Mod Rheumatol (2007) 17:163–166
DOI 10.1007/s10165-006-0558-3

CASE REPORT

**Hiroyuki Hashidate · Mikio Kamimura
Hiroyuki Nakagawa · Kenji Takahara
Shigeharu Uchiyama**

Insufficiency fracture of the acetabulum without apparent trauma

Received: August 28, 2006 / Accepted: December 25, 2006

Abstract A 76-year-old woman presented history of left hip joint pain on walking, which occurred after she bent to move a planter. Plain radiographs showed no fracture. Bone scintigraphy revealed accumulation, and magnetic resonance imaging showed a low signal area on T1-weighted images. We diagnosed an insufficiency fracture and pain decreased naturally on conservative treatment. Insufficiency fracture of the acetabulum should be considered when elderly patients have hip joint pain. Magnetic resonance imaging and bone scintigraphy is most useful for the diagnosis.

Key words Acetabulum · Hip pain · Insufficiency fracture · Osteoporosis

Introduction

Stress fractures consist of a group of bone injuries that result from cyclic mechanical stress. Pentecost et al. have identified two subgroups of stress fracture, a fatigue fracture and an insufficiency fracture.[1] Fatigue and insufficiency fractures occur most frequently in the weight-bearing bones and sometimes in non-weight-bearing bones. Insufficiency fracture (IF) is a type of stress fracture that results from normal stress occurring in bone with reduced elastic resistance due to structural alterations of the bone, such as osteopenia, osteoporosis, or bone metabolism disorder.

H. Hashidate[1] (✉) · H. Nakagawa · K. Takahara · S. Uchiyama
Department of Orthopedic Surgery, Suwa Red Cross Hospital, Suwa, Japan

M. Kamimura
Center of Osteoporosis and Spinal Disorders: Kamimura Orthopaedic Clinic, Matsumoto, Japan

Correspondence address:
[1] Department of Orthopedic Surgery, Shinshu University, 3-1-1 Asahi, Matsumoto 390-8621, Japan
Tel. +81-263-37-2659; Fax +81-263-35-8844
e-mail: hashidate4789@yahoo.co.jp

Insufficiency fracture of the spine and the pelvis is a well-characterized entity that causes low back pain in the elderly patient.[2,3] Recently, as a cause of hip joint pain, IF of the femoral head or neck has been reported and nowadays is well recognized.[4,5] On the other hand, IF of the supra-acetabulum has rarely been reported and is not a well-known cause of hip joint pain in elderly patients. Here, we describe the case of an elderly woman presenting an insufficiency facture of the acetabular roof and outline the clinical and radiographical features of this fracture.

Case report

A 76-year-old woman who was a housewife presented with a 3-week history of left hip joint pain on walking, which occurred after she bent to move a planter. She could walk independently despite hip joint pain. There was no prior history of trauma. On first examination, the range of motion of the left hip joint was not restricted, and leg length discrepancy was not found. No inflammatory signs, such as tenderness, swelling, or redness were observed around the hip joint. Previously, she had received medical treatment for osteoporosis using vitamin D_3 and calcium for 3 years and she had no history of rheumatoid arthritis. The patient's height was 151.0 cm, and she weighed 50 kg. Bone mineral density (BMD) of the lumbar vertebrae was 0.656 g/cm^2 (T-score –2.95, 65%), which revealed osteoporosis. Routine laboratory data are shown in Table 1. The level of serum bone-specific alkaline phosphatase (BAP) was 54.4 U/l and urine type I N-terminal telopeptides of type I collagen (NTx) was 127.3 nmol BCE/mmol Cr, which demonstrated a higher bone turnover, and bone metastasis or metabolic bone disease was suspected. Although we suspected insufficiency fracture of the femoral neck, plain radiographs of the hip joint showed no clear evidence of fracture (Fig. 1). At first examination, her symptoms had already decreased and she could ambulate without any support. Thus, we treated her only with analgesics. Weight bearing was partially permitted using a cane, if it was not

Table 1. Laboratory findings

Complete blood cell count		**Blood biochemistry**	
WBC	$5620/mm^3$	TP	7.3 g/dl
RBC	$391 \times 10^4/mm^3$	Alb	4.1 g/dl
Hb	12.3 g/dl	Na	147 mEq/dl
Platelet	$29.5 \times 10^4/mm^3$	K	3.8 mEq/dl
Bone marker		Cl	107 mEq/dl
BAP	54.4 U/l	Ca	8.9 mg/dl
u-NTX	127.3 nmol BCE/mmol·Cre	P	4.1 mg/dl
		BUN	14.7 mg/dl
		Cr	0.48 mg/dl
		AST	11 IU/l
		ALT	12 IU/l
		LDH	144 IU/l
		γ-GTP	13 IU/l
		ALP	356 IU/l
		CPK	50 IU/l

Fig. 1. Anteroposterior plain radiograph of the bilateral hip shows no evidence of fracture

painful. Free gait on full weight bearing was possible after 2 weeks.

