# Occult Acetabular Fractures in the Elderly: A Report of Three Cases and Review of Literature

**Dear Editor,**

Occult acetabular fractures are uncommon injuries.[1] Whilst acetabular fractures are often the result of high-energy trauma,[2] injuries of varying energy may result in occult acetabular fractures. In the elderly with osteoporosis, they can present with such fractures from low-energy injuries[3] or even in situations with no discernible history of trauma. The elderly may also present with pre-existing arthritis of the hip joint and this can confound the clinical presentation of an occult acetabular fracture. In patients with persistent hip pain especially on weight-bearing, radiographic imaging is indicated. Despite the efficacy of radiographs in the detection of acetabular fractures, occult acetabular fractures are not visible on radiographs and require further imaging such as computed tomography (CT) or magnetic resonance imaging (MRI) scans for diagnosis.[4,5] In addition, advanced imaging can serve to differentiate exacerbated arthritic pain from that of an occult fracture. Occult acetabular fractures are often not displaced and therefore non-surgical treatment can be considered.

For the purpose of this review, we defined occult acetabular fractures to be those that cannot be diagnosed with plain radiographs (including specialised radiograph views such as Judet's view), even on retrospective viewing. We describe 3 cases of occult acetabular fractures in the elderly (65 years and above) as a result of varying mechanisms of injury and reviewed existing literature. Of the 15 cases of occult acetabular fractures found in existing literature, only 10 met our definition (Table 1). The remaining 5 fractures were seen on retrospective viewing of initial radiographs. These injuries are often difficult to diagnose and require a high degree of suspicion as well as judicious use of advanced imaging. This paper thus seeks to discuss the clinical presentation, imaging findings, treatment modalities and outcomes of occult acetabular fractures.

## Case Reports

*Case 1*

An 82-year-old male with hypertension and hyperlipidaemia presented with sudden onset of left hip pain for 2 days. Prior to presentation, the patient was community-ambulant without aid. There was no history of trauma. The hip pain occurred on weight-bearing but resolved on rest. On examination, there was full range of motion of the left hip. Axial loading reproduced the pain. Pelvic and hip radiographs (Fig. 1a) did not reveal any fractures. In view of the persistent pain, an MRI of the left hip (Fig. 1b) was performed on post admission day 2. The MRI revealed a non-displaced fracture of the anterior column of the left acetabulum. His bone mineral density was measured using dual energy X-ray absorptiometry (DEXA), which showed a T-score of -2.3 (femur) and -0.6 (lumbar spine). His vitamin D levels were low at 17.7 g/dl.

As the acetabular fracture was non-displaced and over a non-weight-bearing portion of the acetabulum, the patient was treated non-surgically. He was advised not to weight bear on the left lower limb for 1 month. A Judet's view of his pelvis (Figs. 1c and 1d) was performed 1 month after the MRI of his pelvis and since no definite fracture line was seen, he was subsequently allowed to weight bear as tolerated. For his osteopaenia, he was treated with vitamin D replacement and bisphosphonate therapy. One year after the injury, the patient was well and ambulating without aid.

*Case 2*

A 65-year-old lady with multiple comorbidities such as diabetes mellitus type 2, hypertension, hyperlipidaemia and hypothyroid on thyroxine replacement, presented to the emergency department after a road traffic accident. She was the front seat passenger of a car that collided into a pillar. After the accident, the patient complained of persistent left hip pain. Whilst she was still able to ambulate, the hip pain was exacerbated on weight-bearing.

On examination, there was full range of motion of the left hip. There was palpable tenderness over the posterior aspect of the left hip. Pelvic radiographs did not reveal any fractures. An MRI of her left hip (Fig. 2a) showed a non-displaced fracture of the posterior column of the acetabulum and a non-displaced Pipkin classification type IV femoral head fracture. She was managed non-surgically with wheelchair mobilisation. At the 2-month follow-up, the pelvic radiograph (Fig. 2b) showed sclerosis over the posterior acetabulum, suggestive of a healing fracture. She eventually recovered fully and was able to ambulate independently.

