



## Case report

## Bilateral pelvic crescent fracture combined with left acetabular fracture: A case report

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## ABSTRACT

**Introduction:** Crescent fracture-dislocations are subtype of lateral compression fractures of the pelvic ring, which usually occur following high-velocity impacts. Bilateral crescent fractures are rare entities, with a limited number of cases reported in the literature. Of those reported, none were combined with an acetabulum fracture.

**Presentation of case:** The case involves a 49-year-old male, who presented to the trauma unit after a motor vehicle collision and sustained a bilateral crescent pelvic fracture combined with a left acetabulum fracture. The patient was resuscitated and managed initially according to the advanced trauma life support (ATLS) protocol then staged fixation of his pelvic and acetabulum fractures was carried out.

**Conclusion:** Bilateral crescent fractures of the pelvis combined with acetabulum fractures constitute a rare injury. Given their rarity, a standard of care is lacking and has not been described yet. Staged surgical stabilization of such combined injuries is recommended, and may contribute to a better outcome.

## 1. Introduction and importance

Lateral compression (LC) fractures compromise more than 50 % of all pelvic injuries and most commonly occurs secondary to direct high-energy impact on the side of the body [1–4]. Crescent fracture-dislocations are a subtype of LC fractures, and are characterized by variable disruption of the sacroiliac joint (SIJ) with a proximal extension of the fracture to the posterior iliac wing, while the crescent fragment remains attached to the posterior ligamentous complex [1,5].

This type of pelvic ring injury usually occurs secondary to high-velocity trauma following a direct lateral compression force. It has also been reported to occur in elderly patients with osteoporosis following low-velocity trauma [1,5–7]. While these injuries are rotationally unstable, the vertical displacement is limited by the sacrotuberous and sacrospinous ligaments, as they remain intact in lateral compression fracture types [1,5]. Surgical stabilization is the preferred method of treatment for crescent fractures, using sacroiliac screws and plates, which helps in reducing the risk of: malunion, post-traumatic SIJ arthritis, chronic SIJ pain while walking or standing, and post-traumatic lumbar spine pain [5,8–11].

Bilateral crescent fractures of the pelvis are quite rare, with only three cases reported in the literature to date [6,7,12]. In this case report,

a patient who sustained a rare bilateral crescent fracture combined with a left acetabulum fracture is presented. The standard treatment for this kind of fracture configuration has not been described to date; therefore, details on preoperative planning and surgical technique in treating this injury were shared. The case is reported in line with the updated consensus-based surgical case report (SCARE) guidelines [13].

## 2. Case presentation

A 49-years old male truck driver, with no previous medical conditions, was transported to the trauma center's emergency department by ambulance services after sustaining a motor vehicle collision (MVC). Initial clinical examination revealed that he was conscious and oriented to time and place, vitally stable, and was complaining of chest pain and bilateral hip pain. Local examination of both hips showed normal overlying skin without any deformity. Examination of distal neurovascular status was remarkable for grade 3 motor power of the left ankle plantarflexion and great toe dorsiflexion. Plain radiographs of the pelvis revealed a pubic symphysis diastasis with a left acetabular fracture (Fig. 1). The patient was taken for a full body computed tomography (CT) scan, in accordance with the advanced trauma life support (ATLS) protocol. Pan CT scans revealed left lung contusions with multiple rib

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fractures, and a mild compression fracture of the T12 vertebral body, which was treated conservatively. Additionally, the patient had bilateral crescent fractures of the pelvis combined with a left acetabulum transverse posterior wall fracture, as seen on the CT scan (Fig. 2).

The patient was kept in the trauma intensive care unit (TICU) for observation. One week following admission, he was taken to the operating theater and underwent open reduction and internal fixation of the pubic symphysis using reconstruction plating through the Pfannenstiel approach, followed by bilateral percutaneous sacroiliac cannulated screw fixation. Ten days following the accident, open reduction and internal fixation of the left acetabulum was performed. The procedure was carried out through the Kocher-Langenbeck approach. The fracture was exposed revealing multiple small fragments inside the joint, which was irrigated and cleaned followed by complete removal of all fragments. The marginal fracture impaction was reduced and molded over the femoral head, and the space resulting from the elevated marginal fracture was filled with bone graft created using the fractured fragments. Internal fixation was achieved using two reconstruction plates to fix the posterior column and wall. Furthermore, a one-third tubular plate with a hooked end was added as an adjunct fixation for the posterior wall marginal fragmentation. The left acetabulum anterior column was stabilized by a single percutaneous antegrade partially threaded cannulated screw (Fig. 3).

