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Case Report

Repeat posterior wall acetabular fracture-dislocation: High-energy trauma as a 'second hit phenomenon'

Burton D. Dunlap, Ryan T. Voskuil*, Brandon Cincere, Peter J. Nowotarski

The University of Tennessee College of Medicine Chattanooga, Department of Orthopaedic Surgery, 975 E. Third St., Hospital Box 260, Chattanooga, TN 37403, United States of America

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ABSTRACT

Acetabular fractures are injuries that require significant force transmission, especially when associated with a femoral head dislocation. The mechanism of injury is typically in the setting of a high-speed motor vehicle collision. In a similar manner, this is an injury that is highly demanding for the orthopaedic trauma surgeon to treat as well. We present a patient who sustained an initial posterior wall acetabular fracture with an associated posterior dislocation. This was treated surgically with open reduction, internal fixation without complication. The patient subsequently sustained a second posterior wall acetabular fracture with dislocation fifteen years later through the plated and healed previous fracture. Both injuries were sustained in high-speed motor vehicle collisions, so it is difficult to presume the patient was predisposed for the repeat injury. At any rate, the repeat injury makes the surgical management significantly more challenging. In complicated acetabular fractures like these, a post or intra-operative CT scan can be of utility to determine quality of reduction as well as assessing for retained bony fragments. Our patient underwent a post-operative CT scan with the finding of intra-articular bony fragments that subsequently required arthroscopic removal. Given the rare nature of this complicated injury occurring twice in a patient, it is difficult to make evidence-based comments on long-term prognosis and functional outcomes. This unique case and the applied treatment will serve as a guide for future similar cases.

Introduction

Acetabular fractures with an associated femoral head dislocation are undoubtedly an orthopaedic emergency that requires intervention both initially in the emergency department as well as in the operating room. These orthopaedic interventions have a large effect on the patient's prognosis, functional outcome, and quality of life down the road. These important variables serve as an important reminder when we approach the management strategies. Fracture dislocations of the pelvis and hip are increasing in incidence with increasing motor vehicle traffic [1]. Of all joint dislocations, hip fractures with associated dislocations represent nearly 5% [2]. It has been published numerous times that reduction of the femoral head should be performed within 6 h to reduce the risk of femoral head osteonecrosis. Ideally though, any hip that is dislocated must be reduced as fast as possible [3]. Additionally, an anatomic fracture reduction with under 2 mm of gapping or step off intra-operatively is what most closely correlates with long-term patient satisfaction and prognosis. We present a case of a patient presenting with a posterior wall acetabular fracture dislocation that underwent primary open reduction internal fixation without complication. The patient went on to heal the fracture and subsequently

* Corresponding author.
E-mail addresses: rtvoskuil@gmail.com, bdunlap736@gmail.com (R.T. Voskuil).

