ISOLATED SUPRA-ACETABULAR INSUFFICIENCY FRACTURE: A CASE REPORT

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Abstract: In the absence of trauma, fracture of the acetabulum is a rare injury, and an isolated insufficiency fracture in the supra-acetabular region is extremely rare. We describe a 59-year-old postmenopausal woman with systemic lupus erythematosus (SLE) who developed a fracture in the roof of the acetabulum with underlying corticosteroid-induced bony insufficiency. Faint medullary sclerosis over the roof of the acetabulum was observed on plain roentgenograms. Diagnosis was made using magnetic resonance imaging. Irregular linear low signal intensity lines were observed on T1-weighted, T2-weighted, proton density, and contrast enhanced images, and these represented the fracture. The fracture healed with conservative management. Insufficiency fracture in this location should be suspected in an osteopenic woman with spontaneous hip pain.

Supra-acetabular insufficiency fracture has been reported sporadically since its initial description by Cooper et al in 1985 [1]. This particular localization of insufficiency fracture is probably still underdiagnosed [2, 3] because routine roentgenographic findings are often subtle and easily overlooked [4]. Most reported supra-acetabular insufficiency fractures are associated with other pelvic region fractures [1, 2, 5], and isolated supra-acetabular insufficiency fracture is rare [6]. The diagnosis of supra-acetabular insufficiency fracture must be envisaged in osteoporotic patients complaining of pain in the hip but without radiologic evidence of hip fracture [2]. The diagnosis can be confirmed by magnetic resonance (MR) imaging [2, 3]. This report describes a patient with this rare injury to increase the practitioner’s awareness of the condition and emphasize the need for careful evaluation and early diagnosis with MR imaging to ensure timely treatment.

Case Report

A 59-year-old postmenopausal woman visited our outpatient clinic in April, 2001, due to spontaneous left hip pain which had persisted for 1 month. She reported that no trauma had occurred before the development of left hip pain. She had been taking prednisolone 15 mg/day for more than 1 year for systemic lupus erythematosus (SLE). She underwent quantitative ultrasound bone densitometry of the calcaneus at a regional hospital and was told that she had moderate osteoporosis. The bone mineral density value and T- and Z-scores were not available when she visited our hospital. Physical examination showed a positive Patrick-Faber test. Plain roentgenograms of the pelvis and left hip were normal except for osteopenia of the pelvis and bilateral proximal femur, Singh index grade III (definite osteoporosis) [7], and a subtle, ill-defined medullary sclerosis over the dome region of the left acetabulum (Fig. 1).

After 4 months of treatment with vitamin D3, calcium salts, a non-steroidal anti-inflammatory drug (discontinued...
Supra-acetabular Insufficiency Fracture

Fig. 1. Plain roentgenogram of the pelvis shows diffuse osteopenia and an ill-defined sclerotic arch above the roof of the left acetabulum (arrow).

Fig. 2. Magnetic resonance imaging of the left acetabulum. A) Coronal proton density image (SE 2000.0/12.0) shows a diffuse area of low signal intensity over the roof of the acetabulum and an irregular linear low signal intensity line within it (arrow). B) Sagittal proton density image (SE 2000.0/12.0) shows a diffuse area of low signal intensity over the roof of the acetabulum and an irregular linear low signal intensity line within it (arrow). C) Coronal T2-weighted image (SE 4000.0/90.0) shows a diffuse area of high signal intensity over the roof of the acetabulum and an irregular linear low signal intensity line within it (arrow). D) Coronal post-contrast fat-suppression T1-weighted image (SE 400.0/12.0) shows a diffuse area of high signal intensity over the roof of the acetabulum, which is enhanced after intravenous injection of gadolinium, with an irregular linear low signal intensity line within it (arrow).

Discussion

Insufficiency fracture occurs when normal or physiologic stress is placed on a bone with deficient elastic resistance [4,8]. In the presence of osteoporosis, the pain regressed and the range of motion of the hip returned to normal.

Repeated plain roentgenograms of the pelvis 3 months later showed the same subtle, ill-defined medullary sclerosis over the dome region of the left acetabulum as the previous plain roentgenograms.

Repeated MRI imaging 5 months later showed normal T1, T2, and proton density signals from the acetabulum (Fig. 3), and the fracture had healed well. We encouraged the patient to keep taking calcium and vitamin D supplements for the rest of her life. The need for a repeat bone densitometry examination was also stressed.
elastic resistance of bone is reduced, thereby predisposing it to the development of insufficiency fractures [8, 9]. The typical location of pelvic insufficiency fracture is the body of the pubis (parasympyseal) and the sacral ala. Fractures of both these bones, parasympyseal and sacral, frequently occur together [5]. A less common site is the iliac bone and a rare site is the supraacetabular portion [1, 9]. Lee et al reported the first acetabular insufficiency fracture in the Taiwan region, which was a fracture of the medial wall of the acetabulum combined with fractures of the pubic rami [10]. Fracture of the medial wall of the acetabulum, however, is a particularly common site in patients with rheumatoid arthritis [9]. The true incidence of insufficiency fracture of the acetabular region is difficult to estimate in Taiwan because of a paucity of reports.

