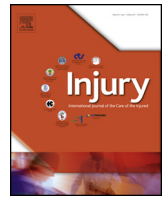




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Surgical resection of severe heterotopic ossification after open reduction and internal fixation of acetabular fractures: A case series of 18 patients



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ABSTRACT

Objective: To evaluate the clinical results of surgical resection of severe heterotopic ossification (HO) after the open reduction and internal fixation (ORIF) of acetabular fractures.

Methods: A retrospective chart review was performed between October 2005 and November 2010 on patients undergoing severe HO resection following an acetabular fracture ORIF. Our primary outcome was functional status evaluated by the Harris hip score (HSS). HO resection and hip release was performed using a Kocher–Langenbeck approach in all cases, and a combined radiation and indomethacin regimen was used to prevent HO recurrence. Plain radiographs were also used to evaluate the hip joint for arthritic changes and HO recurrence.

Results: A total of 18 patients (17 males and 1 female) were included in our study analysis. The mean patient age was 36.8 (range: 22–54 years old) when HO resection surgery was performed. The mean time interval between acetabular fracture ORIF and HO resection was 9.9 months (range: 3–30 months): it was within 6 months in 7 patients, 6–12 months in 8 patients, and >12 months in 3 patients.

The HO was graded as Brooker grade III in 8 patients and grade IV in 10 patients. The mean time interval between HO resection and the latest follow-up was 4.5 years (range: 2.1–7.8 years). The mean Harris hip score (HHS) was 84.5 (range: 38–100), with a clinical outcome rating of excellent in 9 patients, good in 3 patients, fair in 4 patients, and poor in 2 patients (good and excellent rating accounted for 66.7%). The mean hip joint motion arc was 194° (range: 90–260°).

Complications included one intraoperative femoral neck fracture, 1 sciatic nerve injury, 2 femoral head avascular necrosis, and 6 mild HO recurrences (33.3%). There was 28.6% recurrence if HO resection was within 6 months and 36.4% if >6 months. There were no cases of severe HO recurrence, wound infections, deep vein thrombosis, or pulmonary embolism.

Conclusion: The early surgical resection of severe HO after an acetabular fracture ORIF can provide satisfactory results, however the complication rate is relatively high.

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Introduction

The operative treatment of displaced acetabular fractures has been widely accepted after the pioneer work of Judet and Letournel [13,14]. Although operative treatment of these fractures can yield good clinical and radiographic results, there are still some

postoperative complications that can influence the final outcome. The formation of heterotopic ossification (HO) is a common complication that can present as early as 2 weeks following surgery and patients can present with limited joint range of motion and pain. In the meta-analysis by Giannoudis et al. [7], the overall incidence of HO was 25.6% after the open reduction and internal fixation (ORIF) of displaced acetabular fractures and the incidence of HO was related to the surgical approach. The iliofemoral and an extended Kocher–Langenbeck approach were associated with a higher incidence of HO. The development of severe HO (Brooker grade III or IV) can lead to limited hip joint mobility, and as a result can affect the final postoperative outcomes. In the meta-analysis of 13 studies (1424

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acetabular cases), the overall incidence of severe HO formation was 5.7% [7]. Although there are some studies reporting the results of hip HO resection after spinal cord injury, traumatic brain injury, and total hip arthroplasty (THA) [4,6,12,17,20], there are no reports about the resection of severe HO following an acetabular fracture ORIF, except for our preliminary results of five cases [25]. The objective of this study was to report on the functional outcomes of a series of patients who underwent severe HO resection following an acetabular fracture ORIF.

Patients and methods

Local ethics committee approval was obtained prior to data collection. We retrospectively reviewed the medical records of all cases of severe HO resection and hip release admitted to our institution between October 2005 and November 2010. Our inclusion criteria included patients with severe HO (defined as Brooker grade III and IV) [2] and hip joint stiffness following an acetabular fracture ORIF who underwent HO resection. Our exclusion criteria included patients who underwent a primary combined HO resection and total hip arthroplasty (THA), or if lost to follow-up. Our primary outcome measure was functional outcome assessed by the Harris hip score (HSS). Our secondary outcome measures included HO recurrence, intraoperative fractures, sciatic nerve injuries, conversion to THA, and radiographic evaluation according to Matta's criteria [15]. Data regarding age, gender, serum alkaline phosphatase, mechanism of injury, fracture type according to the Letournel classification [13], surgical approach used, quality of reduction on radiographs according to Matta's criteria, severity of the HO according to Brooker's classification, time from initial injury to HO resection, duration of follow-up, surgery duration, estimated blood loss, number of blood units transfused, hip and knee range of motion was collected.

