CASE REPORT
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Bilateral Insufficiency Fracture of Medial Subtrochanteric Area of the Femur: A Case Report

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A non-traumatic, incomplete insufficiency fracture commonly involves the lateral side of the femoral cortex; whereas a non-traumatic, incomplete stress fracture commonly involves the medial side of the femoral cortex. Here, we describe a case of a 66-year-old woman with a two-month history of bilateral thigh pain without trauma or medication usage who was diagnosed with bilateral subtrochanteric insufficiency fractures involving the medial side of the femoral cortex.

Key Words: Femur, Subtrochanteric fracture, Stress fracture

An insufficiency fracture is a type of stress fracture that results from normal or physiological stress occurring in an abnormally weakened bone, such as that seen in osteopenia or osteoporosis[1]. An atypical subtrochanteric insufficiency fracture is an uncommon cause of hip or thigh pain. Atypical femur fractures are observed most commonly in the proximal one-third of the femoral shaft but may occur anywhere along the shaft from just distal to the lesser trochanter to just proximal to the supracondylar flare. According to a recent Task Force of the American Society for Bone and Mineral Research report, atypical fractures of the femur commonly occur as a result of no or minimal trauma. Fractures may be transverse or have a short oblique configuration, and they are non-comminuted. A complete fracture extends through both cortices and may be associated with a medial spike. On the other hand, incomplete fractures may involve only the lateral cortex. Of subtrochanteric and diaphyseal fractures, 17% to 29% are atypical. Bilateral atypical femoral fractures were present in 28% of all atypical femoral fractures[2]. In another study, 39.5% had a stress or complete fracture in the contralateral femur, and 21.1% had focal cortical hypertrophy in the contralateral femur[3].

Compared with most atypical fractures, a medial subtrochanteric femoral fracture is very rare in a situation with normal or physiological stress. Most stress fractures of the medial side of the femur occurred in military recruits and in athletic populations, especially distance runners[4]. They occurred mainly in the femoral neck or diaphysis and involved the medial femoral cortex.

To our knowledge, there have been no reports of bilateral femoral fractures involving the medial subtrochanteric area in an elderly patient with osteoporosis. Our study presents the case of a bilateral subtrochanteric stress fracture which occurred on the

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medial side of the femur. The patient was informed that data from her case would be submitted for publication.

Case Report

A 66-year-old woman presented with a two-month history of bilateral thigh pain. The pain on the visual analogue scale was 7 of 10 and located in the anteromedial aspect of both hips. The pain was aggravated when she stood in weight-bearing status. But pain was reduced at rest. She could not walk with crutches and moved only by wheelchair. She had no evidence of trauma or medication use. Family history was not remarkable. She was a housewife, but volunteered recently at an orphanage, where she performed more physical activities that were lifting heavy goods and repetitive squatting and standing than normal. She had not been receiving anti-osteoporotic medical therapy. She was 65 kg and 160 cm; body mass index was 25.4 kg/m^2. On physical examination, there was no tenderness to palpation at either hip or proximal thigh. Patrick' s tests were positive on both hips, and the log-roll test was negative. Range of motion of both hips and knees was full with mild pain. Neurovascular status was intact in both lower extremities. All laboratory findings were within normal limits.

Plain radiographs in both hips revealed no sign of fracture in either femur (Fig. 1). A whole body bone scan showed increased uptake of radioisotope on the medial side of the subtrochanteric area of both femurs, which raised the possible diagnosis of occult fractures (Fig. 2).

Magnetic resonance imaging (MRI) in both femurs was performed. A linear low signal intensity line on the medical cortex was found with localized bone marrow edema. A fracture line was observed on right side 2 cm below the lesser trochanter and on left side just below the lesser trochanter (Fig. 3).

The patient underwent a dual energy X-ray absorptiometry scan, and her bone mineral density (BMD) was 0.611 g/cm^2(T-score=-2.4) in the femoral neck and 0.650 g/cm^2(T-score=-2.4) in the total proximal femur.

