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Case Report

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Displaced Femoral Neck Stress Fracture in a 7-year-old Child: A Case Report

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Abstract

Background: Stress fracture of the femoral neck is rare in children. Its differential diagnosis includes muscle strain, synovitis, infection, dysplasia, etc. Since physicians rarely see this type of fracture in children, they often overlook it or misdiagnose it.

Case Report: A seven-year-old girl presented to our service with right groin pain following a fall on her right hip 15 days prior to presentation. Pelvic and knee radiographs of her right limb showed a fracture line with sclerosis at the femoral neck. Magnetic-resonance imaging (MRI) confirmed the diagnosis of a stress fracture of the femoral neck. We opted for conservative management and gave the patient analgesics and limited weight-bearing with the help of crutches for eight weeks. Three weeks after her first visit, the patient presented with severe limping and inability to bear weight on her right leg. Right hip radiographic imaging showed a varus displaced fracture of the femoral neck, which we managed surgically with an open reduction and internal fixation using plate and screws, followed by immobilization of the right hip with a hip spica cast. Six weeks following the surgery, the patient had no complaints, and the radiographic images showed an appropriate reduction and signs of union. The patient was allowed to start partial weight-bearing for a further six weeks before proceeding to full weight-bearing.

Conclusion: Our case emphasizes the importance of considering femoral neck stress fracture in children, through a thorough clinical evaluation and imaging analysis, especially for those carrying classical risk factors. Failure to do so can complicate the disease course and may lead to a displaced fracture requiring more invasive and timely management.

Keywords: femoral neck stress fracture, rare case, pediatrics, stress fracture, case report, displaced fracture

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Background

Femoral neck fractures in the pediatric population are uncommon injuries, accounting for less than 1% of all pediatric fractures [1]. The first case was described by Devas in 1963, and since then, only about 20 cases have been reported. Femoral neck stress fractures commonly occur in athletes, physically hyperactive people, and those who are malnourished [2]. Patients present with anterior groin pain that worsens with activities such as walking, and is relieved by rest. On examination, there may be swelling and redness over the site of the fracture. Other findings include bony tenderness, periosteal thickening, and limited range of motion of the hip. Special tests may aid us during the examination, such as the hop test; if upon hopping on the affected leg, the patient feels pain, the test is considered positive. Positive results are present in 70% of patients with femoral neck stress fracture [3].

We report the case of a seven-year-old girl presenting with right groin pain who, following plain radiography and Magnetic Resonance Imaging (MRI), was found to have a right femoral neck stress fracture. This case emphasizes the importance of considering femoral neck stress fracture in children, despite its rarity, when evaluating any child with groin pain.

Case Report

A seven-year-old girl presented to our orthopedic clinic with complaints of right groin pain for the last 14 days. The girl is previously healthy, and the caregiver reported that she fell on her right hip 15 days prior to presentation, while playing with her friends. The pain was progressive, deep, of 5/10 severity on a numeric rating scale, located around the hip flexor insertion and radiating to the anterior aspect of the right thigh and knee. The pain was exacerbated by walking and relieved with rest. There was no morning stiffness, clicking of the joint, or any other associated symptoms, and the patient denied groin pain at night.

On physical examination, the patient weighed 19 kg (10^{th} percentile) and was 116 cm tall (10^{th} percentile). The patient was afebrile. She had an antalgic gait. On examination of the right lower limb, she had tenderness on the greater trochanter with a painful, but not limited, range of motion of the right hip. The patellar reflex was within normal, the motor power of the right hip flexor muscle was 4/5 (on muscle power grading), and the femoral artery pulsation was within normal. The examination of the left lower limb didn't show any abnormality. Complete blood count, erythrocyte sedimentation rate, and a C-reactive protein level were all within normal.

Plain radiography of the pelvis and right knee showed a fracture line with sclerosis at the right femoral neck and an incidental osteolytic lesion with erosive changes at the right anterior inferior iliac spine (Fig. 1).