The patient's postoperative course was uneventful, and he was started on wheelchair mobilization in the initial period. Two weeks after his last procedure, he was discharged home in a stable condition and given regular follow-up at the outpatient fracture clinic. During the course of his follow-up, wheelchair mobilization was continued for a total period of 6 weeks, during which he received anti deep-vein thrombosis (DVT) prophylaxis and physiotherapy. Physiotherapy sessions consisted of pelvic lifts, passive hip, knee, and ankle range of motion, followed by a gradual return to weight-bearing and functional activities. Twelve months after his surgery, he was able to ambulate independently, and he could perform all daily activities without any discomfort. Neurological examination of the left lower limb showed grade 4 motor power for ankle plantarflexion and great toe dorsiflexion with good functional

mobility of both hips, knees, and ankle joints. Radiological assessment showed complete healing of the pelvic and acetabulum fracture (Fig. 4).

### 3. Discussion

Lateral compression type II pelvic injuries usually occur following a direct force over the anterior part of the iliac bone. This force tends to rotate the hemipelvis inward, pivoting on the anterior SI joint, resulting in a posterior crescent fracture. Additionally, due to the strong attachment between the ilium and the sacrum by the sacroiliac ligaments, no vertical pelvic displacement typically occurs in such injury [14].

Day et al. divided sacroiliac joint crescent fractures, based on the location of the iliac fracture line, into three main types: type I fractures involving less than one-third of the sacroiliac joint; type II fractures involving one-third of the SI joint, as is the case with the presented patient; type III fractures involving more than one-third of the SI joint. Based on this classification, he proposed open reduction and internal fixation through a posterior approach for type II fractures [15]. However, open surgical techniques are associated with higher blood loss, risks of nerve injury, and greater infection rates. Closed reduction and percutaneous screw fixation of the SI joint for these types of fractures have also been described. Giannoudis et al. and Khaled et al. also used sacroiliac screw fixation in Day type II fractures and reported good clinical outcomes, highlighting the need for an intact screw entry point, and sufficient space of the iliac table for placement of the guide wires without a risk of breaking the entry point [8,9]. In this case, the patient had Day type II crescent fractures bilaterally, and they were managed successfully with bilateral closed reduction and percutaneous screw fixation.

A literature search on the topic revealed that three previous authors have reported bilateral crescent fractures, but none were combined with acetabulum fractures [6,7,12]. Bachhal et al. reported a case of bilateral SI joint crescent fracture-dislocations secondary to a high-velocity injury, and it was managed by percutaneous sacroiliac screws and fixation with a reconstruction plate [6]. While, O'Neil et al. reported a similar case but it was secondary to a low-velocity injury in an

