Treatment of Acetabular Nonunion and Posttraumatic Arthritis With Bone Grafting and Total Hip Arthroplasty

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Nonunion of the acetabulum compounded by posttraumatic arthritis is a very rare and complex condition requiring treatment of both the acetabular fracture and hip joint degeneration. A similar reconstructive problem has been observed during revision hip surgery with major bone loss and pelvic discontinuity. These reconstructions, which comprise less than 1% of acetabular revisions, have a high failure rate when the pelvic disruption is not stabilized before arthroplasty.[1-3] Several types of acetabular reconstructions, including porous-coated cups and triflanged cages, have demonstrated a high failure rate when the posterior column is not stabilized.[1,3-10] Reconstructing the pelvic discontinuity with posterior column plating before joint reconstruction has yielded acceptable outcomes.[1,11-13]

However, the literature includes few reports on managing acetabular nonunion in cases in which the *native* hip joint requires reconstruction. Reconstruction in this situation may differ from the revision arthroplasty setting because the bone quality encountered when revising a pelvic discontinuity is usually poor, secondary to micromotion at the implant–bone interface and potential stress shielding of pelvic bone stock from prior implants.[1,14] The treatment options in the primary arthroplasty setting are 1-stage reconstruction of acetabular fracture and hip joint and a 2-stage procedure with hip arthroplasty following operative stabilization and healing of the acetabular fracture. The 1-stage option was chosen for the patient described here. This patient, who was informed that data concerning his case would be submitted for publication, had acetabular nonunion and posttraumatic hip joint arthritis.

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Case Report

The patient was a man in his mid-70s who sustained a left acetabular fracture after a fall. He initially underwent open reduction and internal fixation (ORIF) and obtained pain relief for approximately 3 weeks after the procedure. However, the pain progressively worsened after that time, leaving the patient unable to ambulate and wheelchair-bound. He presented to us, 10 months after the initial surgery, with severe hip pain and an inability to ambulate. His past medical history was significant for Parkinson's disease, diabetes, and carotid stenosis. His past surgical history was significant for hernia repair and neurolysis of the peroneal nerve 3 months earlier, before presentation for a left-sided foot drop related to the acetabular fracture. It was unclear if the foot drop was secondary to the initial trauma or primary acetabular surgery. The patient's physical examination was significant for a well-healed posterior Kocher-Langenbach scar, flexion to 80°, an extension deficit of 10°, and limited internal and external rotation. He had decreased sensation in the L5 and S1 distribution and a foot drop with no function in the extensor hallucis longus or tibialis anterior.

Preoperative electromyogram confirmed left-sided sciatic neuropathy with more involvement of the peroneal division of the sciatic nerve. X-rays and computed tomography (CT) scans showed a displaced acetabular fracture with malalignment of the joint surface and plate osteosynthesis (Figures 1A–1D). The acetabulum and femoral head had protruded medially, and there were clear signs of nonunion with fracture gapping and no callus formation. There was also evidence of posttraumatic arthritis with significant joint space narrowing (Figure 1D). Because of the patient's severe pain and functional impairment, he was indicated for 1-stage reconstruction of the acetabular nonunion and total hip arthroplasty (THA).

Surgical Procedure

The patient received a combination of general and epidural anesthesia before positioning in the left-side-up lateral decubitus position on a Jackson table. All bony prominences were padded, and prepping and draping were performed in the usual sterile fashion. A standard Kocher-Langenbach incision was made through the previous hip incision. An interval was developed between the previous scar in the gluteal musculature. Insertion of the gluteus maximus was incised off the posterior aspect of the femur. The sciatic nerve was then identified, and a