We performed bone scintigraphy and magnetic resonance imaging (MRI) for a skeletal survey. Bone scintigraphy revealed apparent accumulation at the left acetabulum (Fig. 2). Magnetic resonance imaging showed a small low signal linear area on the acetabulum on T1- and T2-weighted images (Fig. 3A–C). According to these radiographical findings, we suspected a bone fragility fracture of the acetabulum and continued conservative treatment using analgesics. Pain resolved at 2 months after onset. After 3 months of onset, a small sclerotic change appeared on plain radiographs (Fig. 4). The pain decreased naturally, and as such a state lasted for over 3 months, we then diagnosed the patient as having an insufficiency fracture. After 6 months of onset, accumulation of the acetabulum on bone scintigraphy disappeared (Fig. 5).

At 3 months and 6 months later, the level of serum BAP was 65.1, 63.3 U/l and urinary NTx was 79.3, 102.0 nmol BCE/mmol Cr, which still demonstrated a higher bone turnover.

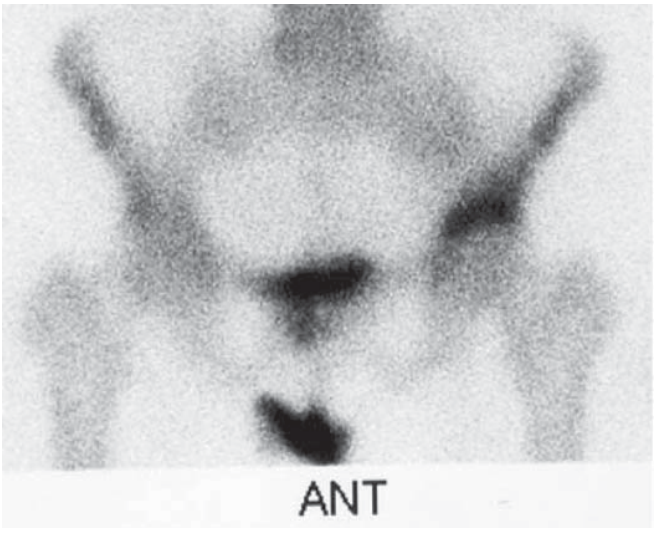

Fig. 2. Bone scintigraphy of the pelvic shows apparent accumulation in the left acetabulum

Discussion

Sacrum, pubic bones, and femoral neck have been recognized as a characteristic location of insufficiency fractures. However, IF of the acetabulum has rarely been reported[6–10] and is not a well-known cause of hip joint pain in elderly patients. In previous reports, the predisposing conditions for supra-acetabular IF have been osteoporosis, rheumatoid arthritis, metastatic neoplasm, long-term exposure to corticosteroids and irradiation. In our case, supra-acetabular IF without severe osteoporosis and trauma occurred.

Some authors reported that the supra-acetabular IF led to destruction of the hip joint and required total hip replacement surgery.[10,11] Therefore, early and precise diagnosis of the femoral neck and supra-acetabular stress fracture is very important for adequate treatment, because these fractures may cause serious complications.

Plain radiographs are usually inadequate to clearly visualize subtle insufficiency fractures.[12] Insufficiency fracture must be envisaged in osteoporotic patients complaining of hip joint pain, without radiological evidence of hip fracture. Grangier et al. reported that axial plane CT showed a slight band of sclerosis of the acetabular roof, but it was inadequate for precise diagnosis,[9] and this finding is usually a sign of fracture healing. Egol et al. strongly recommended performing additional examinations for patients such as bone scintigraphy and MRI whenever stress fracture of the femoral neck was suspected.[13]

We used bone scintigraphy and MRI for diagnosis of our case. Magnetic resonance imaging revealed only a small T1 low signal area. Otte et al. reported that identification of a linear lesion of low signal intensity on either T1- or T2-weighted sequences is characteristic of a supra-acetabular