Because there was no progressive thigh pain, and compression-side stress fractures have a lower risk of displacement, she was given the advice of protective weight bearing for six weeks with planned follow up and was prescribed tramadol for pain control. The pain resolved completely within three months, and the patient was able to walk without a cane. There was no interval change on plain radiographs at three months (Fig. 4).

Discussion

Bilateral stress fractures of the medical subtrochanteric areas of the femurs are extremely rare. Because the

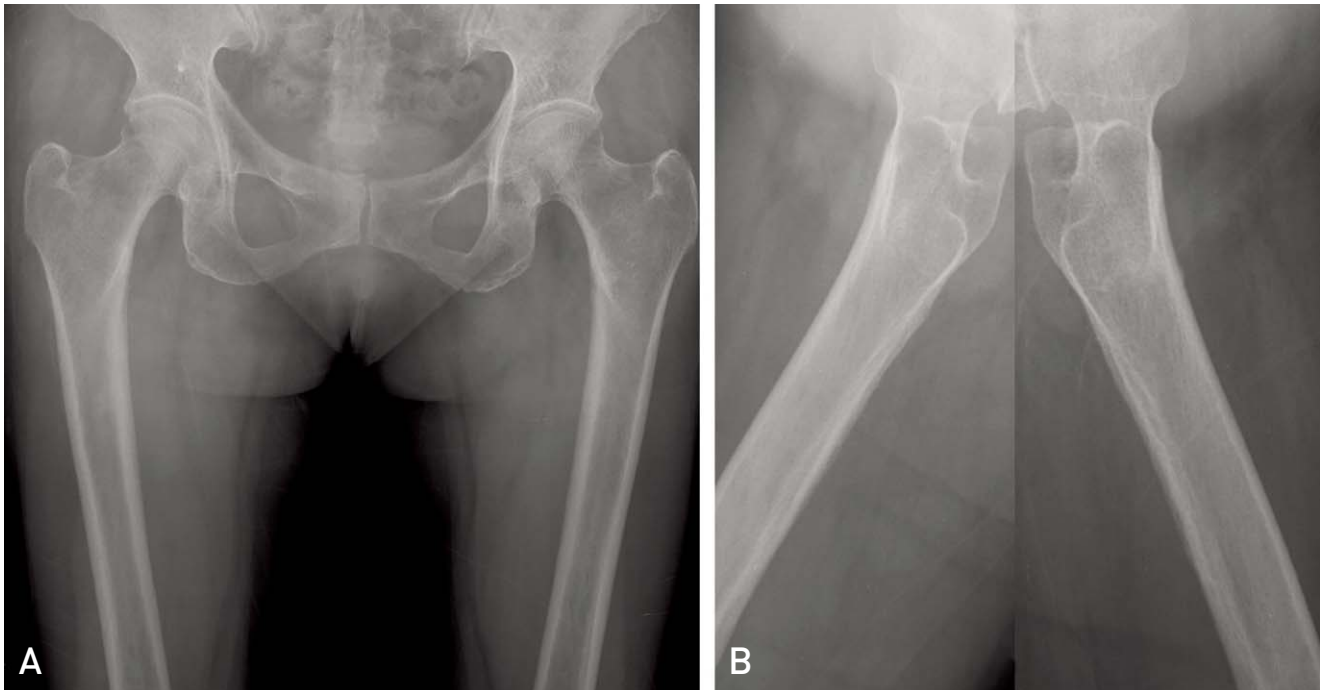

Fig. 1. (A) AP and (B) lateral plain radiographs of both femurs show no bony abnormalities.

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subtrochanteric area of the femur usually has a relatively thick cortex and a large medullary canal, fractures in this area are usually related to high-energy trauma.

Fractures which occur in the subtrochanteric area are typically caused by trauma, and include fatigue-type stress fractures in athletes and atypical insufficiency fractures in the elderly. Each of these fractures has a usual location and appearance. Typical subtrochanteric femoral fractures consist of a severe comminuted fracture due to high energy trauma in young patients and a less comminuted, long spiral fracture due to low energy trauma in elderly osteoporotic patients[5].

