STRESS FRACTURE OF THE ACETABULAR ROOF. CASE REPORT AND VALUE OF MRI

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The authors report the case of an 11-year-old boy with pain in the left leg without history of recent trauma. The diagnosis of a stress fracture of the acetabulum was made based on MRI and bone marrow biopsy. They discuss the role of MRI in the diagnosis of a stress fracture.

Keywords : stress fracture ; acetabulum ; magnetic resonance imaging.
Mots-clés : fracture de fatigue ; cotyle ; résonance magnétique nucléaire.

INTRODUCTION

Stress fractures in children may be mistaken for malignant lesions or infections.

We report the case of an 11-year-old boy with a stress fracture of the acetabular roof, an infrequent location of this pathology.

CASE REPORT

An 11-year-old boy, a regular soccer player, came to our emergency room because of pain in the left groin and limping for more than one month. There was no history of recent trauma or increased physical activity.

Physical examination demonstrated pain on palpation of the left inguinal region, with normal mobility of the hip. Standard xrays of the pelvis and both hips were negative (fig. 1). Since symptoms did not resolve with rest, further examinations were done, including blood analysis, sonography, scintigraphy and magnetic resonance imaging (MRI). The blood analysis was normal. Ultrasound examination of the left hip showed a small hip joint effusion and a hypoechoic image, suggesting tendinitis of the adductor muscles. A standard xray of the pelvis and hip was negative. Increased uptake on the left hemipelvis was seen on bone scintigraphy. On MRI, the T1-weighted imaging sequence revealed a low-intensity signal that became high-intensity on the T2-weighted imaging and the short-tau inversion recovery (STIR) sequence (figs. 2, 3). The T2-weighted imaging also showed a low-intensity signal perpendicular to the cortical bone (fig. 4).

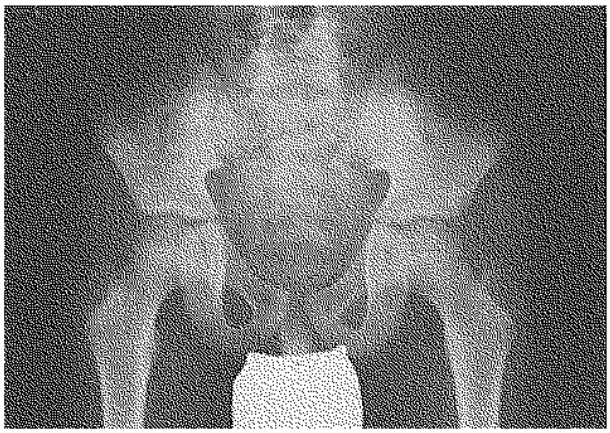

Fig. 1. — AP radiograph of the pelvis 2 months after onset of symptoms. (Note the small cortical lesion due to the bone marrow biopsy).

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Fig. 2. — T1-weighted imaging sequence revealed a low-intensity signal at the left iliac wing, spreading to the ischial region.

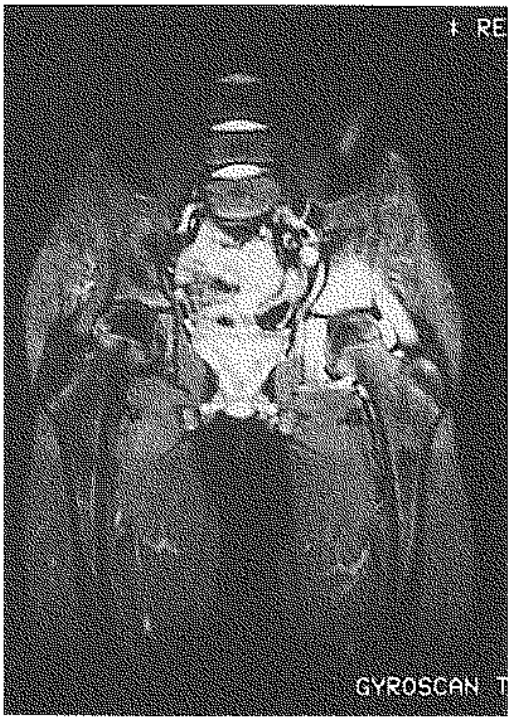

Fig. 3. — The STIR sequence showed a highintensity signal with extension across the growth plate.

These findings were considered as possibly reflecting infiltrating pathology at the inferior part of the iliac wing, spreading to the ischial region.

No signs of malignancy or infection were seen on the bone marrow biopsy. These results were in favor of a stress fracture of the acetabular roof.

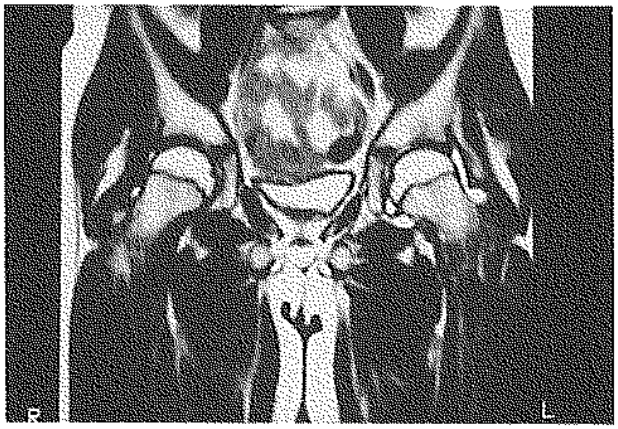

Fig. 4. — The T2-weighted imaging sequence showed a low-intensity signal perpendicular to the cortical bone.

