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Acetabular fracture non-union with pelvic discontinuity treated with two-stage total hip arthroplasty after intra- and extra-articular plate fixation

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ABSTRACT

Surgical intervention for the treatment of acetabular fracture non-union is often challenging. Here, we present a case of acetabular fracture non-union with pelvic discontinuity in a patient who underwent cemented total hip arthroplasty (THA) after intra- and extra-articular plate fixation. The case was a 70-year-old male with left T-shaped acetabular fracture non-union neglected for 5 months after the injury. The anterior and posterior columns were not healed, and the articular surface was displaced toward the medial side with a protrusion of the collapsed femoral head. As the first surgical intervention, we performed intra- and extra-articular plate fixation after femoral head decapitation. We fixed non-union regions from the inferior acetabular margin to the anterior column using a pelvic reconstruction plate bent three-dimensionally at the acetabular curvature on the intra-articular side. Furthermore, we fixed that of the posterior column on the outside of the acetabulum using a bent pelvic reconstruction plate. Union of the anterior and posterior columns was observed at 4 and 6 months after the first surgical intervention. At 7 months, we performed a cemented THA without additional bone grafting. At 1-year follow-up, the patient did not have left coxalgia and could walk without any gait supports. Based on our experience, we propose this surgical protocol as a useful treatment option for cases of acetabular fracture non-union.

Keywords: acetabular fracture non-union, pelvic discontinuity, late reconstruction, intra-articular side, total hip arthroplasty

INTRODUCTION

Acetabular fracture non-union is rare when patients with acetabular fracture undergo appropriate operative fixation in the early stage of the injury.[1-4] Although the non-union rate of neglected acetabular fracture is unclear, it is necessarily expected to be higher than that of an acetabular fracture with early surgical intervention. Reportedly, an established acetabular fracture non-union never heals and often progresses through rapid osteoarthritic changes.[5] Clinically, acetabular

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fracture non-union leads to coxalgia, limping, and restricted range of motion.[5] Although surgical intervention, such as late acetabular reconstruction or total hip arthroplasty (THA), should be considered for the treatment of acetabular fracture non-union, it is often challenging.[6,7] Furthermore, surgical intervention should be more challenging in cases with pelvic discontinuity associated with the fracture non-union than in cases without pelvic discontinuity. Here, we present a case of acetabular fracture non-union with pelvic discontinuity in a patient who underwent cemented THA after intra- and extra-articular plate fixation.

REPORT OF THE CASE

The patient provided informed consent for the publication of this case. A 70-year-old male sustained an injury in his left hip joint after falling from a high place and was rushed to a hospital. At the hospital, he was diagnosed with a T-shaped acetabular fracture. On the first day of admission, he underwent left internal iliac artery catheter embolization and conservative therapy with longitudinal traction for the fracture (Fig. 1). Although surgical intervention with early acetabular reconstruction was planned after his general condition improved, it was not performed because he developed paralytic ileus and cholecystitis at 3 and 5 weeks after the injury, respectively. The traction was maintained until 8 weeks after the injury. Partial and full weight-bearing were permitted at 8 and 11 weeks, respectively. However, acetabular fracture union was not observed at that point. At 12 weeks after the injury, he was discharged from the hospital and his acetabular fracture was neglected. Thereafter, his left coxalgia, range of motion in the left hip, leg discrepancy, and limp were aggravated. He was referred by the initial hospital to our institution 5 months after the injury. On the first visit to our hospital, the Japanese Orthopaedic Association score was 26 points. The anterior and posterior columns were not healed, and the articular surface was displaced toward the medial side with a protrusion of the collapsed femoral head (Fig. 2). A two-stage primary THA was planned for this case of acetabular fracture non-union with pelvic discontinuity.

The femoral head was decapitated followed by reconstruction as the first surgical intervention. The operation was performed with patient in a lateral decubitus position using a posterolateral approach. First, the femoral head was removed. After the debridement of the non-union regions and the elimination of cartilage in the articular surface, morselized cancellous bone was grafted on the anterior and posterior columns. For the bone deficit occurring due to medial wall migration, a bone plate made from the retrieved femoral head was grafted and fixed using poly-L-lactic acid pins. Second, non-union regions were fixed from the inferior acetabular margin to the anterior column using a pelvic reconstruction plate bent three-dimensionally at the acetabular curvature. This procedure was performed from the intra-articular side (Fig. 3).