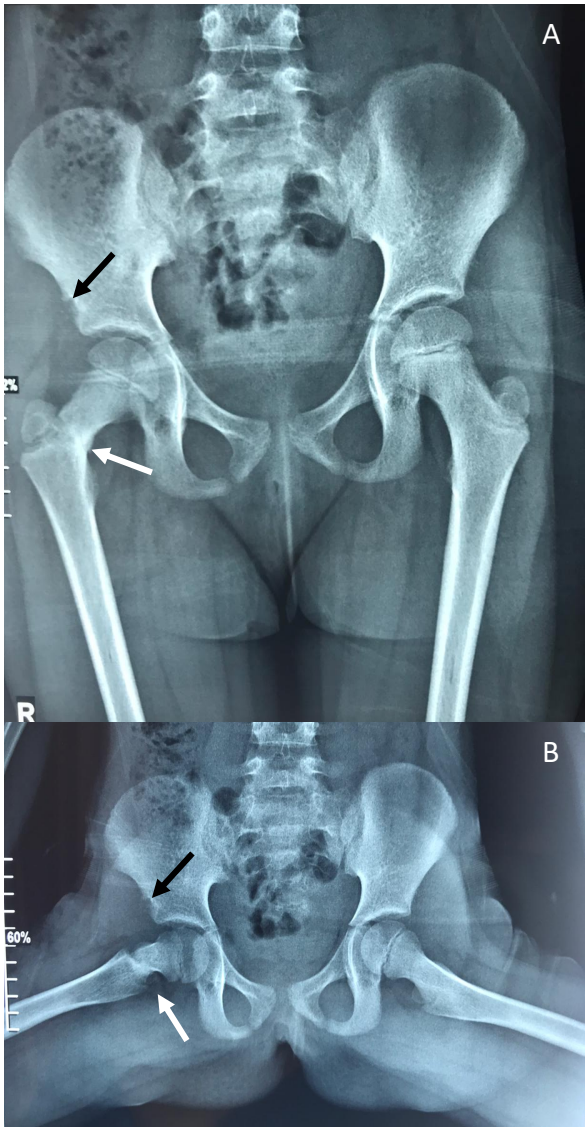

Figure 1: (A) Anteroposterior radiograph of the pelvis and (B) lateral radiograph of the right hip showing a sclerotic line along the right femoral neck (white arrows) with an osteolytic lesion at the right anterior inferior iliac spine (black arrows).

An MRI of the pelvis was then performed and revealed a hypo-intense signal along the femoral neck on T1-Weighted Imaging (WI), with a T2-WI hyperintensity in the same area, with surrounding bone marrow edema, confirming the diagnosis of a stress fracture of the right femoral neck. The anteroinferior right iliac crest showed an 8x13 mm intra-medullary anomaly of a high-intensity signal on T2-WI and a low-intensity signal on T1-WI. The abnormality was not associated with cortical

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erosion, suggesting that the osteolytic lesion, detected by plain radiography, was a benign focal bone lesion (Fig. 2). We opted for a conservative treatment consisting of analgesics and limited weight-bearing with the use of crutches for eight weeks.

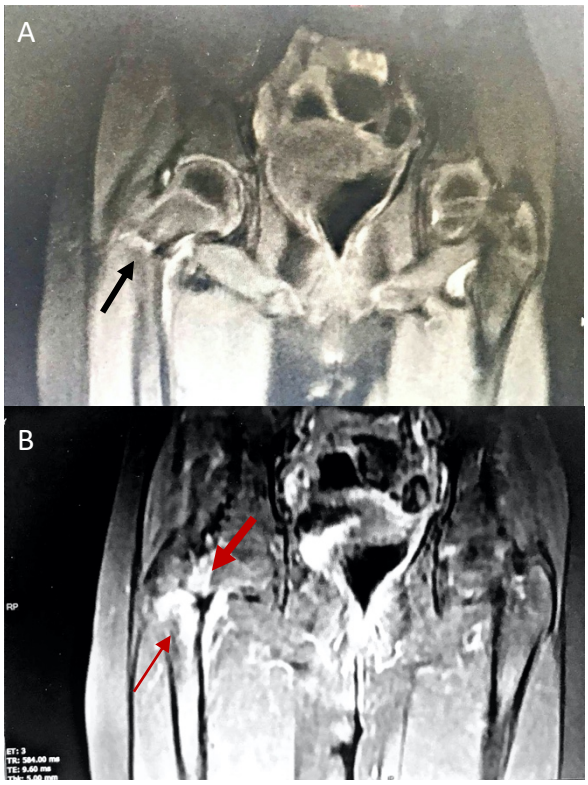

Figure 2: (A) Coronal T1-weighted Magnetic Resonance Imaging (MRI) of the pelvis showing a low intensity signal along the right femoral neck (arrow) (B) Coronal T2-weighted MRI images of the pelvis showing a high intensity signal along the right femoral neck (thick arrow), with surrounding bone marrow edema (thin arrow)

