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ORIGINAL STUDY

Chronic osteomyelitis of the pelvis in children and adolescents

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Osteomyelitis of the pelvis is rare in children as well as in adults. This explains why the diagnosis is often missed, so that the infection becomes chronic. The authors report five chronic paediatric cases, seen between 1993 and 2003. The diagnosis was initially missed in two patients. In two others, the osteomyelitis was recognised but insufficiently treated, so that it also became chronic. The fifth patient developed exogenous osteomyelitis 6 months after an open pelvic fracture. The bone scan was useful for the differential diagnosis, but laboratory and radiographic findings were not. Treatment was the same for all patients, including wide surgical debridement, antibiotic therapy and prolonged immobilisation. Four patients were free of symptoms at the last clinical evaluation, after an average follow-up period of 7 years. Only one patient had a recurrence 3 months postoperatively and was re-operated. This study demonstrates that surgical treatment of chronic pelvic osteomyelitis in children and adolescents yields encouraging results.

Keywords : pelvis ; osteomyelitis ; children.

INTRODUCTION

Pelvic osteomyelitis constitutes only 2 to 3% of all cases of osteomyelitis in children and adolescents. The most common location is the iliac bone (*1*), while the ischial and pubic bones are very rarely affected.

Osteomyelitis can be classified as acute, subacute or chronic, depending on the duration of the symptoms. It can furthermore be classified as exogenous or, most often, haematogenous according to the mechanism of infection (*2*) ; in the series reported here, only one case was exogenous, as a consequence of an open fracture. Finally, a distinction can be made between pyogenic and non-pyogenic osteomyelitis, depending on the host response to the infection. Beaupré and Carroll (*1*) described three clinical pictures of iliac osteomyelitis according to the spread of the inflammation. Spread from the inner cortex of the ilium into the true pelvis would irritate the upper trunk of the lumbosacral plexus and cause an apparent *lumbar*

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Table I. — Clinical picture, laboratory findings and treatment in 5 children with chronic osteomyelitis of the pelvis

Case	**1**	**2**	**3**	**4**	**5**
Age	13	10	15	6	17
Sex	Male	Female	Male	Male	Male
Site	Ilium	Ilium	Ilium-Pubis	Ilium	Ilium
Type	Chronic	Chronic	Chronic	Chronic	Chronic
Mechanism	Haematogenous	Haematogenous	Haematogenous	Haematogenous	Exogenous
Clinical picture	Lumbar disc syndrome	Abdominal syndrome	Gluteal syndrome	Gluteal syndrome	Gluteal/Abd syndrome
Micro-organism	*Staph. Aureus + Cand. albicans*	*Staph. aureus*	*Staph. aureus*	*Staph. aureus*	*Esch. Coli*
ESR	78	63	52	53	59
CRP	12,6	7,9	8,3	2,5	7,4
Plain radio	+	–	+	–	+
Antibiotics	Fluconazol + Ceforanide	Cefuroxime	Amoxycillin + Clavulanic acid	Amoxycillin + Clavulanic acid	Cefamandole
Onset to surgery	1 month	1 month	8 months	4 months	6 months
Hospital	2 months	2 months	2 months	1 month	3 months
Follow-up	10 years	7 years	7 years	4 years	3 years

disc syndrome. Spread from the outer cortex of the ilium to the gluteal muscles would lead to a *gluteal syndrome*. Spread from the inner cortex to the iliac fossa would produce an *abdominal syndrome*, the rarest type, often mimicking acute appendicitis.

Faulty or late diagnosis leads to subacute or chronic osteomyelitis. Most authors agree that surgical treatment is the treatment of choice in these chronic cases (*3, 4, 5*).

MATERIAL AND METHODS

Five patients with chronic osteomyelitis of the pelvis were admitted in our department during the period 1993-2003. There were four boys and one girl. Their ages ranged from 6 to 17 years (mean : 12 years).

The iliac bone was involved in all patients ; the pubic bone was also affected in one of them. The diagnosis of acute haematogenous osteomyelitis was missed in 2 patients (cases 1 and 2, table I) : one was treated as a lumbosciatica, while the other underwent appendectomy. In cases 3 and 4 (table I) the right diagnosis was made, but the treatment was inadequate. One patient (case 5, table I) had an exogenous pelvic osteomyelitis 6 months after an open pelvic fracture with abdominal and urinary tract injury. A g*luteal syndrome* was the most common clinical finding (cases 3 and 4, table I). One patient presented a so-called *lumbar disc syndrome* (case 1, table I) and the only girl presented an *abdominal syndrome* (case 2, table I). Case 5 (table I) had a mixed *gluteal-abdominal* syndrome. Local tenderness on palpation of the iliac bone and pain on pelvic compression were present in all patients. Three of the patients had systemic manifestations such as fever, asthenia and anorexia (cases 2, 4 and 5).

The laboratory findings were suggestive of a septic process (table I). The white blood cell count (WBC) was elevated in all patients, with a relatively high percentage of neutrophils. The same was true for the erythrocyte sedimentation rate (ESR) (range : 52 to 78 mm/h) and the C-reactive protein (CRP) (range : 2.5 to 12,6 mg/dl ; normal levels : 0.1 to 0.5 mg/dl).