Table 1. Existing Literature for Occult Acetabular Fractures

| References (Country/ Year of Publication) | Demographics (Age/Gender) | Mechanism of Injury | Fracture Configuration | Diagnostic Modality | Treatment | Outcome |
|---|---|---|---|---|---|---|
| Guerado et al* (Spain/2012) | 75/F | No trauma | Transverse | Healing fracture seen on interval X-ray (2 months) | Cemented THA | Ambulation with aids |
| | 83/F | No trauma | Anterior column | Healing fracture seen on interval X-ray (2 months) | Non-surgical with non-weight bear for 2 weeks | Ambulation with aids |
| Mouzopoulous et al† (Greece/2008) | 28/M | RTA | Anterior column | CT | Non-surgical with traction for 6 weeks | Return to premorbid |
| Kakar et al‡ (UK/2007) | 85/F | Fall | Anterior column and posterior wall | CT | Non-surgical with non-weight bear for 6 weeks | Ambulation with aids |
| | 69/F | Fall | Transverse | MRI | Weight bear as tolerated with aids | Ambulation with aids |
| | 69/F | Fall | Medial wall fracture | Healing fracture seen on interval X-ray | No information available | No information available |
| Thomas et al§ (USA/2006) | 79/M | Jogging | Supra-acetabular fracture | MRI and CT | Cemented THA | Return to premorbid |
| Schachter et al‖ (USA/2003) | 65/F | RTA | Transverse | CT | Non-surgical with traction for 6 weeks | Ambulation with aids |
| Olive et al¶ (USA/1989) | 71/F | RTA | Anterior column | Central fracture dislocation seen on interval X-ray | Cemented THA | Satisfactory hip at 1-year |
| Rogers et al# (USA/1975) | 23/F | RTA | Central | Tomography | No information available | No information available |

CT: Computed tomography; F: Female; M: Male; MRI: Magnetic resonance imaging; RTA: Road traffic accident; THA: Total hip arthroplasty; UK: United Kingdom; USA: United States of America

*Guerado E, Cano JR, Cruz E. Occult acetabular fracture in elderly patients. The Open Orthop J 2012;6:582-6.

†Mouzopoulos G, Lasanianos N, Mouzopoulos D, Tzurbakis Mathaios, Georgilas I. Occult acetabular fracture. A case report. Emerg Radiol 2008;15:437-9.

‡Kakar R, Sharma H, Allcock P, Sharma P. Occult acetabular fractures in elderly patients: a report of three cases. J Orthop Surgery (Hong Kong) 2007;15:242-4.

§Thomas M. Occult acetabular fracture in an elderly runner. J Orthop Sports Phys Ther 2006;36:415-24.

‖Schachter AK, Roberts CS, Seligson D. Occult bilateral acetabular fractures associated with high-energy trauma and osteoporosis. J Orthop Trauma 2003;17:386-9.

¶Olive RJ Jr, Marsh HO. Occult central acetabular fracture resulting in fracture-dislocation. A case report. Clin Orthop Relat Res 1989;248:240-5.

#Rogers LF, Novy SB, Harris NF. Occult central fractures of the acetabulum. AJR Am J Roentgenol 1975;124:96-101.

*Case 3*

A 76-year-old nursing home resident with known hypertension and a previous lumbar 1 and 2 compression fracture (but not on bisphosphonates), fell whilst trying to transfer from the bed to wheelchair. He had right hip pain and was unable to ambulate thereafter. His right hip was tender on examination and range of motion was limited by pain. Plain radiographs of the hip did not show any fracture. MRI of the right hip (Fig. 3) was performed in view of the persistent pain and revealed a non-displaced right subcapital neck of femur fracture as well as a non-displaced fracture of the anterior column of the acetabulum. He was treated conservatively in view of his premorbid status with wheelchair mobilisation for 6 weeks. After being discharged back to his nursing home, he defaulted any subsequent follow-up, hence no repeat radiographs were taken after admission. On phone consultation with his son 2 years after his injury, the patient's right hip was pain-free and he was able to return to his premorbid state.