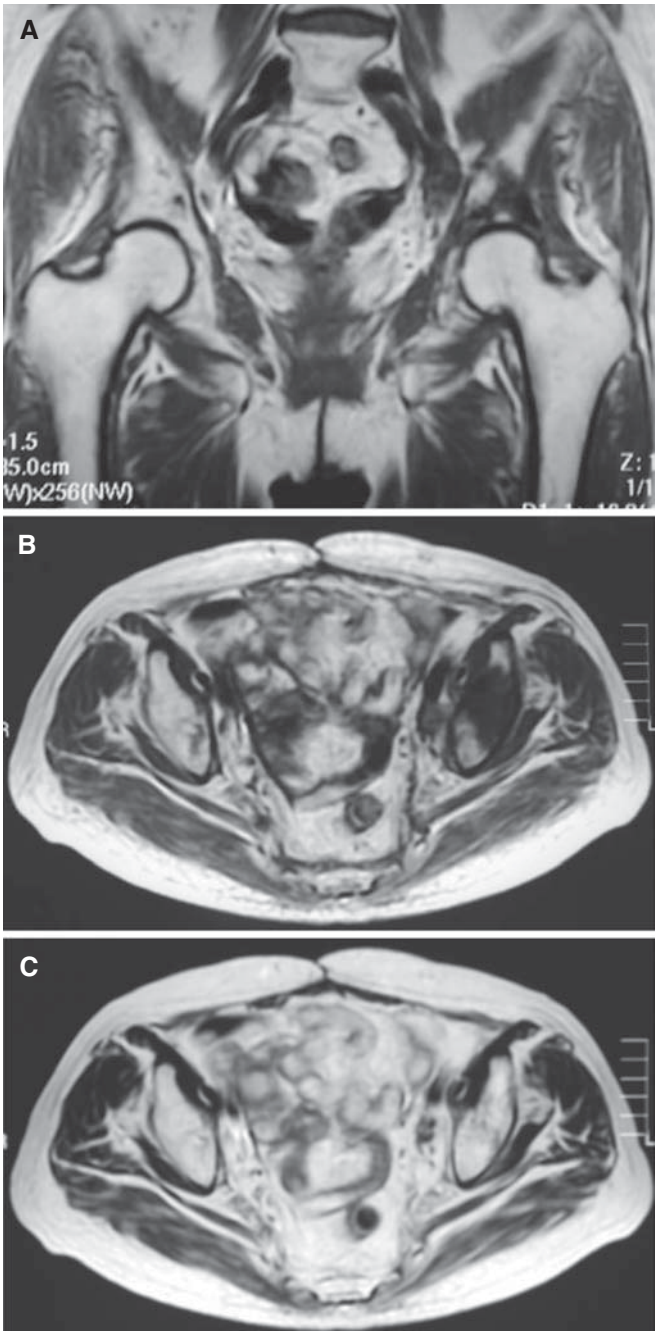

Fig. 3A–C. **A** Coronal T1-weighted magnetic resonance image of the bilateral hip shows a small low signal area on the left acetabulum. **B** Axial T1-weighted image also shows low signal area over the acetabulum. **C** Axial T2-weighted image shows low signal linear area over the left acetabulum

IF. But this finding was usually small and difficult to judge as an abnormal image.[8] On the other hand, bone scintigraphy revealed apparent up take at the supra-acetabulum, and it was easy to judge as an abnormal finding. Thus, bone scintigraphy was the most appropriate for screening IF around the hip joint. However, although bone scintigraphy is a sensitive method for detecting a fracture, it is not specific. Both MRI and bone scintigraphy should be used to establish the diagnosis of supra-acetabular IF.

Fig. 4. Anteroposterior plain radiograph of the left hip at 3 months after onset of pain shows small sclerotic change at the acetabulum

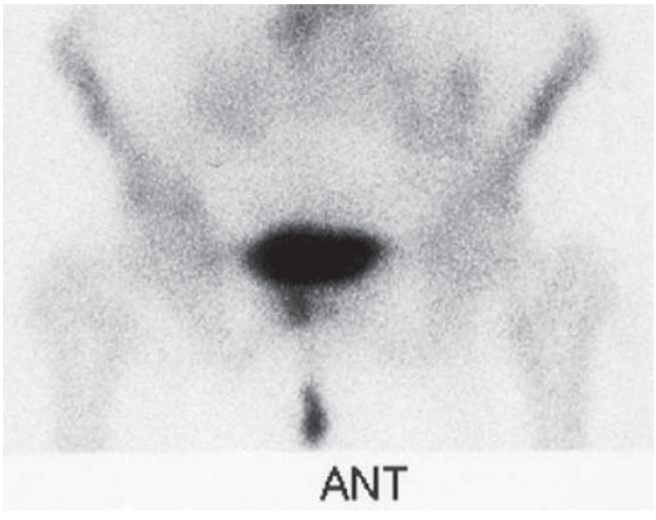

Fig. 5. Bone scintigraphy of the pelvis at 6 months after onset of pain. Accumulation of the left acetabulum has disappeared