The plain roentgenograms obtained on admission showed a widened sacroiliac joint space (cases 1 and 2), lytic lesions of the ilium (cases 3, 4, and 5) (fig 1) and a

Fig. 1 . — Lytic lesions of the right ilium and pubis (arrows) and narrowing of the joint space of the right hip (case 3).

lytic lesion of the pubis (case 3) (fig 1). Definitely positive roentgenographic signs like lytic and sclerotic lesions of the iliac wing and disturbance of the bony architecture of the iliac bone were only seen in the patient with exogenous osteomyelitis. Features of paralytic ileus were seen in the girl with the *abdominal syndrome.*

All patients had a technetium bone scan. It was positive in all cases and, taken together with the clinical signs, led to the diagnosis. Two of the patients had a CT-scan (fig 2) in order to assess the extent of the osteomyelitis, which facilitated the surgical excision.

The mean delay from the onset of symptoms until surgical treatment was 4 months (range : 1 to 8). Treatment was the same for all patients, including surgical debridement of the infected bone and surrounding soft tissues, followed by antibiotic treatment. An anterior ilioinguinal approach was used. The muscles lying on the inner and outer surface of the iliac bone were subperiosteally dissected. Subsequently, all infected bone and granulomatous tissue were removed.

Staphylococcus aureus was identified as the causative organism in 4 patients ; it co-existed with *Candida albicans* in a single patient (case 1). In one patient (case 5) *Escherichia Coli* was identified.

Postoperatively a preliminary scheme of intravenous antibiotics was started, until the antibiogram allowed to make a definitive choice. After 3 weeks, oral antibiotics were administered for about 2 to 3 months, based on the laboratory findings (ESR and CRP). Bed rest was provided for about 9 weeks (range : 8 to 12). Subsequently, partial weight-bearing with crutches was allowed for a further 3 weeks. The mean hospitalisation period was 2 months (range : 1 to 3).

Fig. 2. **—** CT scan of the pelvis in case 3, showing extensive involvement of the right iliac bone.

RESULTS

The mean follow-up was 6 years (range : 3 to 10). All patients were re-evaluated clinically and radiologically. Four patients were free of symptoms, with a full range of motion of the hip joint ; they returned to their previous activities 6 months after surgery. Only one patient (case 5) had a recurrence and was re-operated upon, 3 months after the first operation. Partial excision of the iliac wing was necessary. At final follow-up, 3 years later, a relative limitation of the hip joint mobility was noted : flexion 100°, extension 15°, abduction 30°, adduction 25°, external rotation 35°, internal rotation 20°. Weakness of the hip abductors (grade 4) created problems with sports and strenuous activities.

DISCUSSION

Chronic osteomyelitis of the pelvis mainly involves the ilium, more often than the ischium and

the pubis (*1, 3, 5-9*), maybe because it is the largest bone of the pelvis with the richest blood supply. The infection usually starts close to the sacroiliac joint (*5*). Some authors feel that there is a true sacroiliac arthritis causing iliac osteomyelitis (*1*). Occasionally the acetabulum is the site of primary infection. Predisposing factors are : mild trauma, urinary tract infections and Crohn's disease (*6*).

Clinically one can distinguish three syndromes : the *lumbar disc syndrome*, the *gluteal* and the *abdominal syndrome*, depending upon the direction of spread of the inflammation (*1*).

In the *lumbar disc syndrome*, inflammation extends through the inner cortex of the iliac bone to the pelvis and irritates the lumbosacral plexus. The main complaints are difficulty in walking and pain in the lower back, hip and thigh. The straight leg raising test (SLR) is positive. The quadriceps muscle may be atrophied and the patellar reflex absent or diminished. Sensitivity is normal. Gentle examination shows that the hip is mobile, but the extremes of the ranges of motion are painful. The anterior and posterior aspects of the hip joint are not tender. Lateral pelvic compression produces severe pain on the affected side. This is the most specific clinical test in order to differentiate iliac osteomyelitis from septic arthritis of the hip (*1*).

If the inflammatory process extends towards the outer wall of the ilium, one is faced with a *gluteal syndrome*. A gluteal abscess may form. The main complaint is pain in the buttock. Pelvic compression is again painful. Palpation reveals local tenderness, and in the most advanced cases an abscess. Far more unusual is the presence of a sinus. There is no neurological deficit.

In the *abdominal syndrome*, the inflammation extends anteriorly into the iliac fossa. Symptoms and signs are similar to those of an acute appendicitis or present themselves as chronic abdominal pain. Lateral pelvic compression and localised tenderness help in making the differential diagnosis.

Concomitantly there may be systemic manifestations such as pyrexia, weakness and anorexia.

The diagnosis of osteomyelitis of the pelvis is difficult because of its rarity, its lack of early radiographic signs, and its ability to mimic other conditions (*1, 3-10*). The biochemistry is that of any infection ; haemocultures are mostly negative, and only the bone scan is really helpful for the differential diagnosis (*1, 8*). Computed tomography is useful for planning a surgical approach (*4*). MRI can delineate the extent of the infected bone to be removed (*7*).

The differential diagnosis includes eosinophilic granuloma and Ewing sarcoma, neither of which will respond to antibiotic therapy ; septic arthritis of the hip joint, characterised by limited mobility, and acute abdomen, without bony tenderness (*7*).

It is logical that the diagnosis is often made late, so that purely antibiotic treatment, as advocated by Highland and LaMont (*5*), becomes impossible ; surgical treatment is then mandatory. Most authors agree that the treatment of chronic pelvic osteomyelitis is surgical (*1, 3, 6, 7*). One should try to preserve part of the periosteum for the regeneration of cancellous bone.

The long-term results of chronic pelvic osteomyelitis seem to be good, if the appropriate treatment is applied : wide surgical debridement, antibiotics intravenously and later orally, and prolonged bed rest.

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