

Anterior fracture dislocation of sacroiliac joint: A rare type of crescent fracture

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ABSTRACT

Crescent fractures of the pelvis are usually described as posterior sacro iliac fracture dislocations. Rarely anterior displacement of the fractured iliac fragment along with dislocation has been reported in crescent fractures. Four cases of anterior fracture dislocation of the sacro iliac joint managed in the last two years by a single surgeon are presented. The injury mechanism, radiological diagnosis, management protocol along with functional outcomes of all the four patients have been discussed. CT scan is essential in the diagnosis and preoperative planning of this injury pattern. Early fixation along with proper reduction leads to excellent functional outcome in this subset of lateral compression injuries of the pelvis.

Key words: Anterior sacroiliac dislocation, crescent fractures, pelvis fractures

MeSH terms: Pelvis, sacroiliac joint, fractures, dislocations, fracture fixation

INTRODUCTION

Lateral compression injuries of pelvis include a defined subset of fractures named crescent fractures.¹ Their mechanism of injury is described as medially directed forces to the pelvic ring, leading to a fracture of the iliac wing with a stable posterior (crescent) component.² It usually leads to posterior fracture dislocation of the sacroiliac joint (SIJ), which has become synonymous with the term - crescent fractures.¹ The contrarian anterior SIJ fracture dislocation has not been well reported in the literature due to its rarity. Only four such cases³⁻⁵ with two of them being pure SIJ dislocations with no fracture have been reported until date in adults.

We describe four cases of anterior fracture-dislocation of the SIJ managed in the last 2 years by the senior surgeon. The radiological features of such injuries, mechanism of injury along with their proper management and prognosis are

discussed in this report. These anterior dislocations should be recognized early by the treating surgeon owing to their increasing incidence especially in the developing world.

CASE REPORTS

Case 1

A 26 year old male patient was changing his car tyre on the roadside when he was hit by another car from the side. On arrival to the emergency department (ED), he was hemodynamically stable with heart rate of 100/minute, BP 100/70 mm of Hg and respiratory rate of 18/minute. He was managed as per Advanced Trauma Life Support (ATLS) protocol. The patient was oriented with negative focused assessment with sonography for trauma (FAST) and inability to lift left leg with pain in the pelvic region. On examination, pelvic compression test was positive. He was having foot drop on the left side. After initial clinical assessment plain anteroposterior radiograph of the pelvis suggested a pelvic fracture. Subsequent computed tomography (CT) scans and radiographs revealed a fracture of the left posterior ilium with anterior dislocation of the SIJ [Figure 1]. There was associated symphyseal disruption with marked widening and high oblique fracture of the left superior ramus.

The patient was operated for his pelvic injuries on the 5th day following trauma. Pfannenstiel incision and lateral window of the ilioinguinal approach were used to access the fractures. The fractured ilium was found to be lying anterior to the sacrum. A Schanz pin was placed onto the iliac crest to get a proper hold of the iliac blade, which was then levered anteriorly, laterally to its anatomical position. Proper care was taken to avoid further damage to the intact yet contused L5

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nerve root while reducing the anteriorly placed fractured iliac blade. The fractured fragment was reduced anatomically and fixed with a reconstruction plate (4 hole) across the SIJ in the standard fashion. The symphysis was also stabilized with a 3.5 mm plate and screws [Figure 2]. The total operative time was 2 hrs with a blood loss of 300 ml. Patient was allowed full weight bearing after 8 weeks. At the end of 18 months, patient was back to his pretrauma activities. The functional outcome of the patient was good with recovery of the peroneal nerve function at the last followup at 2 years.

Case 2

A healthy 28 year old man who was hit by a heavy vehicle while getting down from a moving bus. Patient was hemodynamically stable on arrival in the ED. He was unable to lift both the lower limbs due to severe pain. There was a 5 × 3 cm wound in the left inguinal region. On further radiographic and CT evaluation, there was evidence of a fracture of the left posterior ilium with anterior fracture dislocation of the SIJ with fractured anterior fragment lying in front of sacrum [Figure 3]. Ipsilateral superior and inferior rami fracture were also present. On the right side, there was a typical posterior crescent fracture dislocation with ipsilateral superior and inferior rami fracture.

On the 3rd day, after complete stabilization and work-up, the patient was operated upon for his pelvic injuries. A staged procedure was performed. First, in supine position, the reduction and fixation of the left anterior fracture dislocation of SIJ was performed through the lateral window of the ilioinguinal approach. Application of anterior iliac crest Schantz pin assisted in achieving reduction of the iliac blade. The hip was abducted with the knee extended to aid in reduction by countering the unopposed muscle actions of the abductors of the hip. Total blood loss was 250 ml. After 3 days the patient was operated for the right sided posterior SIJ fracture dislocation in a prone position. Fracture was reduced closed and two lateral compression (LC) II screws from posterior superior iliac spine were placed percutaneously across the crescent fracture under image guidance. The patient recovered well and had excellent functional results at the end of 18 months followup [Figure 4].

