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Fractures of the posterior wall of the acetabulum: Treatment using internal fixation of two parallel reconstruction plates

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ABSTRACT

Objectives: Our aim was to evaluate the efficacy of the treatment method using internal fixation of parallel reconstruction plates for the posterior wall of the acetabulum fractures.
Design: Randomised, prospective.
Setting: Level I trauma centre. *Patients/participants:* 57 patients with posterior wall fractures of the acetabulum in our department from 2007 to 2010 were treated operatively using this technique. *Intervention:* internal fixation of two parallel reconstruction plates was used in this study. One of the plates was near the border of acetabulum. The other was parallel to the former one and was located to stress concentrated area. *Main outcome measurements:* The clinical outcome was evaluated using the clinical grading system and radiological outcome was evaluated according to the criteria described by Matta. In addition, complications were researched in this study.
Results: The percentages of the clinical excellent-to-good and fair-to-poor results were 93.0% and 7%, respectively. We found that clinical outcome had no correlation with age, operation time from injury to operation, nor had correlation with hip dislocation, comminuted fracture condition and marginal compression fracture. Anatomical reduction was significantly correlated with excellent-to-good clinical outcome. Necrosis of the femoral head and heterotopic ossification were prone to decline the outcome of acetabular fractures despite good fracture reduction.
Conclusions: the internal fixation of two parallel reconstruction plates facilitated rigid fixation and avoided fracture fragment injury, was an effective and reliable alternative method to treat fractures of the posterior wall of the acetabulum.

Introduction

Fractures of the posterior wall of the acetabulum comprise one-fourth to one-third of all acetabular fractures and represent the most common pattern of fracture of the acetabulum [1]. It is distinguished from other forms of acetabular fractures. The only posterior part of the column is involved in these fractures, and there is usually an associated hip dislocation. Though conservative treatment may be recommended for the stable joint with a small fragment, open reduction and internal fixation are usually needed when an unstable hip or a large part of the posterior wall is involved, which was first reported by Judet et al. [2]. This approach has become the standard treatment and has led to a reduction in the incidence of post-traumatic arthritis and an improvement in the overall outcome [3–5].

However, several studies demonstrated a significant complication rate after open reduction and internal fixation of posterior-wall fractures, even when compared with other forms of acetabular fracture [6–8]. Indeed, the most crucial determinant of clinical success is the accuracy of the reduction and the avoidance of increased contact pressure due to steps and gaps [9,10]. Maintaining anatomical reduction of the fracture fragments until solid union takes place is difficult. In addition, compromised vascularity of posterior-wall fragments can lead to necrosis and resorption of femoral head [11,12]. Therefore, in order to reach solid and lasting anatomical reduction and ensure favourable blood supply of fracture fragments, we have used internal fixation of the two parallel reconstruction plates to treat fractures of the posterior wall of the acetabulum and try to evaluate the efficacy of this method in this study.

Patients and methods

Demographic data and type of fracture

We treated 57 patients with posterior-wall fractures of the acetabulum in our institution by internal fixation using two parallel reconstruction plates, during the period from July 2007 to

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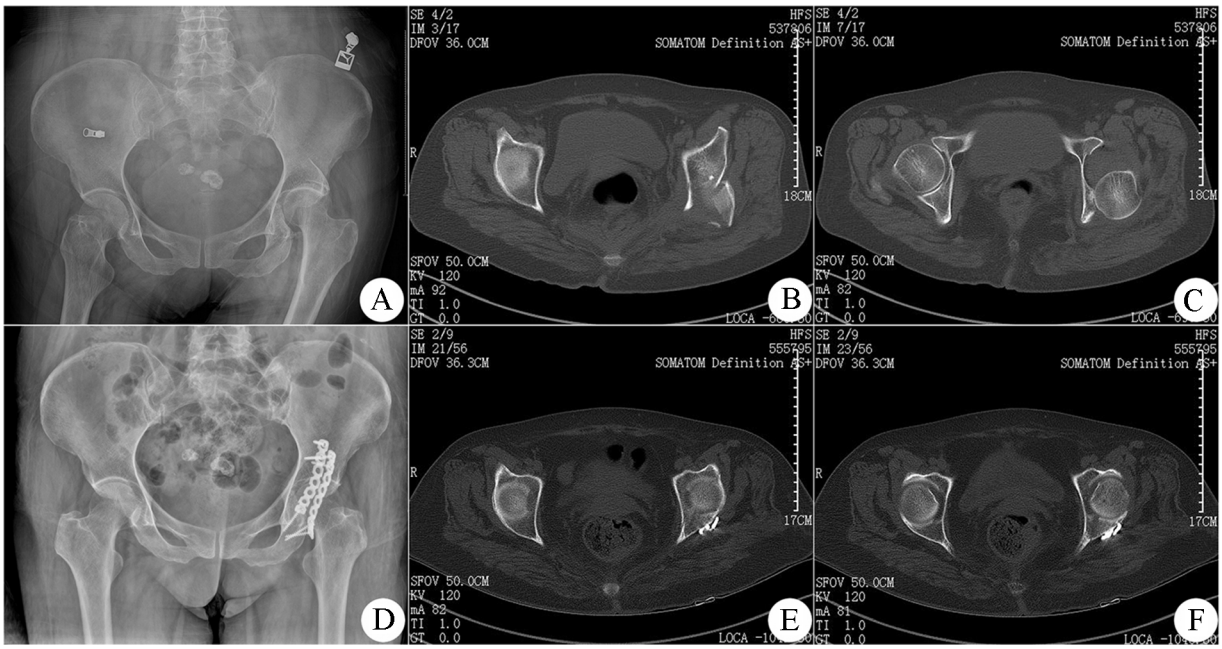

