

## CASE NOTE

# Isolated quadrilateral plate fracture: an unusual acetabular fracture

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The most widely used classification of acetabular fractures is that of Letournel and colleagues.<sup>1</sup> This anatomic classification divides all acetabular fractures into elementary and associated types based on the anterior and posterior columns and walls. We report the case of a patient with an isolated quadrilateral plate fracture of the pelvis associated with a superolateral quadrant femoral head impaction. To our knowledge, this type of acetabular fracture cannot be classified according to Letournel's classification and has never been reported in the English literature.

**CASE REPORT**

A 31-year-old healthy patient was involved in a high-velocity motor vehicle collision. On presentation to the emergency department, he had severe right abdominal pain and bilateral hip pain, and his right lower limb was internally rotated. His vital signs were stable. Initial evaluation of the patient revealed a hepatic hematoma, rib fractures and bilateral acetabular fractures with posterior dislocation of the right hip. The lower extremities were neurologically intact with good pedal pulses.

Initially, we treated the patient emergently with a closed reduction of the posterior hip dislocation. Plain radiographs showed a transverse-plus-posterior wall fracture of the right acetabulum associated with a reduced femoral head. On the left side, an atypical fracture pattern could be seen on plain radiographs (Fig. 1) and on a computed tomography (CT) scan (Fig. 2): a displaced isolated quadrilateral plate fracture of the acetabulum with a comminuted impaction of the superolateral aspect of the femoral head. On postinjury day 4, the patient underwent open reduction and internal fixation of the right acetabulum through a Kocher–Langenbeck approach. We treated the left hip through a standard Smith–Petersen approach with an excision of the osteochondral fragments of the femoral head. Despite the femoral head's impaction, intraoperative fluoroscopic imaging confirmed a concentric hip joint. Examination of the hip stability in different directions, especially in full abduction and medially directed force on the trochanter, did not cause subluxation of the femoral head into the medial wall defect. We decided to treat the quadrilateral plate acetabular fracture nonoperatively, with a postoperative non-weight bearing regimen for 12 weeks followed by progressive weight bearing as tolerated.

**DISCUSSION**

In a recent meta-analysis,<sup>2</sup> all fractures of the acetabulum (3670 cases) were found to be classifiable according to Letournel's classification. Fractures of the quadrilateral plate are normally associated with pelvic column disruption and can be classified as such. Our patient's case is of particular interest

because of the lack of injury to any part of the pelvis other than the quadrilateral plate and the association with a femoral head impaction fracture.

Meinhard and colleagues<sup>3</sup> published a case of an acetabular fracture with intrapelvic (central) dislocation of the femoral head without major pelvic-column disruption as well as an ipsilateral femoral-neck fracture. We believe that their case report represents the final stage of severity on the same continuum on which our patient's case lies.

According to a study by Letournel and Judet,<sup>4</sup> to explain our patient's bilateral acetabular injury, the mechanism of trauma would have been a force applied to the flexed knee in the axis of the femoral shaft. The forces explaining a dislocation with a transverse-posterior wall fracture are transmitted to a hip flexed at 90°, adducted at 0°–20° and internally rotated at 50°. To explain our patient's isolated quadrilateral fracture associated with the femoral head impaction fracture, the left hip would have been positioned at 90° of flexion, 20° of internal rotation and maximum abduction. We believe that an impingement occurred between the superolateral femoral head and the lateral acetabulum. That could have created a force vector that caused only a partial central protrusion of the femoral head into the medial acetabulum, thus creating the isolated quadrilateral plate fracture in addition to the femoral head impaction fracture.