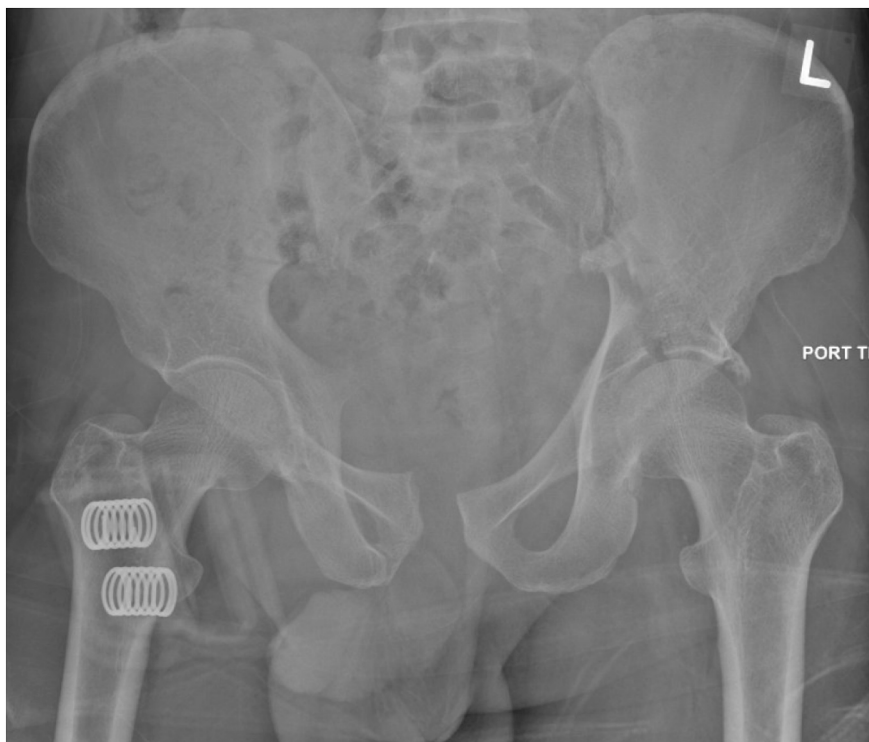
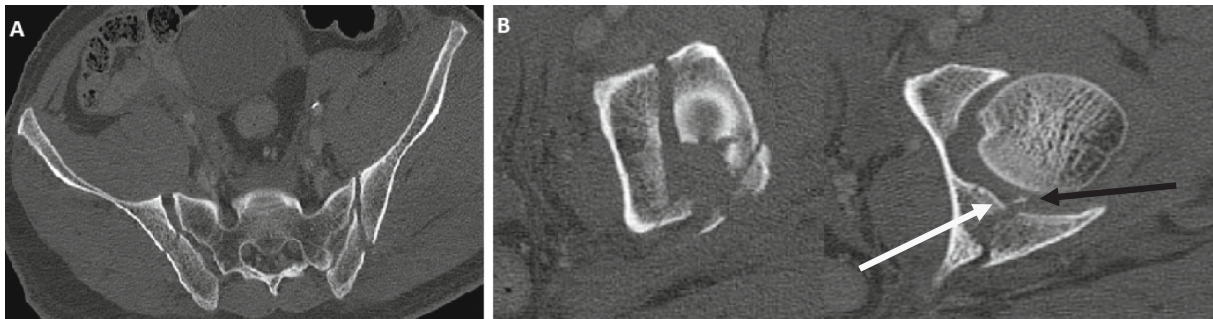
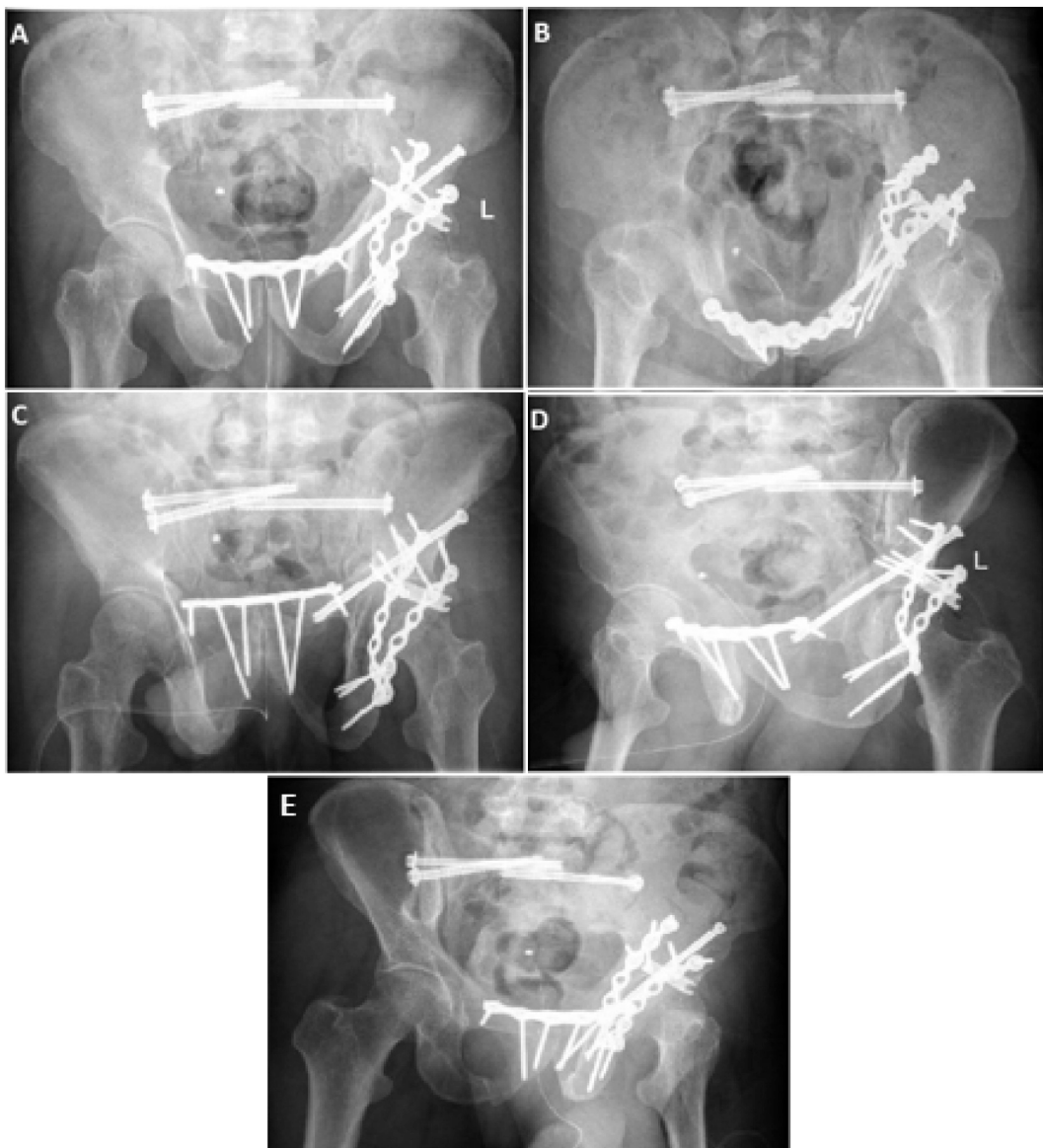