Three weeks after her first visit, the patient presented with severe limping and inability to bear weight on her right leg. The patient's caregiver reported that the limp developed suddenly while the girl was walking, mentioning that the patient was not compliant with using crutches at the time. On physical examination, the patient had a leg length discrepancy, and the right leg was externally rotated. A right hip plain radiography showed a varus displaced fracture of the right femoral neck (Fig. 3). We decided to intervene surgically. Under general anesthesia, we performed an open reduction and internal fixation using a proximal femoral plate and two screws, one at the level of the femoral neck and the second at the level of the diaphysis (Fig. 4, 5). This was followed by immobilization of the right hip with a hip spica cast to prevent weight-bearing during recovery. The pre- and post-operative courses were free of complications. Six weeks after the surgery, we followed-up on the patient clinically and through radiographic imaging. The patient had no complaints, and radiographic imaging showed signs of union with an appropriate reduction of the fracture. We removed the cast, and the patient was allowed to start partial weight-bearing for a further six weeks before advancing to full weight-bearing.

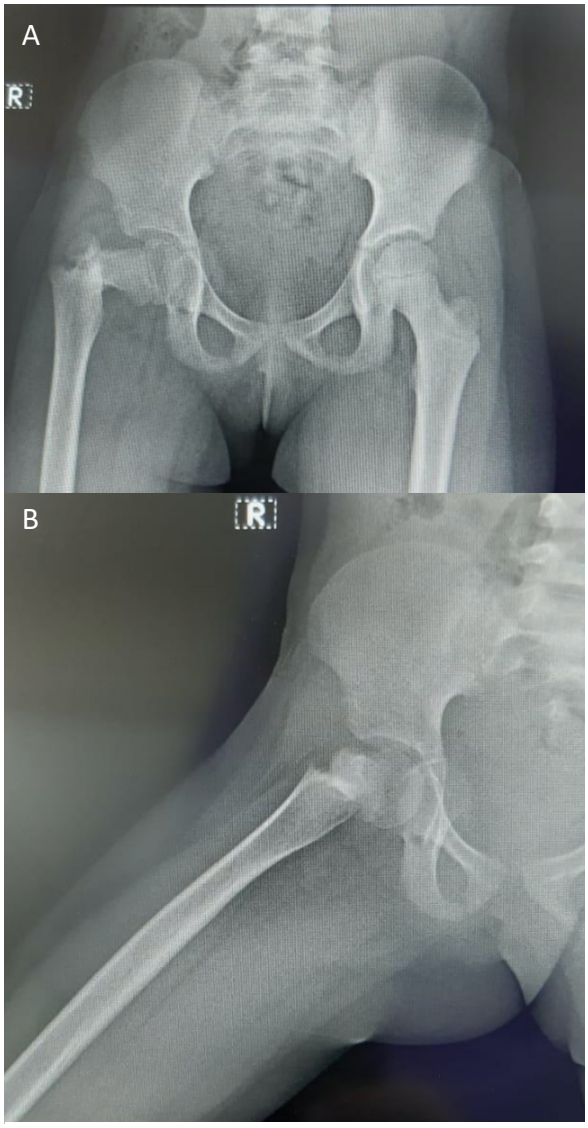

Figure 3: (A) Anteroposterior and lateral (B) radiograph of the pelvis showing a displaced fracture of the right femoral neck.

Discussion

Femoral neck stress fractures can be classified into two types: *(1)* **tension-type fractures**, which occur mainly in the superior-lateral part of the neck and have the greatest risk for a complete fracture, and *(2)* **compression-type fractures,** which occur mainly in young athletes at the inferior medial part of the femoral neck [4]. In individuals with an immature skeleton, stress

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fractures are rare and are mainly seen as a compressive type fracture. [5]. Indeed, our case was a compressive-type stress fracture of the right femoral neck. Risk factors leading to these types of fractures include osteopenia, inactivity, demineralized bone or anatomical variations, female gender, poor physical condition, hormonal or menstrual disturbances, and nutritional deficiencies [6, 7].