Case 3

A 36 year old male patient who fell from second floor of his house and presented in the ED with complaints of severe pain in the back and the pelvis. The pelvic compression test was positive. Radiographic and CT scan evaluations [Figure 5] revealed fracture of the right posterior ilium with a small fragment attached posteriorly to sacrum with anterior dislocation of the remaining ilium in front of sacrum. On the left side, there was a crescent fracture with mild posterior dislocation of the iliac blade.



Figure 1: Axial computed tomography scan view showing the anteriorly placed left ilium over the sacrum



Figure 2: Postoperative radiograph of the same patient (Case 1) showing the anatomical reduction and fixation with plate and screws



Figure 3: Three-dimensional computed tomography scan view of pelvis showing the fractures of the both sacroiliac joints in the 28-year-old male (Case 2)

Associated fractures of superior and inferior pubic rami on the left side and of inferior pubic rami on the right

side were also noted. There was no distal neurovascular deficit in both the lower limbs.

Operative intervention was performed on the 4th day following trauma. Both the fractured SIJ were operated upon in the same sitting with standard anterior SIJ plating [Figure 6]. The reduction of the anteriorly placed fractured iliac wing was facilitated by the insertion of the Schantz pin in the supracetabular region to have a proper control of the iliac blade.

Total duration of surgery was 2.5 hrs with a blood loss of <500 ml. The fractures healed completely and the patient was performing all his activities at the last followup at end of 14 months.

Case 4

A 29 year old male patient who fell from the third floor of

an under construction building and was brought to the ED in a haemodynamically unstable position with heart rate of 120/minute, BP 90/60 mm of Hg and respiratory rate of 22/minute. On further assessment it was found that he was having splenic laceration, left renal injury, left ureteric transection distal to pelviureteric junction and an anterior fracture dislocation of the left SIJ along with iliac blade fracture on the right side and dislocation of the left elbow joint [Figure 7]. He had a 7 cm lacerated wound over the left flank. He was urgently managed for his splenic, renal and ureteric injuries. After 7 days, he was operated for his pelvic ring injuries.

Similar maneuver of reduction as described for other cases was performed and the fracture stabilized with two reconstruction plates across the SIJ. The fractured ilium was also fixed with a reconstruction plate (4 hole) and two 3.5 mm cortical screws. Iliac blade fracture on the right side was managed percutaneously with three lag



Figure 4: Postoperative inlet view radiograph of the Case 2 showing the reduction of the dislocation



Figure 6: The postoperative anteroposterior radiograph showing anatomical reduction of both sacroiliac joints (Case 3)



Figure 5: Three-dimensional computed tomography scan view showing the unique fracture pattern of anterior right sacroiliac fracture dislocation and left posterior sacroiliac joint fracture dislocation in a 36-year-old man (Case 3)



Figure 7: Axial computed tomography scan view confirms the diagnosis of left anterior fracture dislocation of the sacroiliac joint along with the fracture of ipsilateral iliac wing and also the fracture of right iliac wing

screws [Figure 8]. At 12 months followup, the patient was walking unaided and had no residual pain or instability [Table 1].

Rehabilitation

After internal fixation and stabilization of pelvic ring patients were allowed to sit up from 3rd postoperative day. Regular followup at 3 weekly interval was done with assessment of AP, inlet and outlet views of pelvis. Touch down weight bearing was allowed once fractures showed early signs of healing progressing to full weight bearing initially with support and later on without any support, once solid union was evident.

DISCUSSION

The anterior SIJ dislocation with crescent fractures has not been commonly described in the world literature. To the best of our knowledge, only four such cases have been reported in English literature in adults with two of them being pure dislocations with no fracture.^{3,4} Few such cases have also been reported in the pediatric age group.⁶ The initial report by Lewis and Arnold in 1976 was of a 38 year old man who sustained an anterior sacroiliac

dislocation, ipsilateral transverse acetabular fracture, L4 and L5 transverse process avulsions and contralateral rami fractures with symphyseal diastasis following a motor vehicle collision. His posterior injuries were fixed with wires and screws after open reduction through a posterior approach. Postoperatively, the results were not so good with 2 cm residual cephalad subluxation of the SIJ and a postoperative course complicated by lumbosacral root or plexus injury. No other case was reported in adults for the next 35 years when in 2010, Feinblatt *et al.* described two such cases in young adults with one having pure anterior sacroiliac dislocation and the other having anterior sacroiliac fracture dislocation.⁴ They encountered intraoperative difficulty in reduction with the average operative period of 6 hrs. They also had postoperative complications of wound dehiscence and repeated wound debridement in one case. Another such case of pure anterior dislocation was reported by Bouguennec *et al.*, managed nonoperatively due to initial hemodynamic instability compounded by a deteriorating central nervous system condition.³ Compared to the previously reported cases, our patients had their fracture - dislocations easily reduced and managed adequately in a short operative period with less blood loss and no postoperative complications.

