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CASE REPORT

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Atypical anterior wall fracture extending to anterior inferior iliac spine with preservation of pelvic brim: A case report and literature review

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Key Clinical Message

Anterior acetabular wall fractures that extend into the anterior inferior iliac spine are more likely to be unstable, and more likely to require surgical fixation.

Abstract

Conventional acetabular anterior wall fractures originate below the anterior inferior iliac spine (AIIS) level and involve the pelvic brim. Since surgical treatment is preserved for instability and hip incongruency, atypical variation of this fracture usually jeopardizes hip stability. We report on a 33-year-old case of an acetabular anterior wall fracture extending to the anterior inferior iliac spine. He was prepared for the stress test and hip stability checked, that was unstable in extension and external rotation. The joint was exposed with the Smith–Peterson approach. Hip congruency was restored, and the AIIS fragment was stabilized by open reduction. Acetabular anterior wall fracture involving AIIS with preservation of pelvic brim is a rare equivalent of anterior wall fracture that jeopardizes hip stability and should be managed surgically. Anterior approaches are preferred in order to visualize the joint.

KEYWORDS

acetabulum, bone fractures, case study, hip dislocation

1 | INTRODUCTION

Nowadays, acetabular fractures are classified based on the Judet and Letournel classification.[1,2] According to this classification, the anterior (ant.) wall fracture line begins below the anterior inferior iliac spine (AIIS), involving the articular surface of the pelvic brim and proceeds toward the quadrilateral surface and ischiopubic notch; meanwhile, the second fracture line crosses through superior ramus and separates the anterior wall fragment.[3] This is the typical and classic form of the anterior wall fracture. Atypical anterior wall fracture with preservation of pelvic brim and obturator foramen also has been described in the literature.[4]

Indications for surgical interventions for acetabular fractures are hip instability, hip incongruency, and fracture displacement of more than 5 mm.[5] Anterior wall fractures, with high incidence in the elderly, are treated surgically in 10.2%.[6] Despite this low percentage, it is crucial to avoid mistreatment, since the key element of favorable

prognosis in acetabular fractures is correctly reconstructing the acetabular roof and weight-bearing zone.[7,8]

In this article, we report an atypical anterior wall fracture extending to AIIS with preservation of pelvic brim, which jeopardizes hip stability. We also review the literature and other reported cases and compare them for a better understanding of this rare event.

2 | CASE PRESENTATION

A 33-year-old male admitted to our emergency department due to inability to bear weight on his left lower limb; following a motor vehicle accident (MVA).

After the accident, he transferred to the hospital. Physical examination revealed left hip tenderness and painful straight leg raise. The neurovascular assessment was normal. X-ray (Figure 1) and computed tomography (CT) scan (Figures 2–4) of his left hip showed anterior wall fracture extending to AIIS. As a result, he was prepared for the stress test to evaluate hip stability. Under general anesthesia, the left hip stability was assessed. The joint was unstable in extension and external rotation. Afterward, the joint was exposed with the modified Smith–Peterson approach. The exposure revealed AIIS avulsion with extension to the anterior wall of the acetabulum (Figure 5). The AIIS and wall fragments were stabilized by open reduction and internal fixation (ORIF) with two cannulated screws (Figure 6). Low molecular weight Heparin (4000 IU daily) was employed for 4 weeks as prophylaxis against deep venous thromboembolism. No heterotopic ossification prophylaxis utilized. Joint mobilization and muscle strengthening began the day after the operation. He was allowed to walk with two crouches, but restricted to toe-touch weight bearing for 2 months. After 2 months, he could tolerate full weight bearing.

FIGURE 1 Preoperative radiography demonstrating the atypical anterior wall fracture extending to the anterior inferior iliac spine.

