



## Case report

## Rapid Destruction of the Hip Joint After Acetabular Fracture in an Elderly Patient

Ryo Hidaka, MD <sup>\*</sup>, Kenta Matsuda, MD, PhD, Hirotaka Kawano, MD, PhD

Department of Orthopaedic Surgery, Teikyo University School of Medicine, Tokyo, Japan

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## ABSTRACT

Cases of rapidly progressive destruction of the hip joint after acetabular fractures are rarely reported. A 78-year-old woman fell from a chair. There was no fracture diagnosis; however, retrospective evaluation of the plain radiograph showed a slightly displaced fracture of the acetabulum. Her pain worsened after experiencing additional minor falls. The left hip joint had severe bone defects at 3 months after the initial injury. She underwent total hip arthroplasty using a KT-plate with an autogenous bone graft for acetabular bone defects. This case indicates that rapid destruction of the hip joint may occur after acetabular fracture from minor falls and bone fragility in elderly patients. In such cases, closer follow-up with advanced imaging can lead to early surgical intervention before severe destruction develops.

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## Introduction

In recent years, the prevalence of acetabular fractures has increased with the aging population [1,2]. There has been a 2.4-fold increase in the incidence of acetabular fractures over the past quarter-century among patients older than 60 years [3]. This could be because of osteoporosis among elderly patients and the differences in the mechanism of injury between the elderly and younger patients. Elderly patients are reportedly more likely to be injured with low-energy trauma such as falling from a standing height in daily life, whereas younger patients are more likely to experience high-energy trauma [3]. Osteonecrosis of the femoral head and posttraumatic osteoarthritis are the main complications of acetabular fractures. Osteonecrosis of the femoral head often occurs after acetabular fractures with dislocation and rarely occurs in elderly patients with low-energy trauma. Anatomical reduction is necessary for displaced acetabular fractures to prevent the occurrence of posttraumatic osteoarthritis. However, owing to poorer bone quality, acetabular fractures in elderly patients have worse outcomes than those in younger patients in terms of open reduction and internal fixation [4]. Moreover, 21% of patients who undergo open

reduction and internal fixation for displaced acetabular fractures reportedly require total hip arthroplasty (THA) within 20 years for posttraumatic osteoarthritis. Hence, the incidence of posttraumatic osteoarthritis after acetabular fractures is a major problem [5].

A previous case series reported massive osteolysis of the femoral head as an early complication after acetabular fracture. Although the pathogenesis and mechanisms were unclear, massive osteolysis of the femoral head rapidly occurred in 15 of 244 (6.1%) patients at an average of 4.4 months, and THA was required in 8 of these patients. This case series was the only report of the rare complication of rapid collapse of the femoral head after acetabular fracture [6].

Here, we present a case of rapid destruction of not only the femoral head but also the acetabulum after acetabular fracture.

## Case history

A 78-year-old woman fell from a chair in the bathroom and presented to a medical clinic with left hip pain. Plain radiography of bilateral hips was performed, and the patient was diagnosed with contusion without fracture (Fig. 1). Walking was still possible; however, the patient subsequently experienced 3 minor falls while trying to get up from the chair after the initial fall. No further radiographs were obtained, and she had progressively worsening pain and difficulty walking on presentation to our institution 3 months after the initial injury. The patient's medical history included osteoporosis and total knee arthroplasty for right knee

<sup>\*</sup> Corresponding author. 2-11-1, Kaga, Itabashi-ku, Tokyo, 173-8606, Japan. Tel.: +81-3-3964-4097.

E-mail address: [qqdr59qd@yahoo.co.jp](mailto:qqdr59qd@yahoo.co.jp)

osteoarthritis. She was prescribed with ibandronate once a month for 3 years for osteoporosis treatment. She had no history of drinking or corticosteroid therapy. She had never received an intra-articular injection of corticosteroids or other potent agents. The patient's height and weight were 152 cm and 43 kg, respectively, with a body mass index of 19 kg/m<sup>2</sup>. Because of the pain, she used a wheelchair outside and held railings when walking indoors. The range of motion of the patient's left hip was severely limited. Laboratory findings included a white cell count of 6200 mm<sup>3</sup>; C-reactive protein level, 0.32 mg/dL; erythrocyte sedimentation rate, 16 mm/60 min; and rheumatoid factor, 8.0 U/mL. These tests were performed to rule out infection and rheumatoid arthritis, which causes rapid joint destruction. All test results were negative. Bone mineral density of the lumbar vertebral body was 67% of the young adult mean, indicating severe osteoporosis.