Third, a non-union region of the posterior column was fixed from the outside of the acetabulum using a bent pelvic reconstruction plate. Surgical duration was 210 minutes, and blood loss was 420 mL (Fig. 4). Partial weight-bearing was permitted postoperatively, and the use of crutches was recommended up to the second surgical intervention. There was no complication associated with the surgery.

Postoperatively, his left coxalgia improved. Union of the anterior and posterior columns was observed using CT scan at 4 and 6 months after the first surgical intervention (Fig. 5). At 7 months, we performed a cemented THA using a second-generation highly cross-linked polyethylene cemented socket and a collarless, polished, and double-tapered cemented femoral stem as the second surgical intervention. The operation was performed in the lateral decubitus position using a posterolateral approach. Debridement of fibrous tissues was performed after

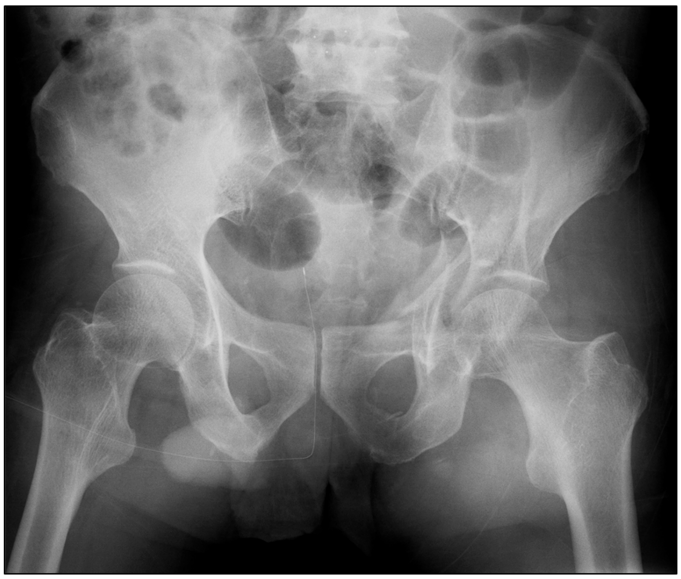

Fig. 1 X-ray in the anteroposterior view on the first day of the injury under longitudinal traction

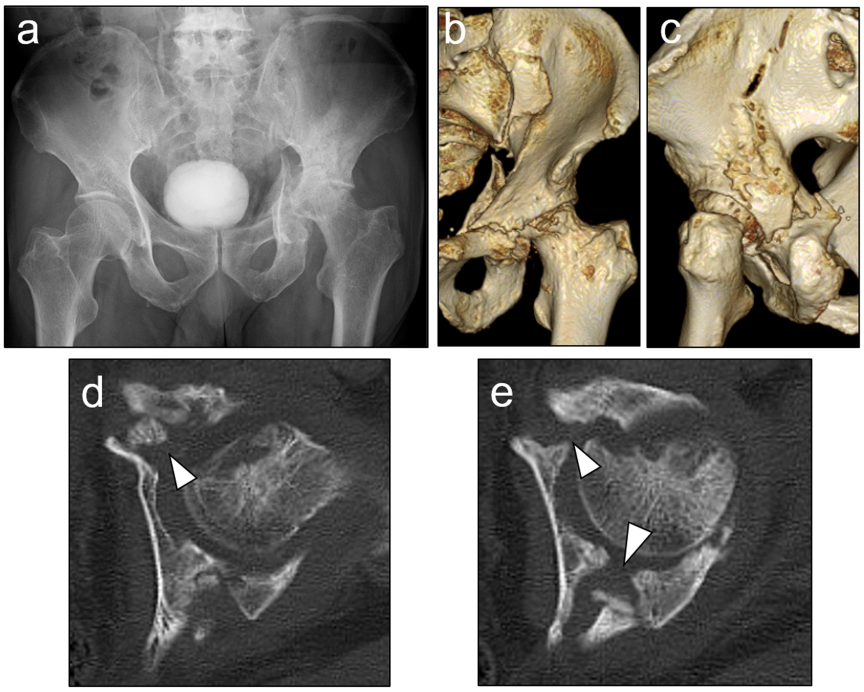

Fig. 2 X-ray (a) at 5 months after the injury

The articular surface was displaced toward the medial side with a protrusion of the collapsed femoral head. Computed tomography at 5 months after the injury; three-dimensional image from the anteroposterior viewpoint (b), three-dimensional image from the posteroanterior viewpoint (c), axial image of the anterior column (d), and axial image of the posterior column (e). White arrows indicate non-unions of the anterior and posterior columns (d, e).