Fig. 1. Preoperative and postoperative radiograph and CT scan: (a) preoperative radiograph of anteroposterior view; (b) preoperative CT scan showed posterior wall fracture of the acetabulum and fragment displacement; (c) preoperative CT scan showed acetabulum fracture combined with posterior dislocation of femoral head; (d) postoperative radiograph; (e) postoperative CT scan showed the fracture end had good para-position and alignment; (f) CT scan showed dislocated femoral head was in position after operation.

June 2010. All the fractures included in our study were isolated posterior-wall fractures. Patients with associated acetabular fracture pattern or combined pelvic and acetabular injuries were excluded.

All the injuries were evaluated preoperatively with radiographs of anteroposterior view, obturator oblique view and iliac oblique view. CT with 2–3 mm sections through the affected area was performed allowing a more accurate characterisation of the fracture (Fig. 1A–C). The indication for surgical intervention was a non-congruent joint, without secondary congruity (displacement of more than 3 mm) and an unstable joint.

Operative technique

All the procedures were performed with the patient under general anaesthesia and with muscle paralysis if hip subluxation was required for joint reduction. The surgical approach was a Kocher-Langenbeck in all. No intraoperative nerve monitoring was used.

During every operation, the soft tissue was protected meticulously from secondary trauma. The standard KL approach was used in all cases and a window for exposure of the posterior wall was created. The displaced posterior wall fragment can be located and gently mobilised with the fingertips to reduce its position on the acetabulum. Then, stable fixation of the fragments was achieved by using two lateral reconstruction plates as followed. After the fracture fragment was reduced, the located femoral head was used as a template and slide the plate from the top of ischial tuberosity to its top and anterior aspects. The plate across the fracture gap, appropriately contoured to accommodate the shape of the posterior wall, was fixed by four to six screws. In no case were lag screws used in the posterior wall fragments. One of the plates was near the border of acetabulum and leave 3–5 mm space, noted to keep along the border of the posterior wall adjacent to the joint. The other plate was parallel to the former one and was located to the area of stress concentration (Fig. 2A).

If compression deformation occurred on subchondral bone of posterior wall, the osteotome should parallel the surface of articular cartilage and keep 5 mm distance from compression location, and then reduce bone block by leverage to make articular surface of acetabulum congruent with femoral head. Bone blocks from the greater trochanter of the femur were grafted to repair the bone defect.

Closed suction drains were used routinely for one to three days until drainage capacity was less than 30 ml. Prophylactic cephalosporin and aminoglycoside antibiotics were used in the perioperative period and post-operatively until removal of the drain. Routine prophylactic indomethacin against heterotopic bone formation was used for four weeks.

Post-operative assessment and follow-up

Postoperatively, joint exercise was recommended as soon as pain had subsided. The activities of patients were limited for an average of 12 weeks before partial weight bearing was permitted, depending on the fracture stability. Full weight bearing was allowed only after clinical and radiological fracture union had been confirmed. The clinical outcome was evaluated using the clinical grading system developed by Merle d'Aubigne and Postel and modified by Letournel and Judet and then subsequently by Matta (Table 1). The radiological outcome was evaluated according to the criteria described by Matta [6,13]. An excellent grade indicated a normal appearance of the hip; good, mild changes with small osteophytes, moderate (1 mm) narrowing of the joint, and minimal sclerosis; fair, intermediate changes with moderate osteophytes, moderate (less than 50%) narrowing of the joint and moderate sclerosis; poor, advanced changes with large osteophytes, severe (more than 50%) narrowing of the joint, collapse or wear of the femoral head and acetabular wear. Physiotherapy was continued until the muscle strength and range of movement were regained or a plateau was reached [13].

In addition, three standard radiographs of the pelvis and CT scan were obtained at the same time, usually within one week of