Anterior stabilization of sacroiliac disruption through transiliac osteotomy

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Received 15 March 2016
Accepted 20 December 2016

The Egyptian Orthopaedic Journal
2017, 52:129–133

Background
Sacroiliac joint diastases from high-energy trauma are always complicated by pain and disability. Open reduction and anterior stabilization with a plate are biomechanically advanced because of direct reduction and stabilization. We report our experience of managing 15 patients with sacroiliac disruption by anterior double plates. The purpose of this study was to evaluate the effectiveness of anterior pelvic plating for these complicated fractures.
Patients and methods
This study included 15 patients who sustained sacroiliac disruption from January 2008 to March 2012 at Menoufia University Hospital. All patients were treated by anterior double plates through an anterolateral approach with transiliac osteotomy. All patients were males.
Results
The average age was 34 years with a range of 20–49 years. The mean follow-up period was 20 months with a range of 12–36 months. The average healing period was 16 weeks. The clinical results according to the Coles pelvic score revealed 12 cases of satisfactory (five of excellent and seven of good) and three cases of unsatisfactory results (two fair and one poor).
Conclusion
Posterior injuries, especially sacroiliac disruptions, affect the long-term outcome significantly; therefore, an anterior approach would allow adequate exploration and the reduction can be confirmed. Double plates allow rigid fixation. Bone-to-bone healing of osteotomy revealed decreased risk of wound complications.

Keywords:
pelvis, sacroiliac joint disruption, transiliac osteotomy

Egypt Orthop J 52:129–133

1110-1148

Introduction

Unstable pelvic ring injuries are uncommon as they are mainly caused by high-energy injuries. They result in extensive disruption of the pelvis and high rates of early mortality due to severe blood loss and late morbidity if anatomical reduction is not gained [1–4].

Conservative treatment of these injuries has led to high incidence of early and late complications such as leg-length discrepancy, rotational malunion, prolonged bed rest, chronic pain, and abnormal gait [5].

The use of an external fixator is helpful in the acute stage to stop bleeding but should not be used as definitive management. Early rigid fixation and anatomical reduction of the pelvic ring are recommended to reduce mortality and allow early ambulation [6].

Displaced unstable pelvic ring injuries are commonly associated with disruption of the sacroiliac (SI) joint, and stable fixation of the SI joint is technically demanding. Unstable pelvic injuries require anatomical reduction, anteriorly and posteriorly, whereas the stability of the posterior pelvic ring is more important and represents the corner stone to restore stability of the pelvic ring [7].

Anterior fixation can be stabilized either by plating or by using an external fixator, which is the method of choice; however, the surgical options for fixing posterior lesions are still controversial.

Patients and methods

Between January 2008 and March 2012, in Menoufia University Hospital, 15 patients with SI joint disruption were surgically treated with double plates. All patients were males. The mean age was 34 years with a range of 20–49 years. All patients had type C injuries (AO classification). Causes of injury were road traffic accidents in 11 patients and falling from height in four.

There were two patients with diastases of the symphysis pubis, which were fixed by a single plate. One patient had a posterior column acetabulum fracture and had it fixed with reconstruction plate in the same sitting. Four patients had pubic rami fractures, which were treated conservatively. There was a single patient with internal hemorrhage and exploration, and therefore the fixation was delayed for 10 days.

