiphyseal HOM in the absence of a periostal collection. But a subperiostal formation is a result of high intramedullary pressure levels. Still, no threshold is defined at which size a surgical drainage is indicated. Howard et al. [21] for example suggested a subperiostal formation of 2 mm to be crucial for surgical debridement. Nevertheless, uneventful recovery after spontaneous rupture of a subperiostal abscess collection is reported by Mah et al. [7] Of note, the authors at the same time consider surgery as to allow for quicker recovery.

Besides presence of a subperiostal abscess formation, our decision to perform surgery was based on the MRI findings regarding the physis affection. Two drill holes thereby released the intramedullary pressure and limited the progression of the infection. However, no general recommendation can be made due to the small number of patients.

**References**