## Discussion

Occult acetabular fractures can result from varying mechanisms of injury, ranging from high-impact trauma to low-energy injuries. Low-energy injuries can result in occult acetabular fractures in the elderly, on the background of osteoporosis.[6] Whilst the literature review revealed 15 occult acetabular fractures in 8 published English literature, only 10 of these cases were truly occult.[7-13] It is important

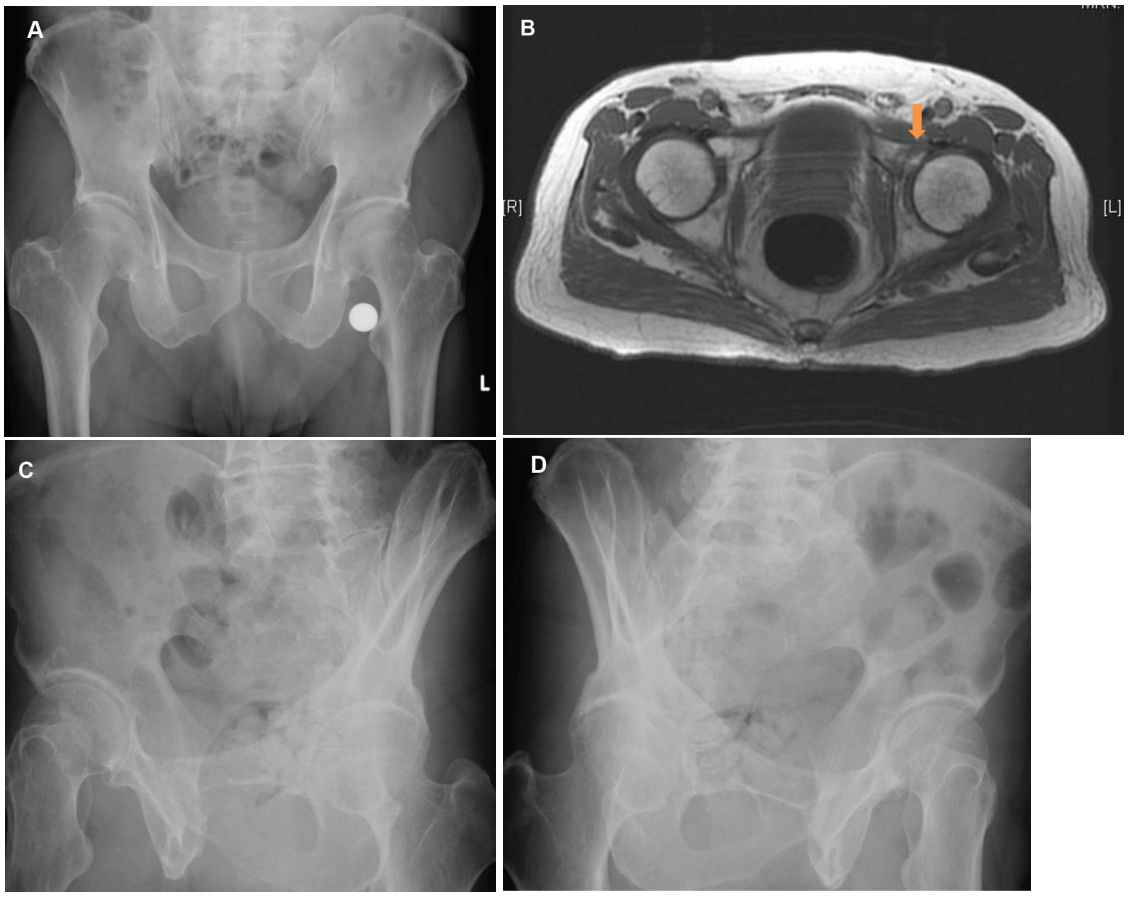


Fig. 1. Imaging of Patient 1. In A, no fracture is revealed in anteroposterior pelvis X-ray of patient performed on the day of admission. In B, MRI scan of the pelvis of patient performed 2 days after admission, showing a non-displaced