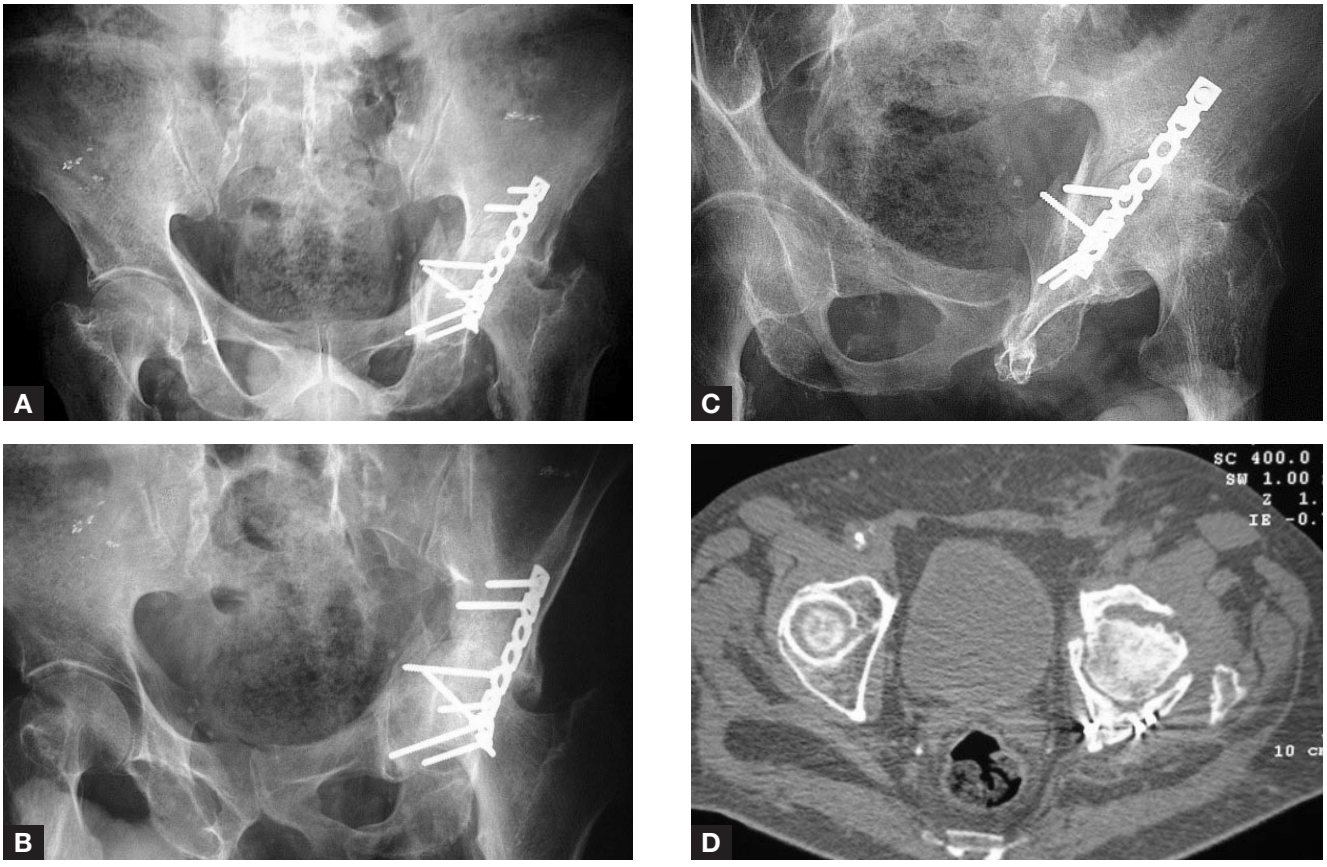

Figure 1. **(A–C)** Anteroposterior and Judet x-rays show acetabular nonunion with medial displacement of the femoral head and protrusio. **(D)** Computed tomography scan shows nonunion of the acetabulum and degenerative changes of the hip joint.

neurolysis was performed. The released sciatic nerve was protected with a blunt retractor positioned in the lesser sciatic notch. The posterior plate and screws were removed. Capsule was incised off the proximal femur. The femoral neck was osteotomized to gain access to the acetabulum. Palpation of the acetabulum revealed incomplete healing, but the dome was intact, and there was adequate stability to support a press-fit cup. The medial wall was noted to be somewhat deficient, and the femoral head was morcellized and used as bone graft to augment the medial wall and correct the protrusio. All scar and reactive tissue were débrided. After multiple deep soft-tissue and bone cultures were obtained, intravenous antibiotics were started. The morcellized cancellous and cortical bits were placed into the acetabulum, and a remnant of the femoral head was also placed into the acetabulum as a contoured bone-block backing to the acetabular component. At this stage, the acetabular cavity was progressively reamed, and a 60-mm porous-coated hemispheric acetabular component was inserted with 2 screws. After reaming and broaching of the proximal femur, a femoral stem was cemented into the femoral canal using third-generation cementing technique (Figure 2A). A 32-mm minus 3.5-mm head was placed on the stem, and the hip was reduced. The hip was taken through a range of motion and noted to be stable in flexion, extension, internal rotation, and external rotation. The wound was copiously irrigated, the posterior soft tissues were reconstructed, and the wound was closed in layers over 2 ConstaVac drains (Stryker, Kalamazoo, MI). The patient was maintained on hip precautions and touch-down 20-lb weight-bearing for 6 weeks.