3 | DISCUSSION

Apophyseal fractures of the pelvic ring are rare and usually occur in adolescent athletes. AIIS avulsion, with 33.2% of incidence, is the most frequent among them, and thick periosteum and surrounding fascia usually restrict

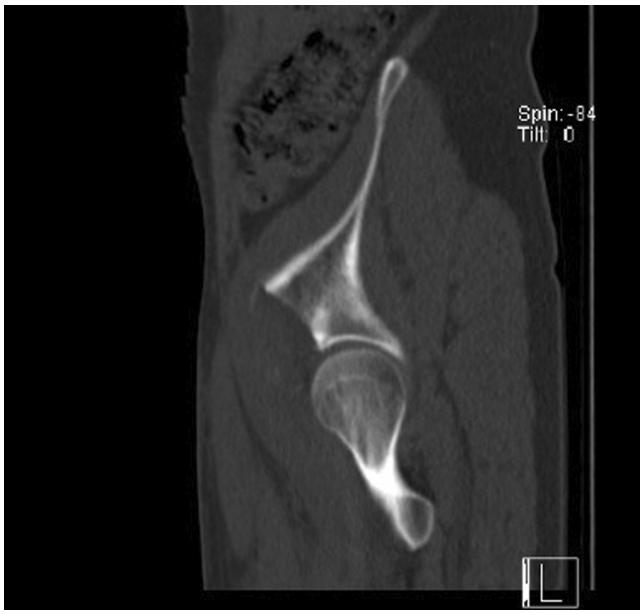

FIGURE 2 Preoperative sagittal computed tomography scan, showing acetabular involvement.

FIGURE 3 Preoperative 3D computed tomography scan shows fracture configuration.

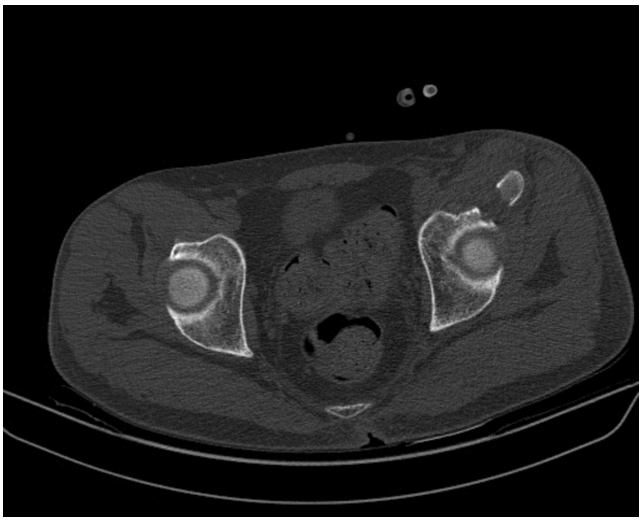

FIGURE 4 Preoperative axial computed tomography scan demonstrates anterior wall involvement.

FIGURE 6 Postoperative radiography: Joint congruency is restored.

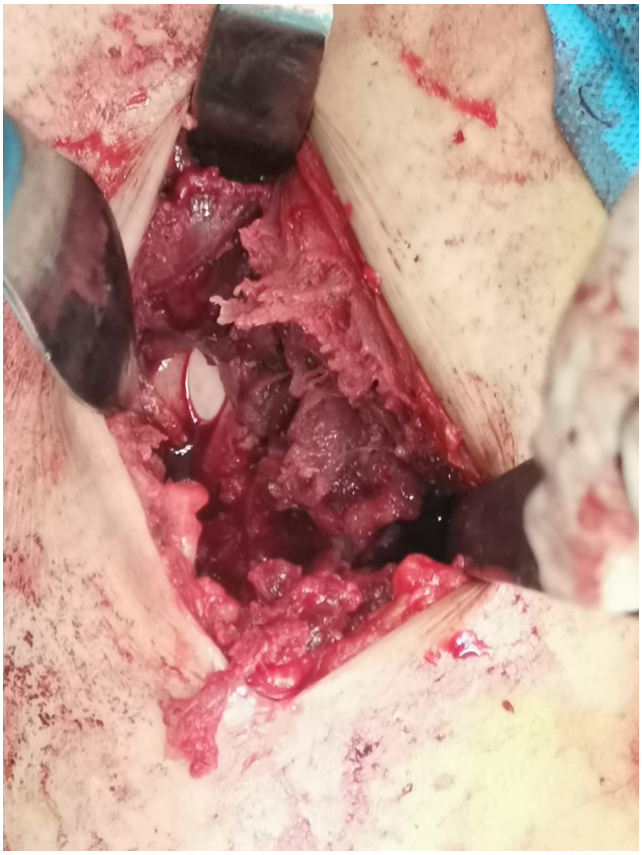

FIGURE 5 Intraoperative photography of acetabular involvement.