fracture of the anterior column of the left acetabulum. In C and D, Judet's view of the pelvis of patient performed 1 month after MRI of his pelvis. No definite fracture line was seen.

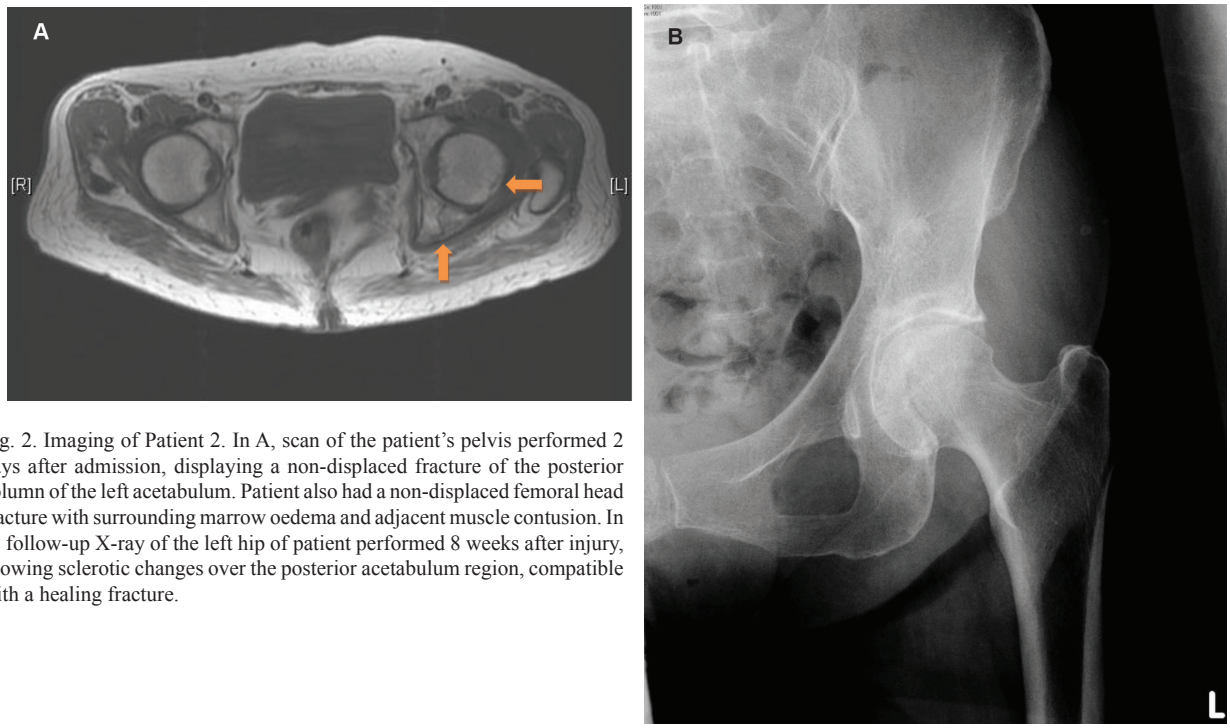


Fig. 2. Imaging of Patient 2. In A, scan of the patient's pelvis performed 2 days after admission, displaying a non-displaced fracture of the posterior column of the left acetabulum. Patient also had a non-displaced femoral head fracture with surrounding marrow oedema and adjacent muscle contusion. In B, follow-up X-ray of the left hip of patient performed 8 weeks after injury, showing sclerotic changes over the posterior acetabulum region, compatible with a healing fracture.