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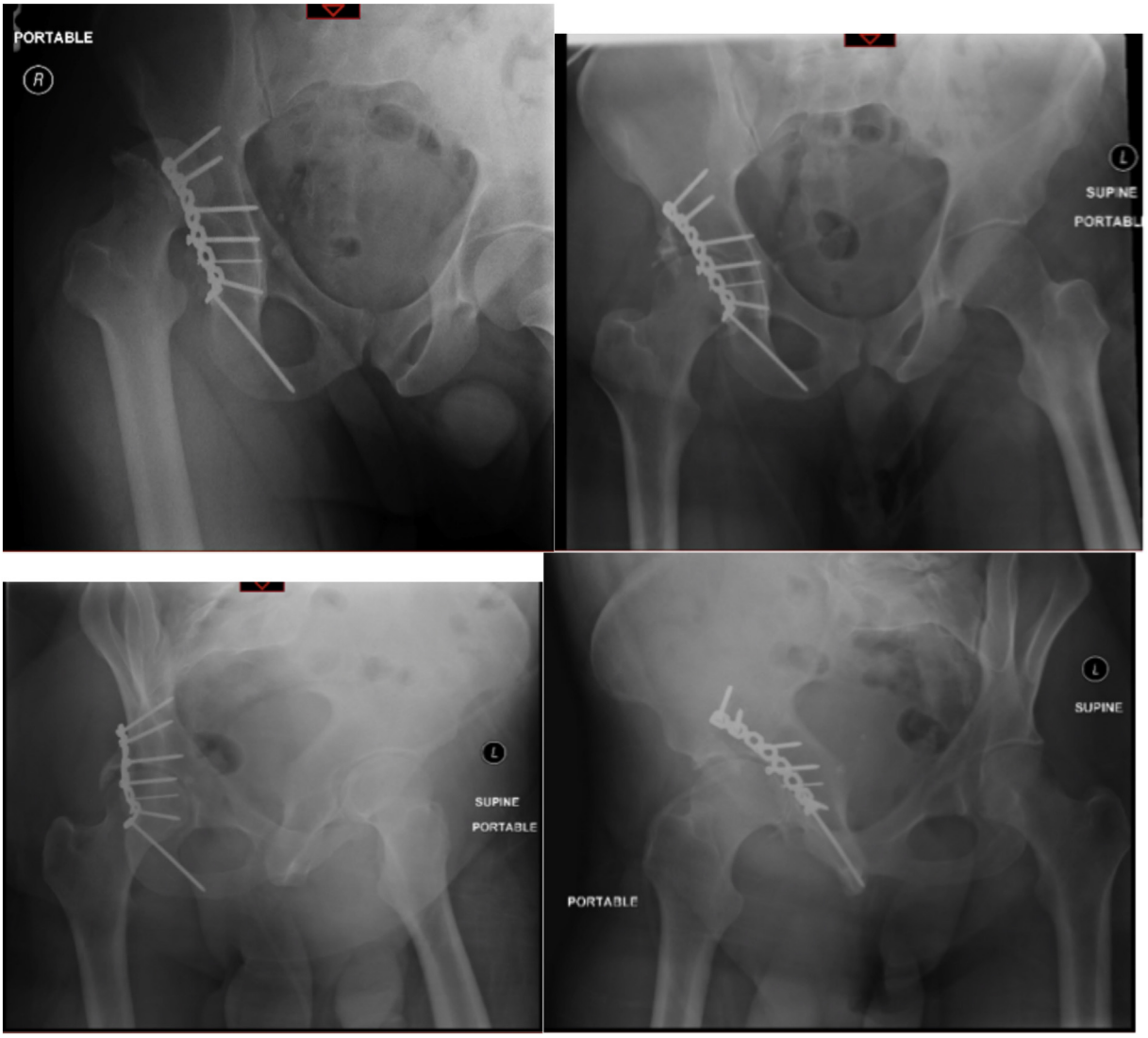

Fig. 1. AP pelvis x-ray of second posterior wall fracture-dislocation showing postero-superior hip dislocation. AP and Judet views of reduced hip with concomitant posterior wall acetabular fracture.

presented fifteen years later after a similar motor vehicle accident with a similar posterior wall fracture dislocation through the healed acetabulum and hardware.

Case report

The patient is currently a 33-year-old male who was originally involved in a motor vehicle accident in December of 2003 as a 17-year-old. Initially, he sustained an isolated posterior wall acetabular fracture with associated posterior dislocation of the femoral head. The images from this initial injury and operation could not be obtained. He underwent open reduction internal fixation of his posterior wall acetabular fracture through a posterolateral Kocher-Langenbeck approach after initial closed reduction in the emergency room. Postoperatively, he was placed on toe touch weight bearing restrictions, underwent physical therapy for two days, and was subsequently discharged from the hospital. He was essentially lost to follow up until he presented yet again in July of 2018 after another motor vehicle collision. He sustained a dashboard impact to his right knee and was taken to an outside hospital. He was found to have a posterior wall acetabular fracture with associated postero-superior dislocation and transferred to our hospital for orthopaedic care (Fig. 1). Although lost to follow-up after the initial surgery, the patient reported at the time of his repeat injury that he had returned to his baseline function with a pain free hip shortly after his first surgery, until his second hit 15 years later.