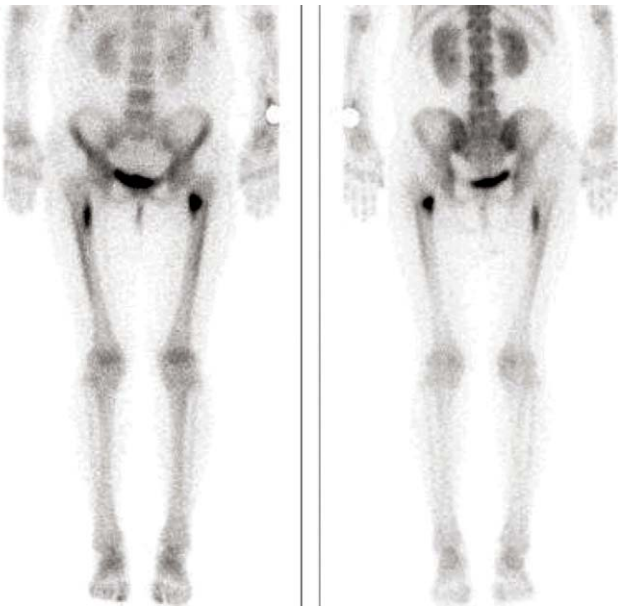

Fig. 2. Bone scan shows increased uptake in the medial subtrochanteric areas of both femurs.

Fatigue-type stress fractures are common injuries in athletes and military recruits. In many case reports of femoral diaphysis stress fractures in athletes (especially runners), the fractures occurred at just distal to the lesser trochanter, at the junction of the proximal and middle third of the shaft, and at the mid-shaft of the femur, and these fractures involved only the medial cortex (compression side) of the femur. Repetitive forces on the femoral diaphysis may result in a stress fracture on the medial aspect (compression side) of the femur at the junction of the proximal and middle third of the shaft. The vastus medialis originates in this area, and this area serves as the insertion point for the adductor brevis. Force transmitted to the femur from the activity of these muscles during weight bearing is considered a causative factor in the development of stress fractures at this site. The adductors and vastus medialis may increase compressive strain in this area, while the iliotibial tract and vastus lateralis decrease the tensile strain along the lateral aspect of the femur and, consequently, decrease the risk of fatigue-type stress fracture in this area. Therefore, despite bone strength being greater on the compression side of the femur, repetitive load coupled with muscular forces may account for the fatigue-type stress fractures that occur on the compression rather than tension side[6].

Recently, subtrochanteric insufficiency fractures in osteoporosis patients have increased in the literature. Some studies suggest a correlation with the use of bisphosphonates, but in our case the subtrochanteric insufficiency fractures occurred without medication. Regardless of the cause, almost all atypical insufficiency femoral fractures occur in the lateral femoral cortex