Fig. 3. MRI scan of the pelvis of Patient 3, showing a non-displaced fracture of the anterior column of the right acetabulum. There is also a right non-displaced sub-capital neck of femur fracture with surrounding bone and soft tissue oedema.

to have a high level of suspicion in patients who present with persistent hip pain as an undiagnosed occult acetabular fracture may result in propagation of the fracture on weight-bearing with worsening morbidity.

The clinical presentation of occult acetabular fractures can be non-specific. Patients often complain of persistent hip or groin pain, which may occur after trivial injury. The pain is mechanical in nature and is exacerbated on weight-bearing. Physical examination may be unremarkable. When lying supine with no physiological loading of the hip joint, patients may be pain-free even on ranging of the affected hip. This may be a subtle difference from occult proximal femoral fractures, which can produce pain during rotation of the femur. As such, axial loading of the joint is an important manoeuvre. Even in the absence of other positive findings, this manoeuvre may reproduce pain in the occult acetabular fracture. In addition, these patients may be unable to weight bear and ambulate due to pain. In the elderly, exacerbation of degenerative arthritis of the hip after minor trauma should also be considered. Whilst the history of these patients often reveals long-standing mechanical pain of the affected hip, clinical examination may be inconclusive. Plain radiographs can reveal definitive features of hip arthritis such as joint space narrowing, osteophyte formation, subchondral sclerosis and cyst formation. In contrast, plain radiographs have a limited role in the diagnosis of occult acetabular fractures.[14] Antero-posterior pelvis X-rays may not reveal any findings but can be helpful in ruling out other injuries that may account for the pain. Judet's views are traditionally used to detect acetabular fractures. These specialised views project oblique fracture lines perpendicularly to X-ray beams, thus allowing easier visualisation of acetabular fractures.[14] Judet's views cannot rule out occult acetabular fractures. As such, physicians should have a low threshold for advanced imaging if patients complain of persistent hip pain, even with normal plain radiographs.

CT and MRI have both been shown to be effective in detecting occult fractures but there is no clear superiority of either modality in detecting occult acetabular fractures. CT scans have been found to be more sensitive than plain radiography in detecting fractures of the acetabular roof and of the posterior lip.[15] CT scans not only allow for diagnosis of occult fractures, but have the added benefit of precise delineation of fracture patterns, which may be helpful for preoperative planning. Finally, CT scans have the advantage of a quicker examination time and thus are often more readily available than other forms of advanced imaging. MRI too has been shown to be an effective diagnostic modality in detecting occult fractures.[16] MRI has the advantage of eliminating the need for ionising radiation to the patient and possesses the ability to detect concomitant soft tissue injuries that may be contributing to pain. MRI can also detect bone oedema, which may indicate the presence of non-displaced or insufficiency fracture. There is currently limited evidence comparing the role of both modalities in the diagnosis of occult acetabular fractures. Chatha et al[4] conducted a systematic review and found that MRI was superior to CT scan in accurately diagnosing occult proximal femur fractures. Furthermore, it was noted that for patients whom had their MRI scans done within 48 hours, senior radiologists achieved up to 100% accurate results.[17] Given these findings, the authors suggest that in the clinical setting of a suspected occult fracture of the hip, physicians should obtain MRI scans early and both the proximal femur and acetabulum regions should be inspected carefully to ensure no occult fracture is missed. Other significant soft tissue injuries should also be identified. Should an occult acetabular fracture be diagnosed, the physician can then proceed to obtain a CT scan to assist in fracture delineation and preoperative planning if surgical intervention is being considered. Utilising CT scans as the initial investigation can be performed for patients who have contraindications to MRI scans or in situations where obtaining an MRI scan would result in a significant delay.