He underwent repeat open reduction internal fixation of his injury (Fig. 2). Surgery was performed through a Kocher-Langenbeck approach again, although with a digastric trochanteric flip osteotomy for improved exposure and to address some associated marginal impaction. The previous 3.5 mm pelvic reconstruction plate was removed successfully in addition to two 3.5 mm posterior wall lag

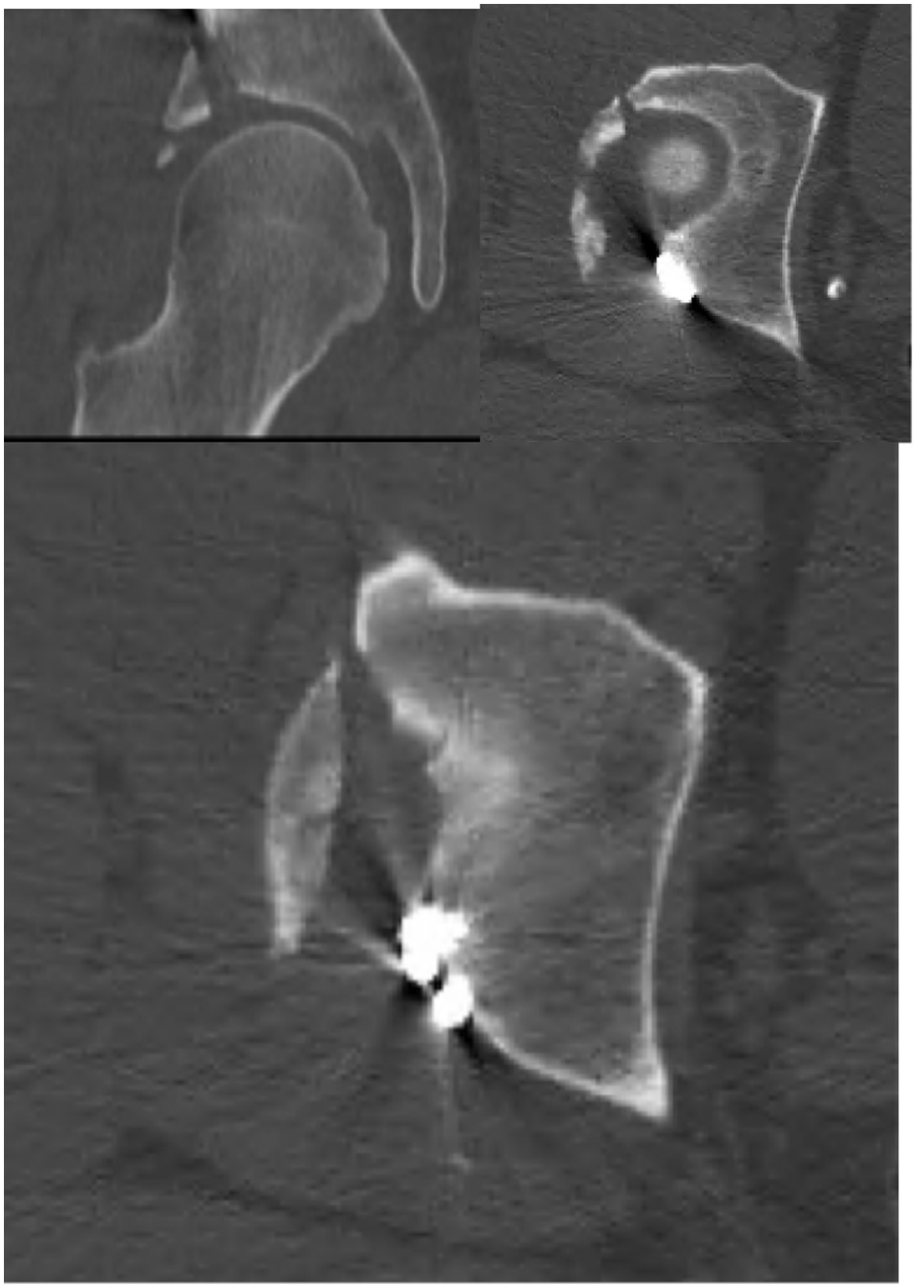

Fig. 2. Key second injury axial and coronal CT pelvis images of the posterior wall fracture with evidence of initial posterior wall hardware.