Plain radiographs at initial injury showed no acetabular dysplasia or osteoarthritis changes in the bilateral hip joint. We retrospectively re-evaluated the plain radiograph at the initial injury and found a slightly displaced acetabular fracture in the left hip (Fig. 1). Three months after the initial injury, a plain radiograph showed acetabular bone loss, collapsed femoral head, no osteophyte formation, and callus formation on a past acetabular fracture site in the left hip. Radiography revealed a type IIc fragility fracture of the pelvis (FFP) in the right hip (Fig. 2) [7]. Computed tomography (CT) revealed that approximately half of the femoral head had collapsed, and there were type III acetabular bone defects (classified via American Academy of Orthopedic Surgeons grading system [8]) and intracapsular small osteochondral fragments in the left hip (Fig. 3). These findings confirmed a diagnosis of rapidly destructive arthrosis (RDA) after acetabular fracture in the left hip.

Because the patient had no right coxalgia and could stand on one leg using her right leg, the right FFP received conservative treatment. The patient underwent left THA, given that she had severe pain in her left hip and a walking disability 4 months after her initial injury. The operation was performed using a posterolateral approach, with the patient in the lateral decubitus position. Upon visualization of the hip joint, we observed synovial hyperplasia and small osteochondral fragments, but no infectious findings (eg, retention of purulent joint fluid). On palpation, the acetabulum was not mobile, and the fractures had healed. We performed an autogenous bone graft using the remaining femoral head for acetabular bone defects in the weight-bearing areas.

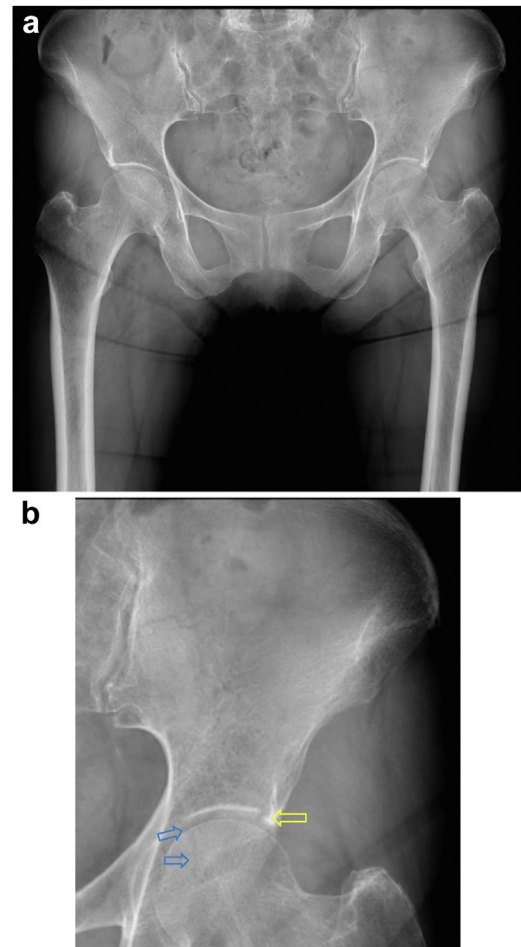
The morselized allograft was filled with an anterior acetabular bone defect from the femoral head allografts. The KT plate (Kyocera, Kyoto, Japan) was inserted into the acetabulum, and 3 screws were used to fix the plate to the host bone. A polyethylene cup (X3 Rim Fit cup; Stryker, Mahwah, NJ) was cemented onto the KT plate. Finally, a cementless stem (S-ROM-A; DePuy Synthes, Warsaw, IN) was used in the femur (Fig. 4).

Weight-bearing was not allowed for 4 weeks postoperatively, after which the patient was allowed to progress to full-weight-bearing at 8 weeks postoperatively.

She received daily parathyroid hormone injections for osteoporosis treatment. She experienced no pain while walking independently and returned to most of her preinjury social activities 9 months after the surgery, which was the latest follow-up. The patient had no complications. Imaging at the 9-month postoperative follow-up showed progressive bone union for the left acetabular fracture and no change in the right FFP displacement (Fig. 5).