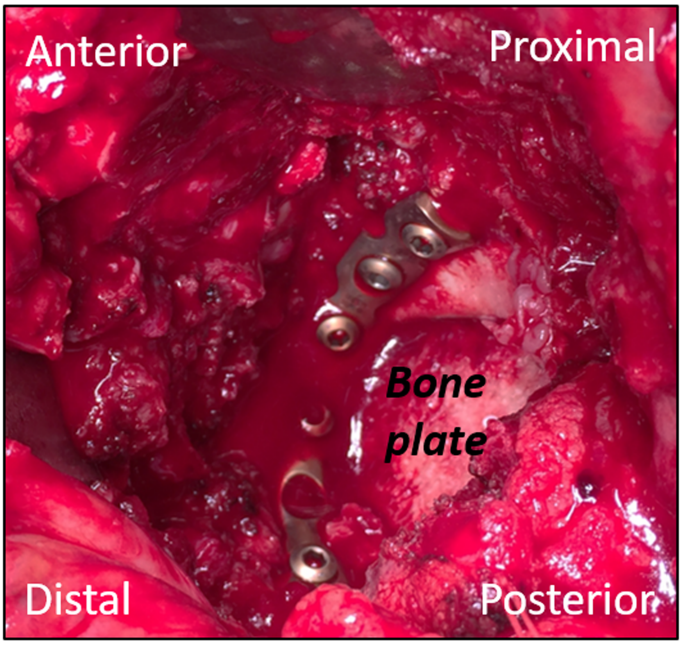

Fig. 3 Operative finding in the intra-articular side showing fixation of the anterior column using a pelvic reconstruction plate bent three-dimensionally at the acetabular curvature and bone grafting with a bone plate made from the retrieved femoral head

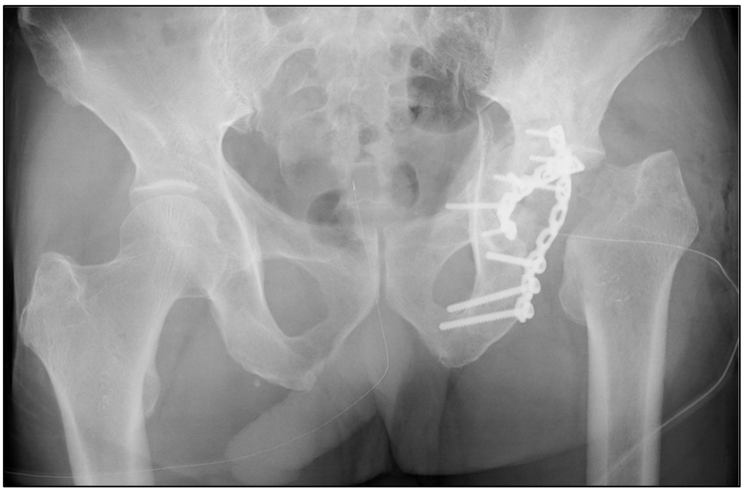

Fig. 4 X-ray after the first surgical intervention

plate extraction from the intra-articular side. We observed bleeding from the cancellous bone following the reaming procedure, confirming bone plate stability and host bone engraftment. When the cemented socket was fixed at the height of the original acetabulum, a bone deficit requiring additional bone grafting was not seen on the acetabular side. Surgical duration was

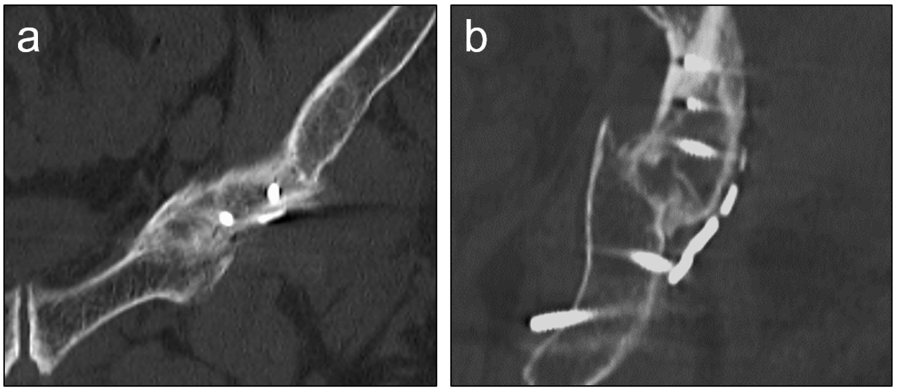

Fig. 5 Coronal computed tomography image of the anterior column at 4 months after the first surgical intervention (a). Coronal computed tomography image of the posterior column at 6 months after the first surgical intervention (b). The anterior and posterior columns were healed