screws and a mini fragment lag screw. The most distal ischial screw head broke off upon attempted removal, so was left given that it was out of working area and out of harm's way. The new fracture bed was addressed with three 2.4 mm cortical inter-fragmentary lag screws. A standard posterior wall buttress plate was placed with the addition of a 4-hole and a 3-hole spring plate placed perpendicularly with 3.5 mm cortical screws for additional and more rigid fixation (Fig. 3). Throughout the duration of the operation, there was extreme care and caution utilized while working around the sciatic nerve, which was found to have significant surrounding scar. A padded mayo stand was used to maintain the hip in an extended and knee in a flexed position to decrease sciatic nerve tension and to allow confident retraction while working around the atypical and scarred gluteus and quadratus muscular planes. The digastric osteotomy allowed easier muscular retraction and exposure of the fracture site, decreasing the risk of sciatic nerve traction or injury in the more difficult revision setting. Postoperatively, the patient remained neurovascularly intact and mobilized well with physical therapy. A postoperative CT scan was ordered at the completion of surgery in order to confirm anatomic reduction of the fracture (Fig. 4). The scan demonstrated an unexpected finding of three very small osseous fragments retained within the hip joint. Subsequently, a colleague who performs hip arthroscopy was consulted for fragment removal, which was done without complication prior