## Discussion

RDA of the hip joint causes rapid destruction, as shown in this case. First reported by Postel and Kerboul in 1970, it is characterized by a rapidly progressive hip disease resulting in rapid



**Figure 1.** (a) Anteroposterior (AP) radiograph of the pelvis, taken immediately after the patient's initial injury. (b) Enlarged view of the AP radiograph of the pelvis at initial injury shows fractures in the acetabular roof (yellow arrow) and anterior wall of the acetabulum (blue arrow).

destruction of the hip joint within a few months [9]. Case reports and small series have been reported for this condition. However, the pathophysiology and etiology of RDA remain unknown. Some studies proposed the following criteria for the diagnosis of RDA: a clinical history of hip pain of 1–6 months' duration, a radiographic appearance of rapid joint space narrowing (>2 mm or 50% joint space narrowing in 1 year), progression of bone destruction involving the femoral head and the acetabulum with minimal osteophyte formation, and the absence of clinical or laboratory evidence of sepsis and neurological disease [10,11]. However, the standard diagnostic criteria for RDA remain unclear.

In our case, the patient had a clinical history of hip pain that lasted for 3 months, and extensive destruction of both the femoral head and acetabulum was observed within 3 months. Moreover, there were no osteophytes or osteosclerosis and scattered small osteochondral fragments, suggesting rapid bone destruction on imaging scans. Clinical findings and blood samples did not reveal any infectious or neuropathic findings. Overall, these findings are consistent with the diagnosis of RDA. A systematic review of RDA reported that the risk factors for this condition were the female sex and age >60 years [12], consistent with the present case.

Including the history of trauma in the diagnostic criteria of RDA remains controversial [12–14]. Our patient had a normal hip without osteoarthritis before the injury, and the destruction of the hip joint had been triggered by an acetabular fracture. Although it



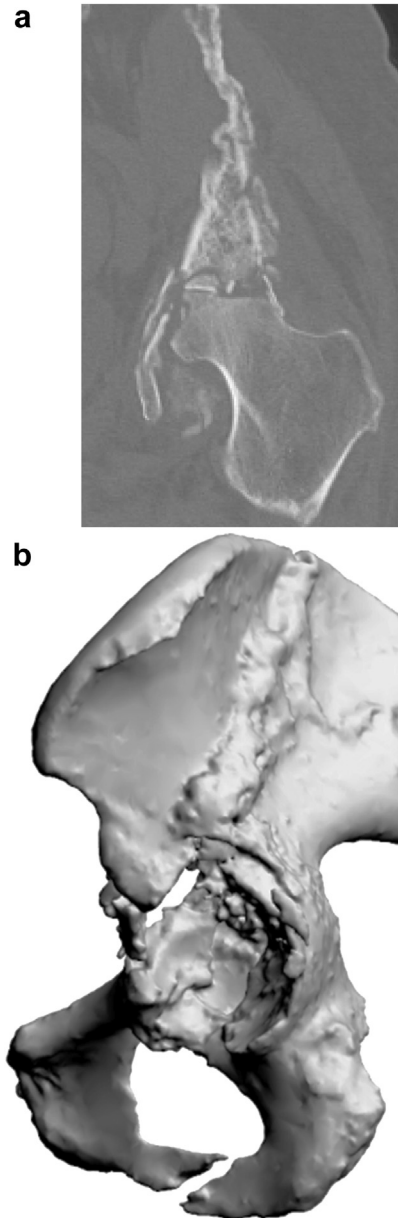
**Figure 2.** Anteroposterior radiograph of the pelvis, taken 3 months after injury.

may be excluded from the diagnostic criteria of RDA, the etiology of the rapid destruction of the hip in this case may be related to the pathogenesis of RDA.

Damage to the femoral head is a predictor of poor outcomes after acetabular fractures [4,5,15]. Potter et al. reported that damage to the femoral head occurs as the femoral head impacts the acetabulum at the time of injury [16]. Furthermore, there were 24 of 37 (65%) cases with subchondral contusion of the femoral head that were observed by magnetic resonance imaging (MRI) but were not apparent on CT scans [16]. Only plain radiography was performed at the initial injury in our case, and there may have been damage to the femoral head that was not detected on radiographs.

A case of subchondral fracture of the femoral head reportedly occurred during conservative treatment of an acetabular fracture, resulting in progressive collapse of the femoral head [17]. This report suggested that subchondral fracture was caused by a 2-mm step-off at the acetabular roof, increased pressure on the femoral head due to irregular articular surfaces, and poor bone quality. Moreover, the presence of a step and gap in a high anterior column fracture reportedly increases contact pressure, contact area, and load [18]. In our case, there was a slight acetabular fracture displacement in the left hip and no pelvic fracture in the right hip at the initial injury; however, it was presumed that much displacement occurred because of the lack of appropriate conservative treatment (such as a non-weight-bearing status and the use of adequate assistive devices) as well as the multiple falls that caused the right FFP after the initial injury. Our patient was assumed to have a subchondral fracture of the femoral head because of the increased pressure and load on the hip joint, which were in turn due to displacement of the acetabular fracture and the bone fragility derived from osteoporosis. Furthermore, many reports suggest that subchondral insufficiency fracture of the femoral head is an important factor in the development of RDA [19–21]; in our case, the presence of subchondral fracture of the femoral head may have led to the rapid destruction of the femoral head and acetabulum.