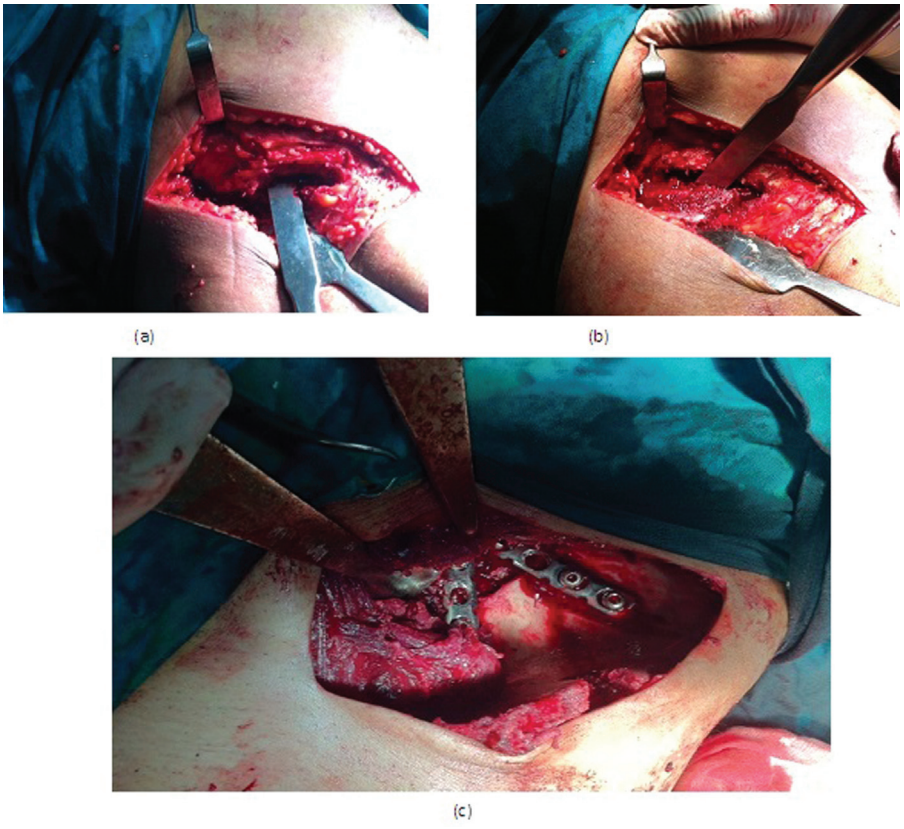
First-aid management was started in the emergency room. Anteroposterior, lateral, inlet, and outlet radiographic views were obtained, and computed tomography was performed for all patients. Surgery was performed with the patient in the supine position on a sterile radiolucent table and with slight hip and knee flexion to relax the iliopsoas muscle.

A 10–15-cm incision was made along the iliac crest from anterior–superior iliac spine. The lateral femoral cutaneous nerve was retracted medially. Two 6.5 mm cancellous screws with 32-mm threads were drilled into the iliac crest before osteotomy. An osteotomy of the iliac crest about 2 cm lateral to the anterior superior iliac spine was performed, and elevation of the iliacus till the SI joint was visualized (Fig. 1). To avoid injury to the L5 nerve, the dissection did not extend more than 10–15 mm medial to the joint with the hip and knee flexed. Reduction was performed through manipulation of the ileum and longitudinal traction under direct visualization of the SI joint and then fixation by double plates; each plate was a small DCP with three or four holes. The plates were fixed at an angle of about 70° with only one screw on the sacral site (Figs 2 and 3). Reduction of the osteotomy site was performed using a screw through the preosteotomy drill holes.

Operations were performed within a mean of 5 days following trauma (range, 3–0 days).Passive hip motion was started postoperatively on the first week. Partial weight bearing using walking aids was allowed at 1.5 months.