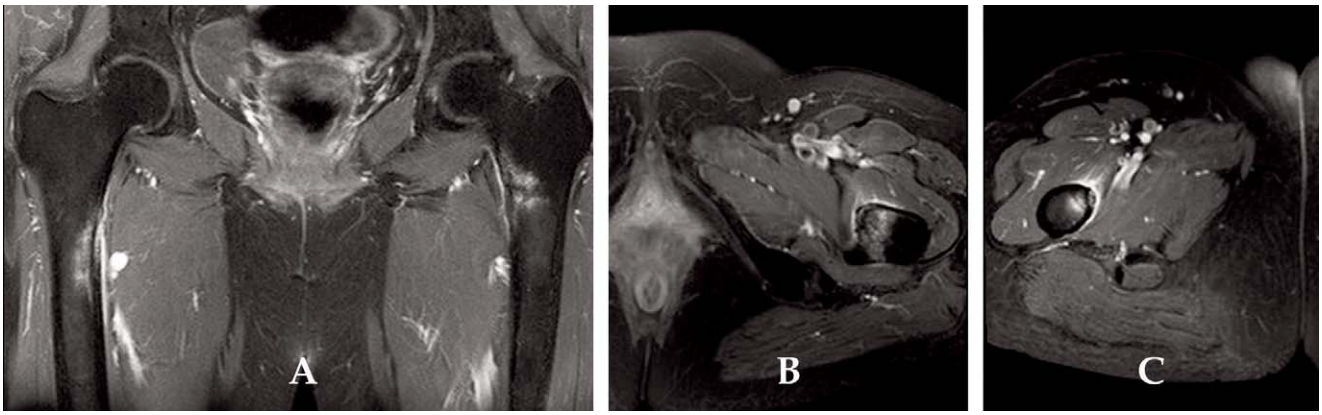

Fig. 3. T2-weighted signal intensity (**A**) coronal and (**B**, **C**) axial MR images of both femurs show increased signaling of the medial subtrochanteric area of the marrow. Linear low signal intensities are seen at just below the lesser trochanter in left femur and 2 cm below the lesser trochanter in right femur.

under tension, and they rarely occur in the medial femoral cortex under compression forces. But in our report, subtrochanteric insufficiency fractures occurred only on the medial compression side. More importantly, these occurred bilaterally. Unique radiographic features in our case do not correspond exactly to some of the above listed aspects of the fracture.

According to the literature, an increased level of activity after a period of relative inactivity and osteopenia are the only two factors that can explain this rare occurrence of femoral stress fracture. Our patient had low BMD in her proximal femur, indicating osteopenia. Her usual activities are mild, but in volunteer activities, she was undoubtedly putting greater stress on her proximal femur with increased use and weight bearing. We think that the compression load on the medial side of the osteopenic subtrochanteric region induced microfractures, and the femur could not respond to this excessive demand quickly enough by remodeling.

Femoral stress fractures manifest with abrupt onset of severe hip pain. The physical findings of localized tenderness and swelling are usually absent from femoral diaphyseal stress fractures, and the fulcrum test proves to be much more critical in making the diagnosis. When performed on a patient with a diaphyseal stress fracture, this test is positive and leads to further imaging studies with radiographs, bone scan, or MRI[7]. Plain radiography is commonly the first imaging study ordered. Any radiolucency, cortical disruption, periosteal thickening, or early callus formation is suspicious for stress fracture. In many cases, however, the initial radiographs are not always sensitive in the early stages of injury. Bone scans have become the gold standard for the identification of stress fractures within 72 hours after injury[8]. MRI has played a more important role in the diagnosis of femoral stress fractures and the differentiation of femoral stress fractures from other causes of thigh pain. If the radiographs do not reveal a fracture, an MRI may be ordered instead of or in addition to a bone scan[9].

In our case, there were no positive findings in simple radiographs. The patient's bilateral hip and thigh pain revealed a missed diagnosis of pain originating in the spine. She visited neurosurgery and underwent neuroplasty in her lumbar lesion before definite diagnosis. Later, when visit to our clinic we should be observed with caution and perform a technetium bone scan and a MRI for evaluation.

In the treatment of femoral stress fractures of the neck, subtrochanteric area, and shaft, the importance of early management, whether nonoperative or operative, is evidenced by the poor results reported following the delayed management of displaced fractures in some studies[10]. Incomplete stress fractures, which occurred on the medial compression side of the femoral neck,