Postoperative Course

As all intraoperative cultures were negative, antibiotics were discontinued. Sensation in the L5 and S1 distributions improved. Motor strength in the tibialis anterior and extensor hallucis longus improved to 3/5. After clearance with physical therapy, the patient was discharged to a rehabilitation facility on postoperative day 8. At 2-month follow-up, x-rays showed good positioning of the THA and healing of the acetabular fracture (Figure 2A). The patient had a relatively painless hip range of motion, was ambulating with a walker, and was engaged in intense physical therapy several times a week. He was advanced to weight-bearing as tolerated. At 26-month follow-up, he was ambulating comfortably with a cane and had minimal hip pain. X-rays at this time showed a healed acetabular fracture and maintenance of cup and stem position (Figures 2B–2D). There was evidence of supra-acetabular osteolysis but no change in implant position since the 2-month follow-up.

Discussion

Posttraumatic acetabular nonunions are extremely rare, and there are few published reports on the problem. Although bone grafting and stabilization of the nonunion are essential

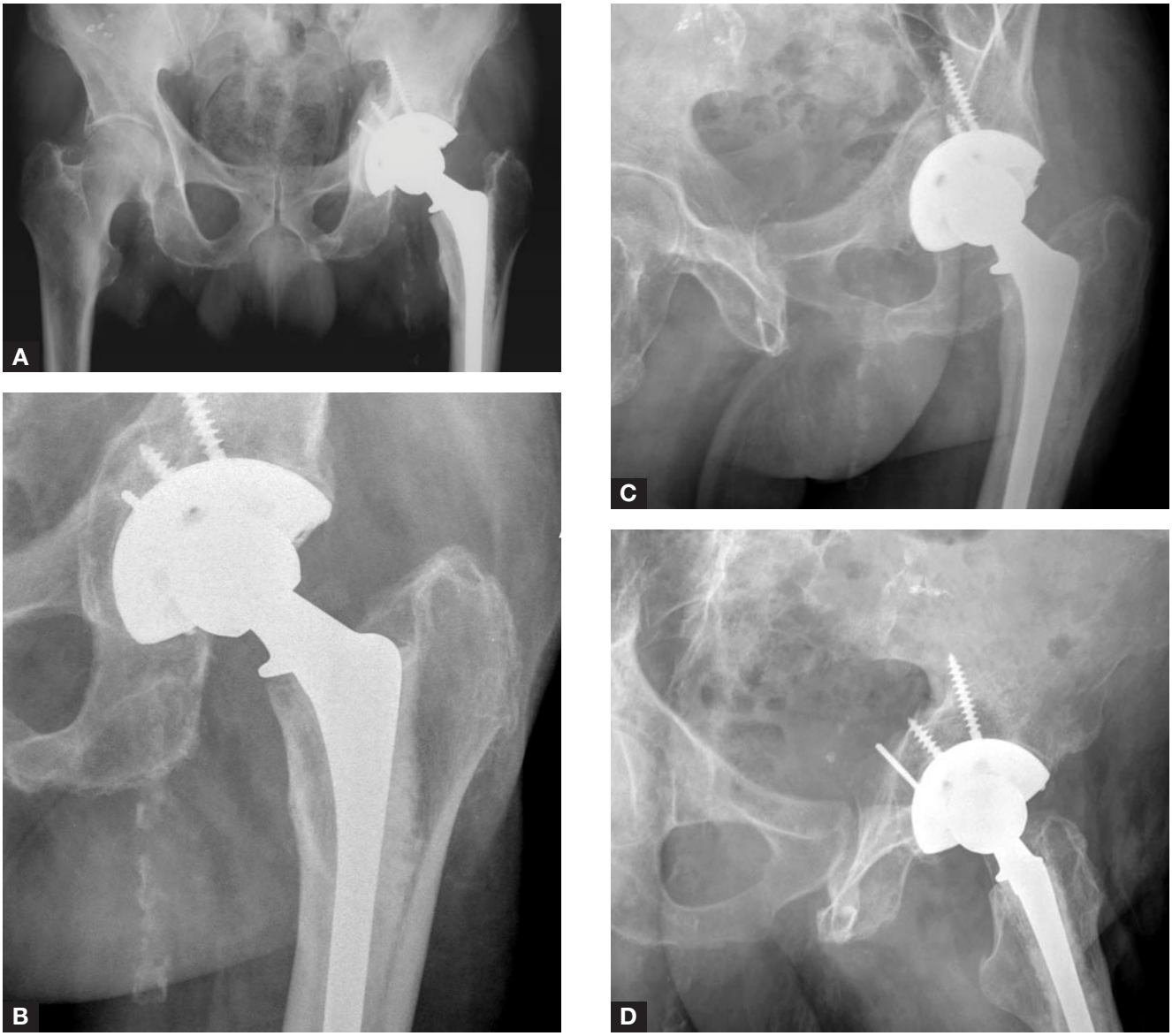

Figure 2. Anteroposterior x-rays obtained 2 months **(A)** and 26 months **(B)** after acetabular reconstruction show healing of the acetabular fracture, maintenance of cup and stem position, and no evidence of component loosening or migration. **(C,D)** Judet x-rays 26 months after acetabular reconstruction show healing of the acetabular fracture.

to management, posttraumatic arthritis or avascular necrosis complicate management of this problem. When a 2-stage procedure is performed, with ORIF of the acetabulum followed by THA after healing of the acetabular fracture, the patient is left with a painful arthritic hip until acetabular union. To our knowledge, the present report is the first in the literature to describe managing a posttraumatic acetabular nonunion in a patient for whom a primary THA is indicated.

Posttraumatic acetabular nonunion with hip arthritis, although similar to a pelvic discontinuity in revision hip surgery, differs in several ways in terms of surgical management. In the revision hip arthroplasty setting, cup loosening with micromotion at the implant–bone interface can result in rapid destruction of bone stock, leading to large osteolytic areas communicating in the anterior and posterior columns. This can result in pelvic discontinuity and an unstable pelvic ring.[1,4]