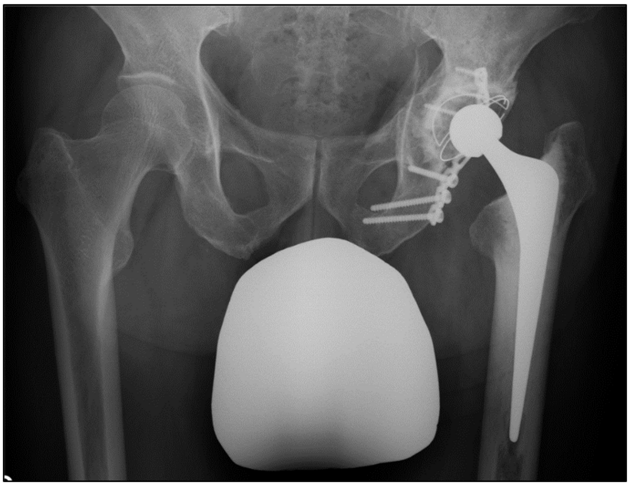

Fig. 6 X-ray after cemented THA. Additional bone grafting or reinforcement support was not required in this surgery

191 minutes, and blood loss was 1213 mL (Fig. 6). Full weight-bearing was permitted the day after surgery, and there were no surgical complications.

At 1-year follow-up, the patient did not have left coxalgia and could walk without any gait supports, although slight leg discrepancy and restricted range of motion in the hip joint remained. The Japanese Orthopaedic Association score was improved from 26 points at the first visit to 83 points.

DISCUSSION

Surgical intervention for the treatment of acetabular fracture non-union is challenging, espe-

cially in cases with pelvic discontinuity.[6,7] Acetabular reconstruction or THA has been reported as an appropriate surgical intervention for neglected acetabular fracture.[6,8-12] However, long-term outcomes of late acetabular fracture fixation beyond 3 weeks after the injury are unfavorable in the literature.[8-10] Moreover, the femoral head in our case was collapsed; therefore, a two-stage primary THA was necessary.

In a study by Schreurs et al[11] of 20 cases with secondary osteoarthritis after previous acetabular fracture who were treated with cemented THA using impaction bone grafting, the Kaplan-Meier survival rate with revision for any reason as the endpoint was 100% at 10 years postoperatively. However, non-union cases were not included in this case series. It is expected that results in non-union cases with pelvic discontinuity were more unfavorable than reported in this previous study. Iotov et al[12] reported THA outcomes in 14 patients (non-union cases = 4 patients) with displaced acetabular fracture of >3 months. They reported that 21.4% of their patients needed revision surgery within 94 months postoperatively. They concluded that the most important procedure was to create sufficiently stable bone stock around the acetabular socket, and that bone healing was essential in non-union cases. In our case, we performed acetabular reconstruction prior to THA in order to heal the non-union regions and create sufficient bone stock for secondary THA.

There are several benefits to performing the reconstruction method reported in this article. First, it can be performed with a posterolateral approach and does not require entry into the pelvic cavity, and it might be safer and less invasive compared with the ilioinguinal or triradiate approach. Second, because the procedure was performed from the intra-articular side, the debridement and fixation of the non-union regions were easily performed along with bone grafting to the bone deficit, which may be problematic in secondary THA. As a result, we could perform a cemented THA without additional bone grafting or reinforcement support in our case. Conversely, it would be a demerit of this method that the patient must keep waiting until secondary THA under a state of Girdlestone resection. According to a study on one-stage revision THA for pelvic discontinuity after THA,[13] the Kaplan-Meier survival rates with revision for any reason as the endpoint for cup-cage construct and cage construct were 100% and 95% at 5 years postoperatively. Considering those results, our case could be treated using one-stage THA; however, we believe that the protocol shown in this case report is more reliable in the long-term compared to one-stage THA.

This is the first reported case of acetabular fracture non-union with pelvic discontinuity who underwent a cemented THA after intra- and extra-articular plate fixation. Based on our experience, we propose this surgical protocol as a useful treatment option for cases of acetabular fracture non-union.

CONFLICT OF INTEREST

All authors declare that they have no conflict of interest.

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