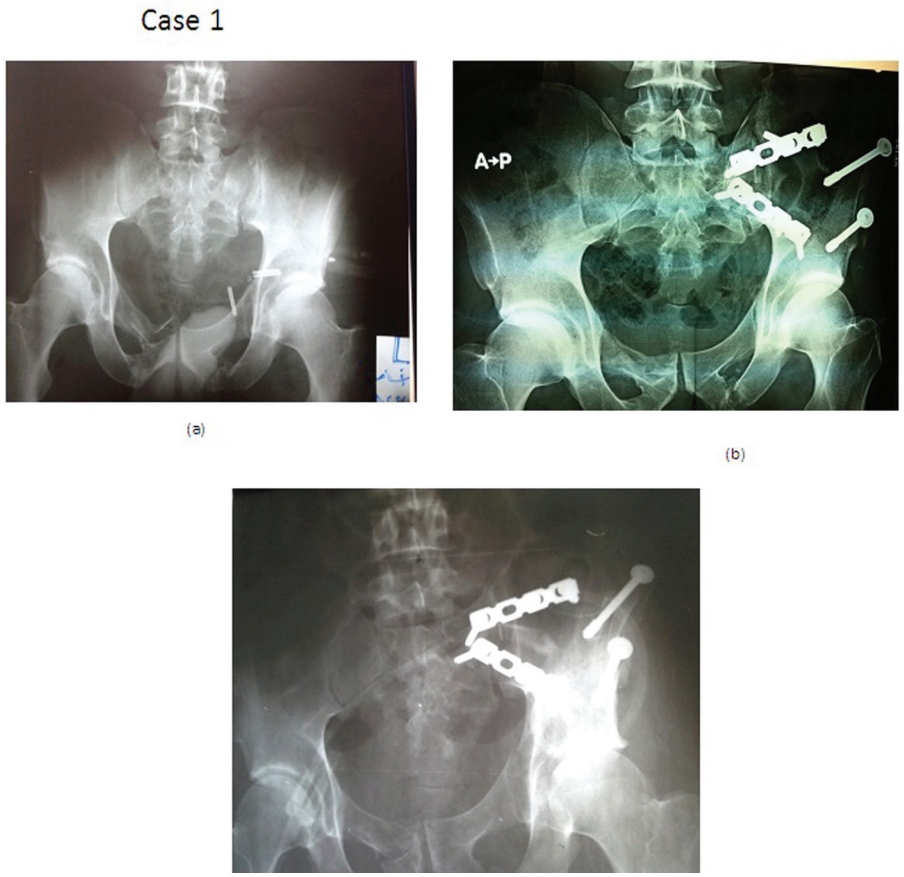
Patients were followed-up every month for 6 months, then every 3 months for 1 year, and then every 6 months up to the last follow-up. At each follow-up, patients were assessed both clinically and radiologically. Clinical evaluation was carried out according to the Coles pelvic score [8]. Radiological assessments included anteroposterior, lateral, inlet, and

Figure 1



(a) Approach (b) after osteotomy. (c) Fixation by double plates.

Figure 2



(a) Preoperative sacroiliac disruption. (b) Postoperative anterior–posterior view showing double plates for sacroiliac disruption and two screws for iliac osteotomy (c) after complete union.

outlet views for assess reduction of the SI site and union of the osteotomy site.

Results

The mean follow-up period was 20 months with a range of 12–36 months. All fractures were united within 16 weeks postoperatively (range, 12–20 weeks). Two nonunions occurred at the superior pubic rami, but they did not affect the results.

The radiological results were as follows: 11 cases of anatomical reduction, three cases of nearly anatomical reduction, and one case of moderate reduction. In the single case of moderate reductions, inadequate reduction of the posterior ring with persisting residual neurological symptoms was observed.

The clinical results according to the Coles pelvic score revealed 12 cases of satisfactory (five of excellent and seven of good) and three cases of unsatisfactory results (two of fair and one of poor).

With regard to postoperative complications, one case had persistent neurological symptoms and another case had soreness of the skin above the iliac crest that needed removal of one of the two screws.