Nevertheless, we had to use a femoral head as an autogenous bone graft in our case, and the histological findings of the femoral head could not be evaluated. Therefore, the pathology of the rapid destruction of the hip joint remained unclear.



**Figure 3.** Computed tomography images of the left hip, taken 3 months after injury. (a) Coronal plane and (b) three-dimensional reconstruction lateral view.

Acetabular fractures can occur in elderly patients even from low-energy trauma such as falls. Even if an acetabular fracture is present at the time of injury, the clinical findings may not be strong enough to give the impression of a fracture, and radiographs alone may miss the acetabular fracture [22]. Femoral or acetabular fractures should be ruled out using a CT scan, MRI, or bone scan, depending on the individual's access to advanced imaging modalities, in cases of persistent hip pain after a fall. Iwata et al. reported that MRI should also be performed in elderly patients with post-traumatic hip pain to rule out occult fractures of the hip joint, which could not be diagnosed on radiographs [23].

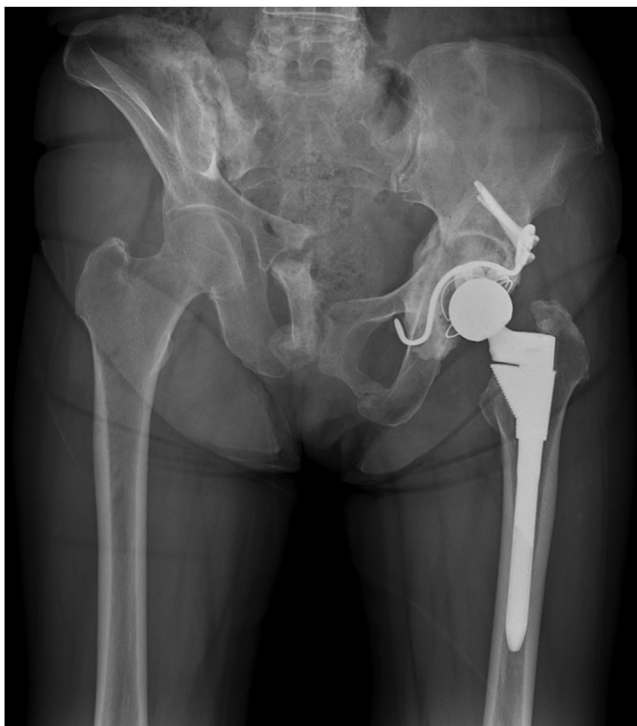
In our case, an elderly woman experienced hip pain after an initial minor fall for which radiography was performed, with an initial diagnosis of no apparent fractures. The initial radiograph was retrospectively reviewed, revealing a slightly displaced acetabular fracture. The patient had 3 minor falls after the initial fall. Her pain





**Figure 4.** Anteroposterior radiograph of the pelvis, taken after total hip arthroplasty.

was worsening, and the condition could have been diagnosed sooner with additional radiographs, a CT scan, or MRI. However, no examination was performed, and the diagnosis was therefore delayed, resulting in severe destruction of the hip joint and the need for a more complex surgical procedure than a routine primary THA. We suggest a closer follow-up with advanced imaging be conducted in such cases.



**Figure 5.** Anteroposterior radiograph of the pelvis, taken at 9 months after total hip arthroplasty, during the latest follow-up.

## Summary

Rapid destruction of both the acetabulum and femoral head in elderly patients after acetabular fracture from low-energy trauma is rare. We present a case where an acetabular fracture occurred after an initial minor fall in an elderly woman who then developed rapid destruction of the hip joint after 3 months because of repeated minor falls.

It is important to recognize that acetabular fractures caused by low-energy trauma in elderly patients can rapidly destroy the hip joint because of bone fragility and multiple minor falls. The use of appropriate imaging techniques can lead to optimal conservative treatment and early surgical intervention before severe destruction develops.

## Conflicts of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

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## Informed patient consent

The authors confirm that informed consent has been obtained from the involved patient, and the patient has given approval for this information to be published in this case report (series).

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