fracture displacement.[9] Generally, pelvic avulsions are classified as type A in the tile classification system, which is stable and managed nonoperatively.[10] Although nonoperative treatment is preferred in most cases, complications such as nonunion, heterotopic ossification, and impingement may occur in the short or long term.[11] Despite solely AIIS avulsion, AIIS fracture involving the acetabular anterior wall (also known as atypical anterior wall fracture) needs surgical treatment (ORIF) to restore hip stability; in other depict, these are acetabular anterior wall fractures with preservation of pelvic brim and are so far different from anterior wall fractures classified by Judet and Letournel.[4] To our knowledge, there are limited case reports related to atypical anterior wall fractures. We found 15 cases of anterior wall fracture extending to AIIS. The details of our findings are demonstrated in (Table 1).

Badelon et al.[12] reported an anterior hip dislocation with involvement of anterior inferior and anterior superior iliac spines (ASIS). Sherlock and Phil[13] also reported such a case that undergone surgery due to instability via the extended Smith–Peterson approach. Mirovski et al.[14] reported an anterior hip dislocation with bone fragment of anterosuperior aspect of the acetabulum with extension to AIIS. After close reduction, the hip remained unstable in extension, so they kept it in a reduced position using traction. After 6 weeks of traction, it remained unstable due to nonunion and soft tissue interposition (iliopsoas tendon). That patient underwent total hip arthroplasty (THA) due to degenerated condition of the femoral head and severe comminution of the acetabular dome. Meyer et al.[15] reported a 16-year-old boy with anterior hip dislocation and avulsion of anterior ilium from ASIS to AIIS. The patient underwent ORIF 2 days later. Uneventfully he returned to full activity 6 months later. Piriu et al.[16] reported two similar cases with instability in extension after close reduction. They preferred the ORIF of fractures via the Smith–Peterson approach. This approach allowed them to visualize the intra-articular elements. Lenarz et al.[4] reported six cases of atypical anterior wall fractures involving anterior rim of acetabulum, but did not involve pelvic brim. All

TABLE 1 A concise summary of relevant studies.

Study/year	Age/sex	Mechanism	Diagnosis	Indication	Treatment	Outcome
Badelon et al.[12]/1986	53/Male		AIIS, ASIS, and anterior wall	–		
Mirovski et al.[14]/1988	67/Female	Falling	AIIS and anterior wall	Instability and nonunion	THA	Walking with 2 sticks 10 days later
Sherlock[13]/1988	20/Male	RTA	AIIS, ASIS, and anterior wall	Instability	Extended Smith-Petersen	FWB at 7 weak and full ROM at 6 months
Meyer et al.[15]/2001	16/Male	MVA	AIIS, ASIS, and anterior wall		ORIF	Full activity after 6 months
Piriou et al.[16]/2002	56/Male	Fall from height	AIIS and anterior wall	Entrapment of a large fragment	Smith-Petersen	Pain-free and full ROM 18 month later
	61/Female	Slipping	AIIS and anterior wall	Instability	Smith-Petersen	Pain-free and full ROM 18 month later
Lenarz and Moed[4]/2007		Fall from height	AIIS and anterior wall	Instability and incongruity	Modified Smith-Petersen	Good to excellent
		Fall from height	AIIS and anterior wall	Instability and incongruity	Modified Smith-Petersen	Good to excellent
		Fall from height	AIIS and anterior wall	Instability and incongruity	Modified Smith-Petersen	Good to excellent
		MVA	AIIS and anterior wall	Instability and incongruity	Modified Smith-Petersen	Good to excellent
		MVA	AIIS and anterior wall	Instability and incongruity	Modified Smith-Petersen	Good to excellent
		Hit by train	AIIS and anterior wall	Instability and incongruity	Combined ilioinguinal and Smith-Peterson	Failed to follow
Reggiori and Brugo[17]/2008	16/Male	Motor-cross racing accident	AIIS, ASIS, and anterior wall		ORIF via ilioinguinal	Pain-free and full ROM
Wang et al.[18]/2020	48/Female	Fall from height	Ant. wall, AIIS, and iliac wing	Instability and incongruity	ORIF via modified para rectus	Satisfactory at 9 months