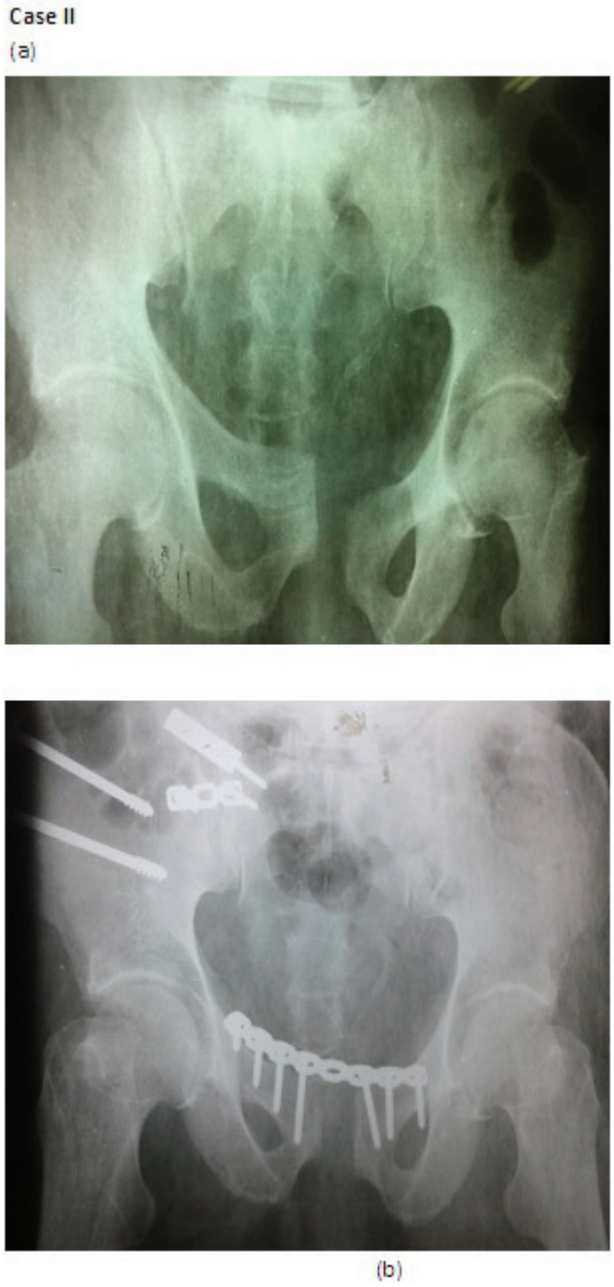
Discussion

The pelvic ring has an important role in protecting the intrapelvic organs, in bearing body weight, and providing support to the trunk and spinal column. Biomechanical studies have shown that internal fixation is the most adequate way to stabilize disrupted SI joints, and accurate reduction of the disrupted SI joint will increase the load-bearing capacity [9–12].

Conservative treatment is a good option for most of stable pelvic ring injuries. However, treatment of unstable pelvic ring injuries conservatively may lead to inaccurate reduction with high morbidity rate. Surgical treatments allow early rehabilitation and decrease many complications [13–14].

Anterior external fixation can be applied rapidly and early in pelvic ring disruption for control of bleeding. However, external fixation alone is not sufficient to stabilize the posterior disruption, and additional

Figure 3



(a) Preoperative anterior–posterior view showing a 30-year-old male with RTA showing vertical shear. (b) Postoperative view after anterior and posterior fixation. RTA, road traffic accident.

methods are needed. Open reduction and internal fixation by double plating can result in satisfactory outcomes [15].

Studies on the use of sacral bars for sacral fractures and SI joint dislocations reveal that there is a risk of overcompression with high incidence of nerve injury. Sometimes the ends of the bar are prominent and can result in discomfort to patients [15].

Percutaneous screw fixation of the SI joint needs an experienced surgeon and high intraoperative fluoroscopic quality and is associated with high incidence of nerve injury and vessel damage due to reduced surgical exposure and high radiation exposure [16].

The anterior approach used in this study has several advantages. It provides good access to the anterior aspect of the SI joint. It can be extended in case of other pelvic ring fractures, which have to be exposed to facilitate reduction, or in case of a concomitant acetabular fracture

Simpson *et al.* [17] used double plates to stabilize the unstable SI joint with an anterior approach but he had high incidence of soft-tissue complications. In this study, as we used transiliac osteotomy, we had no soft-tissue complications due to bone-to-bone union, which avoided any disturbance of soft tissues and avoided presence of dead space under the iliacus muscle.

Unstable pelvic ring injuries have a tendency to redisplace only if the posterior ring is fixed; anterior and posterior fixation lead to lower rates of malunion or nonunion [15].

Sagi *et al.* [18] reported that anterior plating for the vertically unstable pelvis increases the stability of the fixation, and that there were no cases of further displacement after initial fixation and high rate of satisfactory results was obtained. We obtained one case of moderate reduction, which showed unsatisfactory clinical results.

It has been assumed that a residual neurological symptom is a causative factor affecting clinical outcome. Denis *et al.* [19] reported that nerve injuries of type C pelvic ring injuries are more severe than those in type B. There was one case of persistent residual neurological symptoms in this study, which showed poor clinical results.

Conclusion

Posterior injuries, especially SI disruptions, affect the long-term outcome significantly; the anterior approach allows adequate exploration and the reduction can be confirmed. Double plates allow rigid fixation, and bone-to-bone healing of osteotomy decreases risk of wound complications.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

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