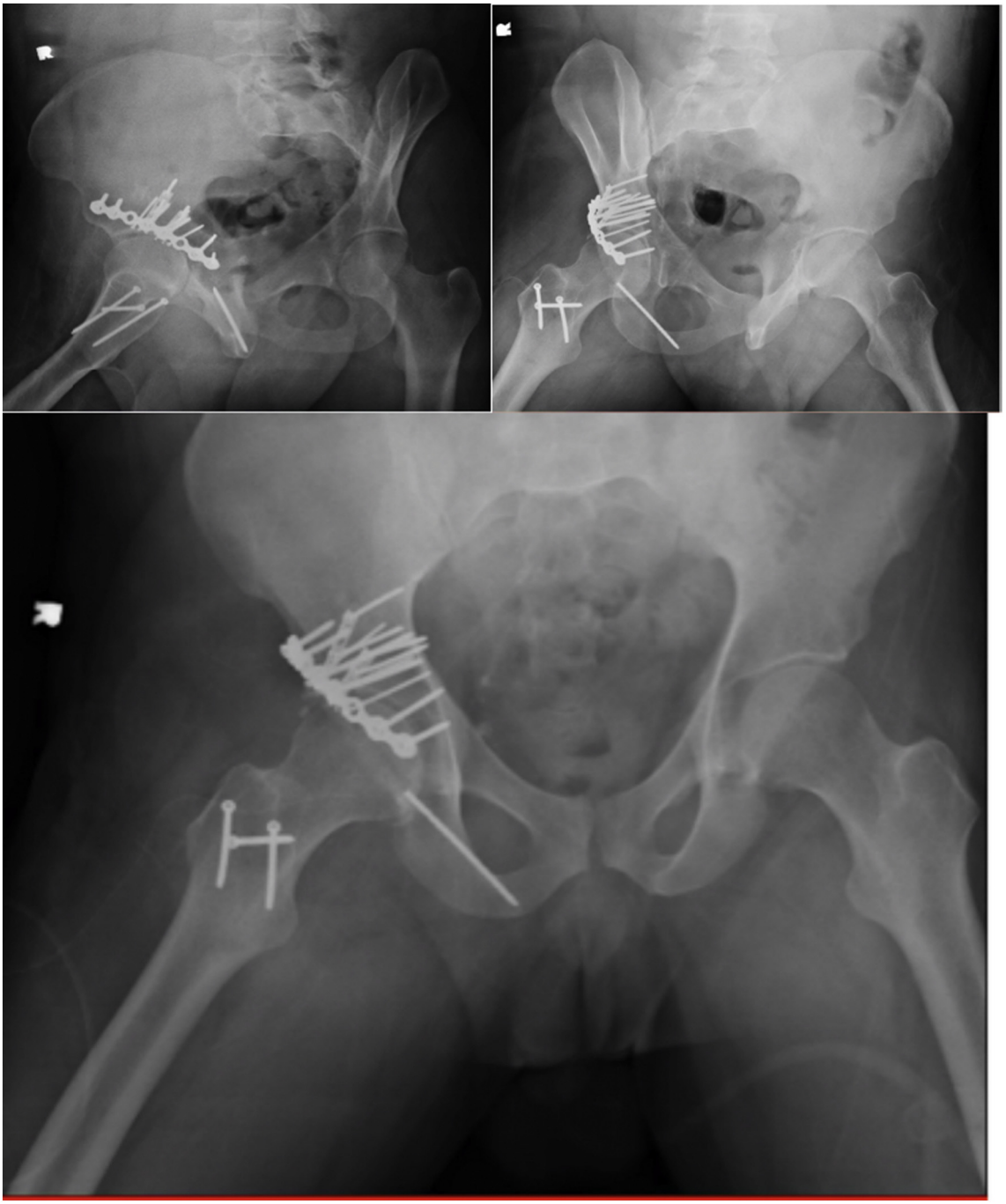

Fig. 3. AP and Judet views of the pelvis after removal of initial hardware and ORIF of second posterior wall fracture with trochanteric osteotomy.

to discharge from the hospital. He was compliant with non-weight-bearing status for 3 months post-operatively and was progressed to full weight bearing at that time.

Discussion

The patient we present sustained two nearly identical injuries 15 years apart after healing his initial injury. The patient states that he was essentially pain and symptom free from his right hip with the exception of some painless, positional hip clicking prior to this most recent injury. He had continued to work as a manual laborer after initial injury. He has yet to return to work this time around, although it is still within months of the second injury. The only data for acetabular fracture re-operation after primary open reduction

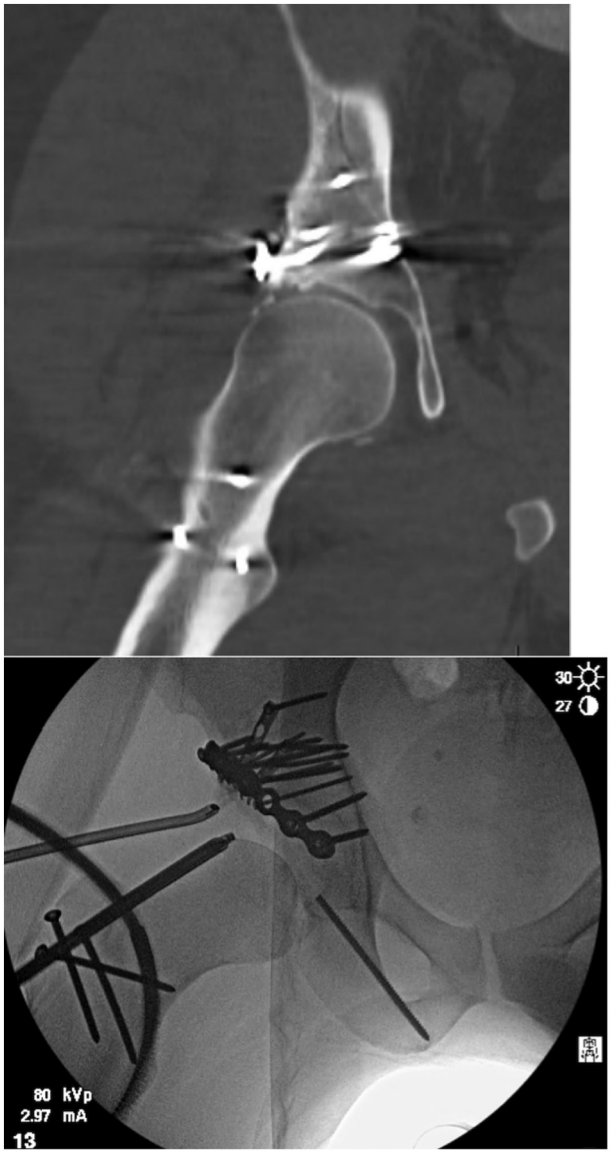

Fig. 4. Post-operative coronal CT image after repair of the second posterior wall fracture revealing several retained intra-articular bone fragments. Intraoperative fluoroscopy during arthroscopic removal of the remaining bone fragments in the hip joint.

internal fixation is either in the setting of joint reconstruction with prosthesis or in an acute setting after primary operation. The acute setting repeat operations were done in order to address and salvage mal-reductions or loss of reduction that occurred within 3–4 months of primary open reduction internal fixation. Mayo et al. demonstrated the difficulty with repeat acetabular operations providing evidence that further time away from initial surgery produces less accurate reductions, and in effect causes worse subjective hip scores. There was an overall perioperative complication rate of about 19% as well [4]. In our trauma center, we have presented a separate patient who sustained a Pipkin IV femoral head fracture with associated dislocation, although this patient sustained the injury just four months after an open reduction internal fixation of a posterior wall acetabular fracture [5]. This patient presentation currently is different in the way of a healed posterior wall acetabular fracture sustaining a subsequent, similar injury.