Abbreviations: AIIS, anterior inferior iliac spine; ASIS, anterior superior iliac spine; FWB, full weight bearing; MVA, motor vehicle accident; ORIF, open reduction and internal fixation; ROM, range of motion; RTA, road traffic accident; THA, total hip arthroplasty.

patients underwent emergent close reduction and treated with ORIF via the modified Smith–Peterson anterior approach, performed 2–21 days after trauma. One of them that underwent delayed surgery was treated with a combined approach using Smith–Peterson and ilioinguinal approach. The outcome was good to excellent. There were no complications, such as wound infections, iatrogenic nerve injuries, or thromboembolic episodes. Reggiori et al.[17] reported a motorcyclist with anterior hip dislocation and ASIS and AIIS avulsions. The patient underwent surgery through an ilioinguinal approach, and the AIIS fragment fixed with two cannulated screws. Wang et al.[18] reported an atypical anterior wall fracture presenting with anterior hip dislocation with AIIS avulsion and extension to the iliac wing. After close reduction, they fixed it via the modified para-rectus approach. Nine months later, there was good bone union without any complications.

As well as former studies, in our opinion, there are many noticeable key points:

1. As mentioned, in all cases, there is an atypical anterior wall fragment extending to AIIS with preservation of pelvic brim and obturator foramen, different from that typical anterior wall fracture described by Letournel. So, it is presumed that this rare type of anterior equivalent of the posterior wall fracture should be noted as a subtype to the anterior wall fractures.
2. Whether under high or low-energy trauma, elderly or young, this fracture may happen.
3. This type of fracture, which typically jeopardizes hip stability, is a clear indication for operative treatment via ORIF to restore hip stability and congruency. Although in previous studies, the involved hip was dislocated, we report a case with a subluxation in extension and external rotation. So, checking the stability of the involved hip should be noted.
4. For surgical approach, many options are available; nevertheless, anterior approach seems to be preferred in order to visualize the joint. With modified Smith–Peterson, ORIF via cannulated screw is possible; however, in the extended version, plates can be implied. The ilioinguinal approach is preferred in terms of delayed surgery.
5. The short-term outcome was perfect in all cases, and complications are scarce; however, longer follow-up is needed to consider complications.

4 | CONCLUSION

In conclusion, acetabular anterior wall fracture involving AIIS with preservation of pelvic brim is a rare equivalent of anterior wall fracture, that jeopardizes hip stability and should be managed surgically. There is no specific approach, but the point is to restore stability and congruency of the hip. The short-term outcome seems to be good.

AUTHOR CONTRIBUTIONS

Reza Zandi: Conceptualization. **Shahin Talebi:** Data curation. **Akbar Ehsani:** Writing – original draft; writing – review and editing. **Narges Bazgir:** Writing – original draft.

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CONFLICT OF INTEREST STATEMENT

The authors have no competing interests to declare that are relevant to the content of this article.

DATA AVAILABILITY STATEMENT

The datasets analyzed during the current study are available from the corresponding author on reasonable request.

ETHICS STATEMENT

Consent to participate was obtained from patient following ethical approval granted from Shahid Beheshti University of medical science ethics committee.

CONSENT

Written informed consent was obtained from the patient for publication of his anonymized information in this article. The authors declare that there is no information (names, initials, hospital identification numbers, or photographs) in the submitted manuscript that can be used to identify patient.

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