Fig. 1. Initial Antero-Posterior (AP) pelvic radiograph showing pelvic ring injury along with left acetabular fracture.



**Fig. 2.** Preoperative CT axial cuts showing (A) bilateral crescent fracture combined with (B) left acetabulum transverse posterior wall comminuted fracture with mild marginal impaction (white arrow) and intra-articular fragment (black arrow).



**Fig. 3.** Immediate postoperative pelvic radiology series including (A) AP, (B) inlet, (C) outlet, (D) obturator and (E) iliac views, showing percutaneous fixation of both SI joint, plating of the symphysis pubis, open reduction and internal fixation of left acetabulum posterior wall/column and percutaneous fixation of the left acetabulum anterior column.

osteoporotic patient. Similarly, this was managed by the same approach, utilizing a reconstruction plate and percutaneous screws for fixation [7]. Additionally, Trikha et al. published a case series containing a single

case of bilateral crescent fractures, which was treated in the same manner. He concluded that early fracture reduction was necessary to achieve good functional outcomes [12].



Fig. 4. AP x-ray of the pelvis at 12 months follow up showing good healing of the fractures with stable fixation.

Combined pelvic ring disruptions and acetabulum fractures are uncommon injuries and account for 5–16 % of all pelvic and acetabulum injuries [2,16–20]. These injuries represent a unique subset within acetabulum and pelvic ring fractures, which require special attention and careful management. In a recent systematic review, Veerappa et al. recommended that pelvic injuries should be addressed before management of the acetabulum fracture, as this will help in the reduction of the acetabulum [21]. However, standardized guidelines have not yet been described for the management of such combined fractures.

#### 4. Conclusion

Bilateral crescent pelvic fractures combined with acetabulum fractures are rare entities. Given their rarity, a standard of care is lacking and has not been described yet. Initial management of such injuries should focus on hemodynamic stabilization of the patient by using a pelvic binder, considering blood transfusion, and identifying any visceral injuries or open fractures. Staged surgical stabilization of this combined injury reasonable in most situations. Pelvic ring stabilization should be addressed before open reduction and internal fixation of the acetabulum, as this could allow for a better anatomical reduction of the acetabulum fracture, which would potentially lead to better clinical outcomes.

#### Consent

Written informed consent was obtained from the patient for the publication of this case report and accompanying images. A copy of the written informed consent is available for review by the editor of this journal upon request.

#### Registration of research studies

No prior registration.

#### Ethical approval

Approved by the Medical Research Center at Hamad Medical Corporation.

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#### Guarantor

Aiman Mudawi.

#### CRediT authorship contribution statement

Aiman Mudawi: Investigation, Writing - original draft - review & editing. Isam Sami Moghamis: Investigation, Writing. Mutaz Awad: Investigation, Writing. Elhadi Babikir: Investigation, Project administration, Salahuddeen Abdelsalam: Investigation, Project administration, Writing - review & editing. Maamoun Abou Samhadaneh: Investigation, Supervision, Project administration, Writing - original draft, Writing - review & editing.

#### Declaration of competing interest

The authors have no competing interest to declare.

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