Fig. 5. — MRI six months after the diagnosis shows complete resolution of the pathologic image.

Two weeks after the biopsy, the left hip was painless on physical examination. A follow-up MRI six months later showed complete resolution of the pathologic image (fig. 5).

DISCUSSION

Stress fractures result from repetitive physical activity causing muscle fatigue and compensatory altered gait. These cause changes in the stress application on bone, leading to altered bone resistance (2, 4, 6, 7, 9, 11, 12).

A stress fracture in children is most commonly located in the tibial shaft. These characteristics, together with the appearance of stress fractures

on standard xrays, are very helpful in the differential diagnosis (2, 4, 11, 12). Confusion is possible however with other pathologies such as malignancy or infection (4, 6). Stress fractures in the acetabular roof in a child has, to our knowledge, not been reported before in the literature. In an early stage of a stress fracture of a long bone, radiographs are negative until there is osteoclastic resorption, osteoblastic repair and eventually periosteal new bone formation. This can be seen on xrays as medullary sclerosis, cortical break, lucency and new bone formation, normally two or three weeks after the onset of symptoms (4, 5, 6, 11, 12). A radionuclide Tc-99m scan will be more sensitive with an early positive result, but this is nonspecific (7).

Because of the increasing use of MRI, we would like to focus on the importance of this highly sensitive examination and its possible specificity in the diagnosis of a stress fracture. As mentioned by Lee and Yao, MRI changes are visible before xray changes (6).

Within the first three weeks after onset of symptoms, edema or hemorrhage is most prominent (7). This is seen as a low-intensity signal on the T1-weighted sequence and is highly intense on the T2-weighted and STIR-sequences (6, 10, 12, 13).

A well-defined cortical break seen as a focal intermediate-signal intensity line, perpendicular to the cortical bone, can sometimes be seen on T1 and/or T2 sequences (11). In our case, this feature is seen as a low-intensity signal on the T2-sequence.

As many studies show, bone marrow edema is best visualized by the STIR-sequence images (1, 3, 8, 11, 13). The STIR-sequence has the advantage over conventional T1- and T2-spin echoes in the evaluation of the bone marrow lesions, because of the fat suppression (1, 3, 13). It reduces the signal intensity of fat, such as marrow fat, which makes high intensity signal lesions that are rich in water, such as hemorrhage, more conspicuous.

There is also a better assessment of the involvement of bone and soft tissue components, which are less well depicted on either T1 or T2 sequences (1).

The absence of a soft-tissue mass and bony destruction is helpful in the differential diagnosis, since this is in favor of a stress fracture (11, 13).

The bone marrow edema may extend away from the fracture site (8, 12). As described by Tyrell and Davies, and as is also seen in our case, extension across the growth plate is possible (11).

Very little literature refers to the time period after which the features for a stress fracture seen on MRI are resolved. Horev *et al.* described a case of a stress fracture of the tibial shaft confirmed on MRI (5). A follow-up MRI at four months was completely normal. In our case, a follow-up MRI was negative at six months. There was no trace of the biopsy. It is possible that the biopsy stimulated the healing process.

CONCLUSION

The diagnosis of a stress fracture in a child is based on the clinical history and standard xrays. The differential diagnosis with a malignancy or infection has to be considered until excluded, especially if xrays are negative.

MRI is more and more frequently used in the assessment of bone pathology. It is becoming the key examination in the diagnosis of bone tumors (11). Besides giving an early positive result, it is also more specific than the bone scan. The STIR-sequence, in particular, has an advantage over the conventional T1- and T2-spin echo. Because of the fat suppression, it provides a more detailed image as well as a better assessment of soft-tissue involvement.

In evaluating a child with a hip problem, one should consider the possibility of a stress fracture that might be diagnosed on MRI, avoiding unnecessary complementary invasive examinations such as a bone biopsy. We however think biopsy of the bone marrow is justified in well-selected cases.

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SAMENVATTING

V. POLLET, M. BELLEMANS, N. DAMRY, J. LAMOUREUX. Een stress fractuur van het acetabulum bij een kind : een case report.

De auteurs beschrijven een stressfractuur van het acetabulum bij een 11-jarige jongen zonder trauma.
Op basis van de standaard radiografieën, echografie, scintigrafie en magnetische resonantie werd een stressfractuur van het acetabulum vermoed.
Een kwaadaardige of infectieuse pathologie kon echter pas worden uitgesloten na een beenmergbioptie.
De specificiteit van de NMR-opname words besproken.

RÉSUMÉ

V. POLLET, M. BELLEMANS, N. DAMRY, J. LAMOUREUX. Fracture de fatigue du cotyle chez l'enfant : description d'un cas.

Les auteurs rapportent le cas d'un garçon de 11 ans qui présentait une fracture du cotyle sans notion de traumatisme.
Sur base des résultats de la radiographie, de l'échographie, de la scintigraphie et de l'IRM, une fracture de fatigue du cotyle a été suspectée.
Une biopsie de la mœlle osseuse a cependant été réalisée, qui a permis d'exclure une pathologie maligne ou infectieuse.
Les auteurs discutent l'interêt diagnostique de l'IRM, en particulier la séquence STIR.