Mitisonis et al. published the long-term outcomes after surgical management of posterior wall acetabular fracture with associated dislocation. In a follow up period of between 15 and 23 years the quality or degree of anatomic reduction, i.e. displacement under 2 mm, was directly correlated to functional outcomes and long-term prognosis. Additionally, a follow up of 24 months is recommended in order to comfortably exclude development of femoral head osteonecrosis [6].

Given the complexity of this particular case, a post-operative CT scan was performed which in fact elucidated some essential information requiring a return trip to the operating room. Routinely, pre-operative CT scans with coronal and sagittal multi-planar reformations are performed for surgical planning of acetabular fractures, although the indications for doing so post-operatively are not as clear. Jaskolka et al. demonstrated that 44% of patients had significant post-operative CT findings defined as imperfect

alignment, 2 or more intra articular fragments, or hardware complications. Out of those with significant post-operative findings, 92% were complex acetabular fractures defined as anything more than a simple Letournel/Judet posterior wall or anterior column fracture [7]. Furthermore, this case would have been an excellent opportunity for intraoperative cone beam tomography imaging and could have possibly avoided a return trip to the OR to remove the intra-articular loose bodies. Although sparse, the current literature supports intraoperative use in more difficult, impacted, and displaced acetabular fractures. Intraoperative imaging demonstrated improved articular reduction accuracy by 2 mm, while OR time was not significantly increased [8]. Intraoperative use can be considered in the more complex, displaced acetabular fractures especially when intra-articular bony fragments were identified preoperatively and the surgeon is unsure of complete removal. Plain radiographs performed post operatively are certainly less effective in detecting articular displacement, although the additional information gained from a CT scan does not always alter further patient management. Plain radiographs were only able to detect or visualize 42% of significant post-operative findings as well [9]. Specifically, CT scans are more helpful in providing information on presence of articular step incongruity, more so than gapping [10]. Postoperative CT artifact is a concern, although the use of titanium implants over stainless steel maximizes the visibility, which can be another intraoperative consideration [11]. The other consideration in this situation is radiation exposure, cost, and proper use of health care resources. Although intra-operative and post-operative CT scans are not routinely encouraged, there are selective indications for its use in the more complex fractures.

We are presenting the case of a patient who sustained two very similar and sizeable traumatic acetabular fracture with associated dislocations. Our patient sustained his primary injury after traumatic motor vehicle collision and underwent open reduction internal fixation via a Kocher-Langenbeck, and then presented 15 years later with the exact same injury pattern after healing his primary fracture. From the patient's subjective symptoms, it is apparent that he healed his initial injury and was a fully functioning laborer and member of society without daily pain. Although we have presented a case of a similar occurrence, the one previously presented had subsequent injury that occurred within four months of the initial injury. There have not been reports in the orthopaedic trauma literature of this particular injury occurring twice, as it did in this example. It is possible that his initial injury and surgery weakened his acetabulum and ability to withstand reactive forces through the hip joint. Additionally, it would be feasible to believe that this initial injury would make him more prone to injury through this area the second time. Either way, the injury occurred in the setting of a high-energy impact mechanism that would have been enough force to create a posterior wall acetabular fracture in a native, uninjured acetabulum. With that being said, it is difficult to know for certain that he would have fractured in this same location in the absence of prior trauma. We do know that operative considerations such as appreciating atypical anatomy, osteotomies, and utilizing more aggressive imaging is helpful in these more complicated, repeat fracture patterns. Given this scenario, it is difficult to comment on whether the patient was predisposed or simply sustained an initial high-energy motor vehicle collision with impact to the right lower extremity followed by a ‘second hit phenomenon’.

Declaration of Competing Interest

None.

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