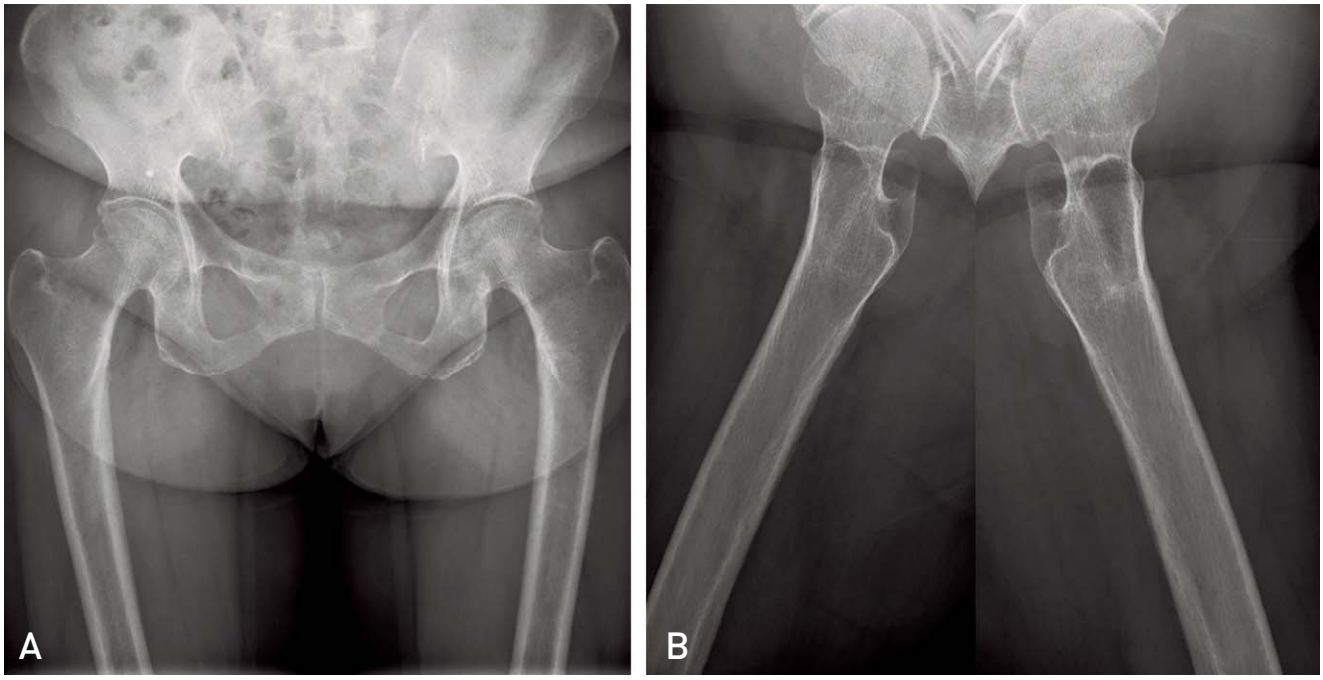

Fig. 4. After 3 months, (**A**) AP and (**B**) lateral plain radiographs of both femurs show no interval change.

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subtrochanteric area, and shaft, have been treated nonoperatively with excellent results[9]. These patients require a period of rest, to allow for bone repair, followed by gradual resumption of activity. Operative intervention is needed for failure of nonoperative management, prophylactic stabilization of a fracture at high risk of displacement, a tension-side femoral neck stress fracture, and any displaced femoral fracture[9]. Treatment of other cases depends on the symptoms and patient compliance.

Our case is exceptional because it describes bilateral insufficiency stress fractures on the compression side of the subtrochanteric area in an elderly individual with osteopenia. Because rapid diagnosis of a stress femoral fracture is critical, any patients with thigh or hip pain should be investigated with radiographs of both femurs to rule out femoral stress fracture, and if necessary, advanced imaging such as bone scan or MRI should be performed.

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국문초록

양측 대퇴골 전자하 내측에 발생한 부전 골절: 증례 보고

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외상력없이 발생한 불완전 부전 골절은 흔히 대퇴골 피질부의 외측에서 발견되는 반면 불완전 피로 골절은 내측에서 관찰되는데, 저자들은 외상력이나 약물 복용의 과거력없이 발생한 두 달간의 양측 대퇴부 내측부 통증으로 내원한 66세 여환으로 대퇴골 피질부의 내측을 침범하는 양측 전자하 부전 골절을 보고하는 바이다.

색인단어: 대퇴골, 전자하 골절, 피로 골절