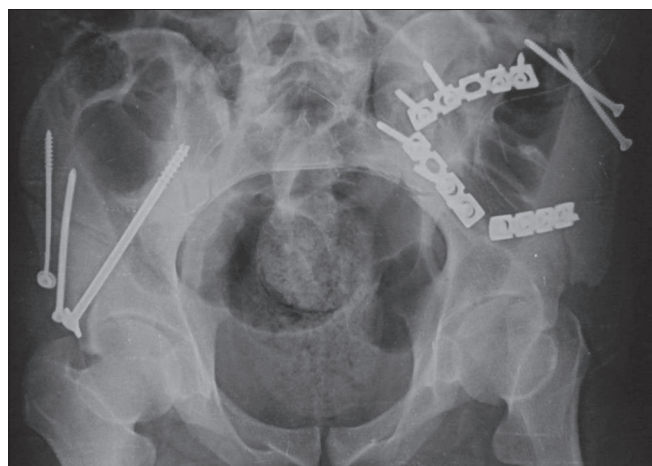


Figure 8: Postoperative radiographs depicting the reduction of the left anterior sacroiliac joint fracture dislocation with two plates in the Case 4 along with the percutaneous screw on (R) side

The injuries sustained by our patients' were the result of high energy trauma either involving severe motor vehicle collision or fall from height. Although, the mechanism to produce this variety of injury has not been clearly defined, we propose that the high intensity of LC force is required for the ilium to break followed by a large external rotational moment of the anterior fragment of fractured hemipelvis or the involved lower limb causing the iliac blade to migrate medially into the pelvis. This causes the iliac wing to lie anterior to the sacrum and hinge at the lateral border of the ala. The sustained lateral force of injury further leads to fractures of the pubic rami (Case 2-4) or a symphyseal diastasis (Case 1).

The anterior SIJ fracture dislocation can have spectrum of fractured fragments depending upon the direction of the lateral force. It may range from a complete anterior SIJ

Table 1: Demographic details

Case no	Haemodynamic stability	Ipsilateral injury	Contralateral injury	Associated injuries	Interval between trauma and surgery (days)	Duration of surgery (Hours)	Blood loss (ml)
1	Stable	Ant.SIJ dislocation, symphysis disruption, superior rami	None	None	5	2	300
2	Stable	Ant.SIJ dislocation, superior and inferior rami	Posterior SIJ dislocation	None	Staged 3,6	2; 1	250; 50
3	Stable	Ant.SIJ dislocation, inferior rami	Posterior SIJ dislocation, superior and inferior rami	None	4	2.5	<500
4	Unstable	Ant.SIJ dislocation	Iliac wing	Spleen, left renal and ureteric injury	7	2.5	250

SIJ=Sacroiliac joint, Ant.=Anterior

dislocation to varying sizes of the fractured iliac fragment which lies anterior to the sacrum as seen in our four cases. The anterior dislocation of the SIJ also appears to be more severe than the posterior dislocation on the basis of the radiographs and the injury mechanism. There is high possibility of crushing the L5 nerve root due to this mechanism and hence, relocation should not be attempted by traction as the nerve root may be further crushed between the fractured iliac fragment and the sacral ala.

Based on the inward directed mechanism of injury, it seems that these fracture dislocations may not be usually associated with severe life-threatening hemodynamic instability. Hence, the urgent application of a pelvic external fixator device may not be required. Three of our cases were hemodynamically stable on arrival and were applied pelvic binders as per the standard protocol for pelvic fractures at our institute. However, urogenital and vascular injuries can complicate any fracture-dislocation of the pelvic ring and should not be overlooked. One of our cases remained hemodynamic unstable and had associated intraabdominal injuries, which required immediate intervention.

Radiographic evaluation of these injuries suggests that the exact injury pattern may not be obvious on routine adult pelvis radiograph due to the overlapping of the ilium and the sacrum. This may lead to a false sense of relative pelvis stability. As in all cases of pelvic injuries, proper series of radiographs and CT scan help in the identification of these injuries. Inlet views or the CT scan (axial cuts in particular) at the level of the sacrum are essential in identifying this subset of injury. Operative intervention is recommended for the anatomical reduction and stable fixation of an anterior SIJ fracture-dislocation. Early operative intervention helps in achieving anatomical reduction and can be performed with minimal blood loss in a short operative period. Use of Schantz pin to safely lever the fragment back to its place is helpful in avoiding damage to the neurovascular structures especially the L5 nerve root, which is already at a precarious position in relation to the displaced anterior iliac fragment. Restoration of the normal anatomy reduces the incidence of malunion, posttraumatic SIJ arthritis and painful stance phase gait cycle instability thus providing

excellent functional results.

The important technical points to be considered while managing this type of injury include proper initial resuscitation along with high degree of suspicion. If a posterior injury of the pelvis is suspected, further evaluation in the form of pelvic inlet and outlet view along with a CT scan is essential. Pelvic inlet view radiograph and CT scan helps in identifying the anterior dislocation of the iliac blade over the sacrum. Recognition of the plane of displacement is imperative to plan the surgical approach as these rare injuries can only be reduced from anterior approach to SIJ. A Schantz pin placed in iliac crest or near anterior inferior iliac spine helps in mobilizing the iliac fragment. Adequate care is needed while reducing the iliac fragment to prevent injury to L5 nerve root. Early reduction of the iliac fragment helps in achieving anatomical reduction and good functional outcome in such patients.

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