Recently, we reported stress fracture of the femoral neck in a young adult.[14] Stress fracture could occur in patients without bone fragility or excessive stress. In patients with bone fragility, IF might occur more frequently than previously thought. Insufficiency fracture sometimes occurred at the same time in multiple sites,[15] and sometimes was asymptomatic.[16,17] We speculated that elderly patients with hip joint pain and no abnormal findings on plain radiograph may incur acetabular IF and heal naturally without complication.

Fortunately, our case with IF was healed without complications, although she visited our hospital 3 weeks after the onset of pain. Delayed diagnosis of acetabular IF may coexist with serious complications. We should bear in mind the possibility of IF of not only the femoral neck, but also the acetabulum when elderly patients have hip joint pain from daily activity. We conclude that combination MRI and

bone scintigraphy is most useful for the diagnosis of supra-acetabular IF.

References

1. Pentecost RL, Murray RA, Brindley HH. Fatigue, insufficiency, and pathologic fractures. JAMA 1964;187:1001–4.
2. Brahme S, Cervilla V, Vint V, Cooper K, Kortman K, Resnick D. Magnetic resonance appearance of sacral insufficiency fractures. Skelet Radiol 1990;19:489–93.
3. Wild A, Jaeger M, Haak H, Mehdian SH. Sacral insufficiency fracture, an unsuspected cause of low-back pain in elderly women. Arch Orthop Trauma Surg 2002;122:58–60.
4. Rafii M, Mitnick H, Klug J, Firooznia H. Insufficiency fracture of the femoral head: MR imaging in three patients. AJR 1997;168: 159–63.
5. Yamamoto T, Bullough PG. Subchondral insufficiency fracture of the femoral head: a differential diagnosis in acute onset of coxarthrosis in the elderly. Arthritis Rheum 1999;42:2719–23.
6. Kooper KL, Beabout JW, McLeod RA. Supra-acetabular insufficiency fracture. Radiology 1985;157:15–7.
7. Schreiber S. Radiological vignette. Insufficiency fracture of acetabulum. Clin Rheumatol 1992;11:440–2.
8. Otte MT, Helms CA, Fritz RC. MR imaging of supra-acetabular insufficiency fractures. Skelet Radiol 1997;26:279–83.
9. Grangier C, Garcia J, Howarth NR May M, Rossier P. Role of MRI in the diagnosis of insufficiency fractures of the sacrum and acetabular roof. Skelet Radiol 1997;26:517–24.
10. Ozaki D, Shirai Y, Nakayama Y, Uesaki S. A case report of insufficiency fracture of the Fossa acetabuli in a patient with rheumatoid arthritis. J Nippon Med Sch 2000;67:267–70.
11. Motomura G, Yamamoto T, Miyanishi K, Shirasawa K, Noguchi Y, Iwamoto Y. Subchondral insufficiency fracture of the femoral head and acetabulum: a case report J Bone Joint Surg Am 2003;84:1205–9.
12. Schreiber S. Radiological vignette: insufficiency fracture of the acetabulum. Clin Rheumatol 1992;11:440–2.
13. Egol KA, Koval KJ, Kummer F, Frankel VH. Stress fractures of the femoral neck. Clin Orthop Relat Res 1998;348:72–8.
14. Takahara K, Nakagawa H, Kamimura M, Hashidate H, Kawaguchi A, Uchiyama S. Unusual stress fracture of the femoral neck in young adult not caused by excessive stress: a case report. J Orthop Sci 2004;9:650–3.
15. Iba K, Wada T, Takada J, Yamashita T. Multiple insufficiency fractures with severe osteoporosis. J Orthop Sci 2003;8:717–20.
16. Abe H, Nakamura M, Takahashi S, Muraoka S, Ogawa Y, Sakamoto K. Radiation-induced insufficiency fractures of the pelvis: evaluation with 99mTc-methylene diphosphonate scintigraphy. AJR 1992;158:599–602.
17. Cook GJR, Hannaford E, See M, Clarke SEM, Fogelman I. The value of bone scintigraphy in the evaluation of osteoporotic patients with back pain. Scand J Rheumatol 2002;31:245–8.