Berry and colleagues[1] reported on 31 acetabular revisions with a pelvic discontinuity reconstructed with posterior column plating and acetabular reconstruction with a porous-coated cup inserted without cement. At a minimum follow-up of 2 years, results were best in patients who did not have severe segmental acetabular bone loss. For pelvic discontinuity with major bone loss, reconstruction cages appear necessary, as column plating and bulk allograft reconstruction alone resulted in revision rates of 47% at a mean follow-up of 83 months.[13] In a series of 13 acetabular revisions with pelvic discontinuity and severe bone loss, treatment with structural bone graft and a reconstruction cage resulted in stability in all cases at a minimum follow-up of 2 years.[1] Similarly, Eggli and colleagues[15] reported on 7 cases of pelvic discontinuity in acetabular revision reconstructed with ORIF of the acetabulum, bone grafting,

and use of reinforcement rings. In 6 of the 7 cases, the pelvic discontinuity healed, and the constructs were stable at 8-year follow-up; in 1 case, the construct was revised at 12 months for aseptic loosening. Trabecular metal components, which have more ingrowth potential than conventional acetabular components, have also been proposed to treat pelvic discontinuity with massive bone loss.[11,12,16-18]

In our patient's case, a *primary* hip replacement was performed for acetabular nonunion with degenerative arthritis of the hip joint. Unlike the revision arthroplasty settings mentioned, in which osteolysis and bone loss can be extensive, we noted sufficient bone stock and bone quality in our patient for arthroplasty. Although there was evidence of acetabular nonunion, the dome was intact and could support an uncemented cup secured with multiple screws. If the dome were disrupted, plate fixation in conjunction with cup arthroplasty would have been required. Weight-bearing was protected for several weeks after surgery to allow the fracture to heal. Although acetabular nonunion with posttraumatic arthritis is a rare clinical condition, our patient's good outcome suggests that bone grafting and immediate THA using a hemispheric porous-coated cup can result in acetabular union, pain relief, and good function with minimal complications.

Authors' Disclosure Statement

The authors report no actual or potential conflict of interest in relation to this article.

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