Schreiber categorized the known risk factors for insufficiency fractures into two types [11]: general osteopenic situations, ie, postmenopausal, senile, and corticosteroid-induced osteoporosis, and fluoride therapy especially in the absence of appropriate calcium supplements; and local fragility factors, ie, disuse osteoporosis and radiation therapy. Chary-Valckenaeere et al drew attention to the role of vitamin D deficiency and history of previous fluoride treatment in insufficiency fractures of the supraacetabular region [2]. Our patient was a middle-aged, postmenopausal woman who had SLE as well as corticosteroid-induced osteoporosis. The fracture might have been caused by some sort of trauma, although the patient reported no history of trauma.

The patient with SLE is at risk of osteoporosis because of the inflammatory disease itself, disease-related comorbidity, and treatment for SLE. Bone loss is apparent early in the disease and this may be confounded primarily by treatment with corticosteroids [12]. Sen and Keen made the following suggestions concerning the management of patients with SLE [12]: Bone mineral density measurement should be considered in patients at high risk of osteoporosis, particularly those starting corticosteroids and postmenopausal women. Calcium and vitamin D supplementation to provide general prophylaxis are a suitable first-line option. Hormone replacement treatment should be used in hypogonadal subjects unless contraindicated. In subjects at high fracture risk, particularly postmenopausal women, bisphosphonate therapy should be considered. Our patient developed insufficiency fracture despite calcium supplementation.

Supraacetabular insufficiency fractures are exceedingly difficult to diagnose without a high index of suspicion [1, 3]. Cooper et al considered the plain roentgenographic finding of supraacetabular insufficiency fracture to be a subtle sclerotic band, consisting of endosteal callus formation, which is located a few millimeters above the roof of the acetabulum and forms an arching band paralleling the contour of the acetabular roof [1]. Otte et al, however, found no abnormalities on plain films in eight of 12 cases [3]. The findings on plain roentgenograms in our patient are compatible with the classical description by Cooper et al [1].

Bone scintigraphy has been advocated as a sensitive method but lacks specificity and requires other cross-sectional imaging to differentiate fractures from metastases [3, 11]. MR imaging has been reported to have a high sensitivity for supraacetabular fracture, and also gives significant multiplanar information to help differentially diagnose fractures from a destructive metastatic process, or to identify other concomitant fractures or pathology [3]. Invasive diagnostic procedures such as bone biopsy can be avoided with the help of MR imaging [10].
Otte et al. stated that an area of low signal intensity on T1-weighted images and high signal intensity on T2-weighted images could be seen in the supra-acetabular region [3]. Within this diffuse area, a discrete linear focus of low signal intensity, most commonly paralleling the acetabular roof, could be identified on both sequences, representing the fracture itself. Chary-Valckenaere et al. indicated that medullary edema, surrounding the fracture line, is an area of intermediate signal intensity on T1-weighted images, an area of high signal intensity on T2-weighted images, and is enhanced after intravenous injection of gadolinium [2]. The MR imaging findings in our patient were consistent with their results. Granger et al. indicated that axial spin echo T2-weighted images are useful for eliminating soft tissue involvement and lowering the suspicion of tumoral infiltration [13]. Gadolinium injection or fat suppression techniques improve the delineation of fracture. Nevertheless, the presence of edema in the absence of a fracture line may require a follow-up study within 3 months [13].

Laroche et al. suggested that remission of abnormalities on follow-up MR imaging, as found in our patient, is essential in the diagnosis of insufficiency fracture [6]. Fractures in the pelvic region take approximately 12 weeks to heal, and Laroche et al. [6] and the present study showed fracture healing on MR imaging after 4 and 5 months, respectively. Follow-up MR imaging after 4 months of conservative treatment may be helpful.

Early diagnosis and differentiation of an insufficiency fracture is essential because most insufficiency fractures respond rapidly to conservative therapy directed to its underlying causes [3]. Bone displacement at the fracture site may also occur in some neglected cases [4, 14]. It is important to avoid the misconception that the only treatment required of an osteoporotic fracture is management of the acute fracture itself [15]. Active intervention to treat osteoporosis after a first fracture in an effort to prevent subsequent fractures is not routine practice and frequently neglected [16]. The diagnosis of a first fracture provides a unique opportunity to initiate treatment for osteoporosis in these patients [17], and that is why calcium and vitamin D supplements were started in our patient, even though the fracture might have healed spontaneously.

In conclusion, knowledge and recognition of an insufficiency fracture should prevent confusion with metastases and inappropriate bone biopsy. The possibility of such a fracture should be highly suspected in an osteopenic woman with spontaneous hip pain. MR imaging is critical in the early diagnosis of insufficiency fracture and differentiation from metastatic lesions.

References