Acetabular fracture configurations vary with the mechanism of injury. Letournel et al[18] suggested that fractures involving the anterior acetabulum result from a force applied to the greater trochanter in the axis of the femoral neck. This is consistent with a higher incidence of anterior acetabulum fractures reported in elderly patients, as compared to the younger population, who are more likely to suffer impact to their greater tronchanter following a fall onto their side.[18] This fracture configuration is consistent with the history of a fall in case 3.

It is important to diagnose an occult acetabular fracture early. Low-energy acetabular fractures have a 1-year

mortality of up to 13.9%.[19] Disruption in the congruency of the joint lines can predispose patients to early osteoarthritis. Older patients are also likely to have more comorbidities resulting in a higher risk for surgery. Furthermore, open reduction and internal fixation of displaced acetabular fractures has been considered to be technically more difficult or results in poorer outcomes, especially in elderly patients or those with osteoporotic bones.[20]

The management of acetabular fractures are both patient and fracture dependent, especially in the elderly population. Due consideration to the comorbidities and pre-injury ambulatory status should be given to the elderly patient who suffers an occult acetabular fracture. Elderly patients who are ambulatory prior to presentation should be evaluated fully with advanced imaging so as to diagnose possible occult fractures. This is important as without eliminating a possible occult fracture, these patients would be subject to unnecessary weight-bearing restrictions and its associated risks of prolonged recumbence. Historically, non-operative management of acetabular fractures in the geriatric population have yielded poor results.[8] However, Butterwick et al[9] found that elderly, low-demand patients with acetabular fractures can be managed conservatively and have acceptable functional outcomes if the hip joint exhibits secondary congruence. As such, in elderly patients who are low-demand, conservative treatment of occult acetabular fractures are a viable option.

In terms of fracture configuration, Magu et al[10] performed a retrospective analysis of 69 patients with 71 displaced acetabular fractures who were treated conservatively. Using the Merle d'Aubigne and Postel score to assess functional outcome, Magu concluded that patients who sustain posterior wall, posterior column, anterior column, infratectal transverse and even both column fractures can be treated conservatively and still have good functional outcomes as long as the joint is congruent. Transtectal transverse or T-shaped fractures presenting with the "V" sign should however be managed operatively. Grubor et al[11] recommended surgical fixation in incongruent or unstable acetabular fractures with more than 5 mm displacement of the fracture fragments.

In the literature reviewed, information regarding treatment for 2 patients was not available, whilst 6 out of the 8 (75%) remaining patients were treated non-surgically and all of these patients were eventually able to return to ambulation. Due to the rarity of these injuries, no comparison between surgical and non-surgical treatment has ever been conducted. However, occult acetabular fractures are often not displaced and thus it is likely that these fractures will heal well and patients will still have good functional outcomes even without surgical treatment.

## Conclusion

Occult acetabular fractures are rare. These injuries can occur after low-energy trauma in the elderly. Physicians should maintain a high level of suspicion in patients who present with persistent hip pain despite normal radiographs, especially if there is pain on axial loading of the hip. MRI scans should be performed early if occult fractures are suspected. Adequate attention should be placed on the acetabulum when reviewing imaging for occult fractures. There is a role for conservative treatment in low-demand elderly patients whose acetabular fractures display congruence of the joint and less than 5 mm displacement of the fracture fragments.

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Marcus J Lee, [1] *MBBS, MRCS (Edin)*,
Sean WL Ho, [1] *MBBS, MRCS (Edin), MMed (Ortho)*,
Ernest BK Kwek, [1] *MBBS, FRCSed (Ortho), FAMS*

[1]Department of Orthopaedic Surgery, Tan Tock Seng Hospital, Singapore

Address for Correspondence: Dr Marcus Josef Lee, Department of Orthopaedic Surgery, Tan Tock Seng Hospital, 11 Jalan Tan Tock Seng, Singapore 308433.
Email: Marcusjosef.lee@mohh.com.sg