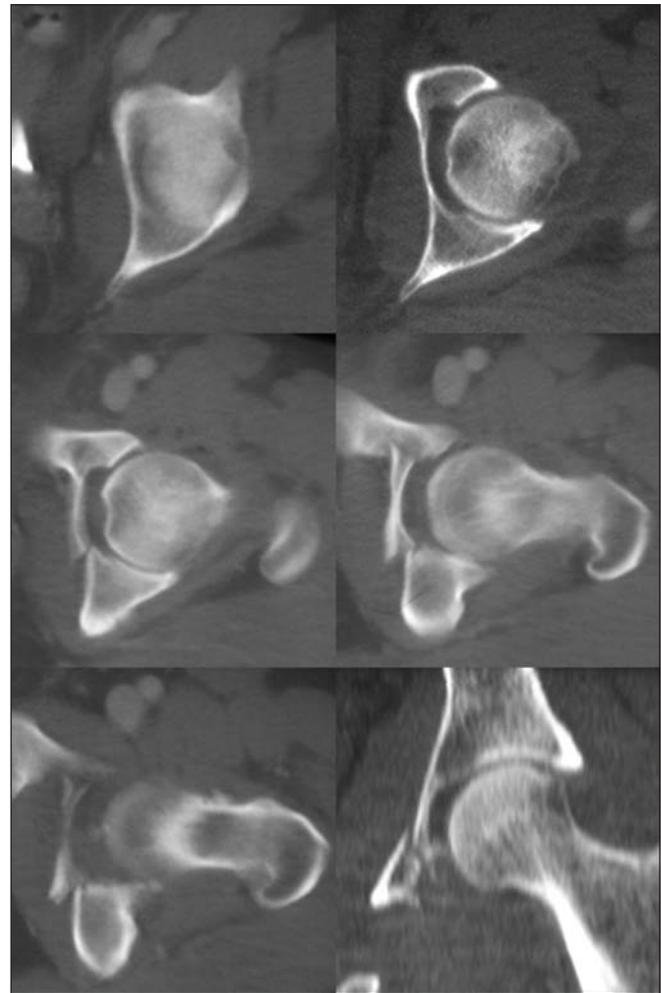
It is also possible that, at the moment of impact, the femoral head subluxed inferiorly and then medially within the acetabulum such that most of the force was directed toward the inferior floor of the acetabulum. It appeared

that the entire width of the femoral head could fit into the hole created by the fracture of the medial wall of the acetabulum. This explanation would account for, first, the fact that most of the residual fracture displacement was at the inferior aspect of the medial wall and that the superior aspect of the medial wall was essentially nondisplaced and, second, that after the accident, with radiographs obtained with the hip in neutral position, no residual subluxation of the joint was noted.

Displaced acetabular fractures should be considered a surgical problem unless specific criteria are met. The objective criteria for nonsurgical management are based on plain radiographs and axial CT.<sup>5</sup> The first is that the femoral head must be congruent with the acetabulum on the anteroposterior and both Judet views of the pelvis. If the hip is congruent, the weight-bearing surface of the acetabulum should be unaffected by the fracture. This is defined as an intact 45° roof arc on all 3 plain radiographs and an intact 10-mm subchondral arc on axial CT scan. The quadrilateral plate is non-weight-bearing and out of



**Fig. 1.** Anteroposterior injury radiograph of the hip with Judet views showing medialization of the quadrilateral plate (black arrow) without disruption of the 2 columns. There is an impaction of the superolateral aspect of the femoral head (grey arrow).



**Fig. 2.** Axial computed tomography scan showing displacement of the quadrilateral plate without disruption of the 2 columns. Coronal reconstruction shows that the left acetabulum roof is intact.

the roof arc. In our patient's case, the indication to operate on the left hip was not the reduction and fixation of the quadrilateral plate fracture; rather, it was the excision of the femoral head fragments and re-establishment of a congruent articulation.

Our patient's case illustrates an isolated quadrilateral plate fracture of the pelvis with no involvement of either column but with an impaction fracture of the femoral head. The injury's successful treatment illustrates how current surgical indication criteria can still be used even when a rare acetabular fracture cannot be classified according to commonly used classification systems.

**Competing interests:** None declared.

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