Surgical procedure

All of the surgeries were performed under general anaesthesia with the patient placed in the lateral decubitus position. The compromised hip and lower extremity were draped free. A Kocher–Langenbeck approach was used, through the previous surgical scar, for all patients. After the fascia lata was incised and gluteus maximus was split, the sciatic nerve was exposed from the distal aspect of the wound due to the distorted anatomy by the HO proximally. A nerve stimulator was also used in all cases to help us identify and protect the sciatic nerve. A wound drainage system was used in all patients.

Postoperative care

Deep vein thrombosis prophylaxis was used in all patients, with low molecular weight heparin and intermittent pneumatic compression devices. Prophylactic intravenous antibiotics were used for 5 days. Active hip joint motion was encouraged from postoperative day 1. A combination of indomethacin and radiation was used for HO recurrence prophylaxis. All patients received 6 weeks of oral indomethacin. If the patient received postoperative radiation, a single dose of 7 Gy was used; On the other hand, if preoperative radiation was used a single dose of 8 Gy was given within 4 h of HO resection. The wound drainage system was not removed until the drain output was less than 100 ml per day.

Our results will be expressed as means for continuous variables (i.e. Harris hip score, age, time from initial injury to HO resection, duration of follow-up, surgery duration, estimated blood loss, mean number of blood units transfused, hip and knee range of motion) and as percentage for frequency distribution.

Results

Patient demographics

A total of 34 patients underwent HO resection at our institution, of which 20 patients met our inclusion criteria. One patient was excluded for loss of follow-up, after moving to a different province, and one who patient underwent a primary combined HO resection and THA was also excluded. Eighteen patients (17 males and 1 female) were included in our results analysis. The mean age was 36.8 (range: 22–54 years old) at the time of HO resection. The mechanism of injury and acetabular fracture characteristics are described in Table 1.

Five of the patients had their initial acetabular fracture ORIF performed at our institution and the other 13 patients were referred from other hospitals. Fracture repair was performed through a Kocher–Langenbeck approach in 15 patients and a combined Kocher–Langenbeck and ilioinguinal approach in 3 patients (2 both column fractures, Fig. 1, and 1 transverse and posterior wall fracture, Fig. 2). According to Matta criteria [15], the postoperative reduction was classified as anatomical in 12 patients, imperfect in 4 patients, poor in 1 patient, and surgical secondary congruence in 1 patient.

The HO formation was classified as Brooker grade III in 8 patients and grade IV in 10 patients. In 3 patients who's HO was graded as grade IV on X-ray, the hip joint was not totally ankylosed on physical examination and on CT scan there was still some discontinuity of the HO (Fig. 3); in the other 7 patients there was no motion of the compromised hip joint. The remaining 11 patients had very limited hip joint motion with a mean hip motion arc of 32.8°, and 2 patients had ipsilateral knee stiffness. According to Matta criteria [15], the preoperative radiographs of the compromised hip joint was graded as excellent in 1 hip, good in 13 hips, fair in 3 hip, and poor with intra-articular hardware in 1 hip.

The mean time interval between the acetabular fracture ORIF and HO resection was 9.9 months (range: 3–30 months). It was within 6 months in 7 patients, 6–12 months in 8 patients, and >12 months in 3 patients (at 14, 21, and 30 months, respectively).

Operative findings

In 14 patients the sciatic nerve was pushed medially by the HO, while in the other 4 patients the sciatic nerve was enclosed by

Table 1
Mechanism of injury and acetabular fracture characteristics.

Mechanism of injury	
Traffic accident	n = 14
Fall from height	3
Crush injury	1
Involved side	
Left	9
Right	9
Acetabular fracture type ^a	
Posterior wall	6
Transverse with an associated posterior wall	6
Pure transverse	2
Both column	2
Posterior column and posterior wall	1
T-shaped	1
Fixation approach	
Kocher–Langenbeck	15
Combined Kocher–Langenbeck and ilioinguinal	3
Radiographic reduction ^b	
Anatomical	12
Imperfect	4
Poor	1
Surgical secondary congruence	1

^a According to Letournel classification [13].

^b According to Matta criteria [15].

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