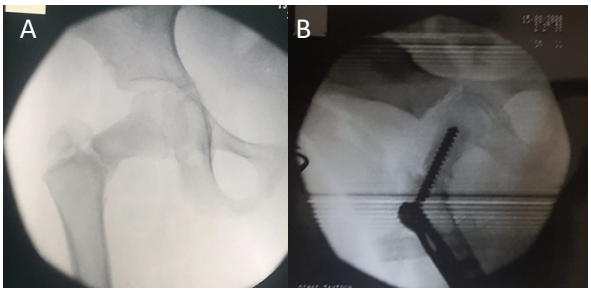

Figure 4: Intraoperative fluoroscopy image (A) before and (B) after reduction and fixation of the right femoral neck fracture by plate and screws.

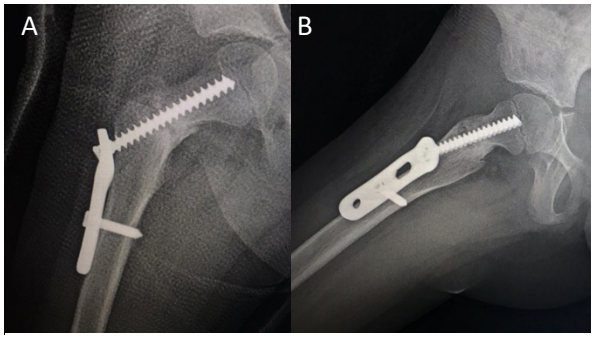

Figure 5: (A) Anteroposterior and (B) lateral view of the right hip six weeks after the surgery, showing an appropriate reduction and signs of union.

Our patient had no known predisposing condition except that she was underweight and malnourished, which could have contributed to her fracture. We believe that in her case, the pain was due to her fall and not to the fractures. The latter was an incidental finding since the patient never complained of any groin pain before her fall. A femoral neck stress fracture occurs when the bone undergoes repetitive stress at a rate that overcomes its ability to remodel, leading to microtraumas. At this stage, the patient may experience swelling and pain but without any signs of fracture on radiographs. In case the causative factor persists, this microtrauma may progress into a complete fracture [8].

Abnormal radiographic findings include periosteal elevation, sclerosis, fracture line, and a cortical thickening [4]. MRI can reveal changes earlier than plain radiography, showing a linear hypointense signal on T1-WI and edema on T2-WI. Subperiosteal fluid can be a useful indicator to confirm the diagnosis [9]. The radiologic and MRI findings in our case fit well the diagnosis of a femoral neck stress fracture. Other conditions including hip joint strain, Legg-Calvé-Perthes disease, osteosarcoma, osteoid osteoma, and synovitis should also be included in the differential diagnosis [2]. Nonetheless, laboratory tests were all normal, and imaging studies showed no signs of synovitis. There were no signs of osteonecrosis or any suspicious tumor lesions on imaging, which helped ruling out the aforementioned conditions.

Treatment of undisplaced fractures is with the use of crutches to prevent weight-bearing. If this is not a possibility, we can opt for cast immobilization. Following the resolution of the pain, and after regaining complete range of motion, a trial of partial weight-bearing may be initiated. In patients with progressive fracture, delayed union, or non-union, a spica cast or internal fixation is recommended. Reduction and internal fixation are recommended for those with displaced fractures [10]. In our case, we opted for an open reduction and internal fixation using a proximal femoral locking plate with one screw at the femoral neck and the other in the diaphysis, to ensure better biomechanical stability of the fracture. Complications following a femoral neck stress fracture include malunion, non-union, delayed union, osteoarthritis, avascular necrosis, failure of fixation, and revisional surgery [11].

The prognosis of a compression-type stress fracture is usually benign [9]. However, displaced fractures are associated with more serious complications. Visuri et al. reported 12 cases with a displaced femoral neck stress fracture, where three patients developed non-union, and four patients developed avascular necrosis. In nine cases of displaced fractures reported by Blickenstaff et Morris, only two patients recovered without complications [12].

Conclusion

A femoral neck stress fracture in a seven-year-old child is very rare, and its diagnosis can be easily overlooked or missed, even after radiological evaluation.

Our case highlights the importance of considering the diagnosis of femoral neck stress fractures in children with a thorough clinical and radiological evaluation. In the case of inadequate management, the fracture can progress to a displaced fracture requiring more aggressive therapy.

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