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Displaced acetabular fractures in the elderly: Results after open reduction and internal fixation

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ABSTRACT

Background: The optimal management of elderly patients with displaced acetabular fractures remains controversial. This paper aims to summarize the clinical results of open reduction and internal fixation (ORIF) and the possible factors influencing them.
Methods: Radiographic and clinical data on 52 elderly patients with displaced acetabular fractures that were treated by ORIF between May 2000 and May 2008 were retrospectively analysed. Data, such as fracture type (Letournel's classification system), quality of reduction, clinical outcomes (Harris hip score and modified Merle d'Aubigne-Postel score), and radiological outcomes (Matta score), were evaluated.
Results: Good to excellent clinical and radiological outcomes were recorded in 43 (82.7%) and 37 patients (71.2%), respectively. Acetabular fractures without radiographic features, such as quadrilateral plate fracture, Gull sign, posterior dislocation of hip, posterior wall marginal impaction, comminuted posterior wall fracture, and femoral head injury, can still achieve good to excellent outcomes. However, patients with the abovementioned radiographic features tend to achieve fair or poor outcomes. When an acetabular fracture with the aforementioned features, except for femoral head injury, can achieve and maintain anatomic reduction until complete fracture healing, the difference between fractures with and without the radiographic features is no longer significant. The results indicate that the outcomes are more affected by reduction rather than radiographic features.
Conclusion: ORIF may be suggested for displaced acetabular fractures in the elderly. Good to excellent outcomes and a high degree of patient satisfaction can be achieved in majority of the patients. We recommend ORIF as the preferred treatment for displaced acetabular fractures without the abovementioned radiographic features.
Level of evidence: Therapeutic level IV.

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Introduction

Displaced acetabular fractures in elderly patients presents treatment challenges that may be compounded by a combination of comorbid medical conditions, osteoporosis, and certain radiographic features. Some of these features include articular impaction of the medial roof (also called the "Gull Sign" [1]), posterior wall marginal impaction (PWMI), comminuted posterior wall fracture (CPWF), posterior dislocation of hip (PDH), femoral head injury (FHI), quadrilateral plate fracture (QPF) and pre-existing degenerative joint disease (PDJD). These features are deemed high risk for surgery, making it difficult to achieve and maintain a stable reduction, and, in the case of PDJD, rapid progression, which may yield a poorer outcome of open reduction and internal fixation (ORIF) [1–6]. Therefore, conservative treatment or total hip arthroplasty (THA) has been advocated as the primary choice [2,7,8]. However, numerous studies have also shown that satisfactory outcomes can be achieved in the majority of elderly patients with displaced acetabular fractures who were treated with ORIF [1,9–11].

These inconsistent clinical outcomes can create a therapeutic dilemma for surgeons. Numerous authors agree that the indication for conservative treatment for an acetabular fracture in the elderly is only preferred in patients who have a stable and absolutely minimally displaced fracture or a surgical contraindication [12,13]. Debate focuses on whether ORIF or an acute THA should be the treatment of choice for displaced acetabular fractures in the elderly. To determine which patients can be a candidate for

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treatment by ORIF or THA, a long-term study and a thorough understanding of factors associated with ORIF outcome are necessary. However, only a few studies have been reported [1,2,14].

This study aims to evaluate the clinical results and determine factors affecting the outcome of ORIF for acetabular fracture in patients with aged 60 years or older.

Patients and methods

An institutional review board approval was obtained for this study. Between May 2000 and May 2008, we retrospectively reviewed the medical records of 59 patients aged ≥60 years, who had displaced acetabular fractures and underwent ORIF. Patients with one or more of the following criteria were excluded: (1) a pathologic acetabular fracture (no patients); (2) incomplete radiographic or clinical data (three patients); and (3) without adequate follow-up (patients with adequate follow-up were defined as having a follow-up for a minimum of two years or having a clearly poor clinical result before two years [4]). Four patients did not have adequate follow-up. One died within seven days after surgery because of heart failure, whereas three died of natural causes at a mean follow-up of nine months postoperatively (range, 3–18 months). After applying the exclusion criteria, 52 patients (43 males and 9 females) were enrolled in the study (Table 1).

Three pre-operative standard plain radiographs, including anterio-posterior pelvis, obturator oblique, and iliac oblique views, were obtained along with computed tomography (CT) scans to classify fractures according to Letournel's classification system [15]. When the acetabular fractures were difficult to classify according to Letournel's system, they were sorted according to anatomical parts. The distribution of fracture types, mechanism of injury, and associated injuries are shown in Table 1.

The mean interval between injury and the operative procedure was 6.6 days (range, 2–15 days; SD = 3.3). The approach for the patient was determined according to the type and nature of acetabular fractures (Table 2). All fractures were fixed with reconstruction plates and screws, except for acetabular fractures involving the quadrilateral plate which were fixed with a combined L-shaped plate.

Post-operatively, drain was removed after 48 hours. Patients were managed with antibiotics and prophylaxis against venous thrombosis Antibiotics were used for 2 days, and low-molecular weight heparin was used for three weeks after the surgery. No prophylaxis against heterotopic ossification was used. On the first day after surgery, patients were encouraged to sit up on bed, after which active and passive functional exercises were performed on the affected hip joints, and progressive resistance exercises of the hip adductors, quadriceps, and hamstrings were started. Patients were encouraged to use walkers between 1 and 6 weeks after surgery, later crutches between 6 and 12 weeks after surgery. After 12 weeks, patients were tasked with full weight bearing according to their tolerance. A monthly follow-up was performed on patients after the procedure until the radiographs and CT scans showed signs of union. Afterwards, patients were followed up at three months, one year, and annually thereafter, unless an onset of a focal problem occurred. The median duration of follow-up was 72 months (range, 2–12 months).

We reviewed operative notes, three pre-operative, post-operative radiographic views, and CT scans for all patients. Operative notes were reviewed for FHI and impacted fragment. We identified all fractures associated with or not having six radiographic features, such as Gull sign, PWMI, CPWF, PDH, FHI, and QPF (Fig. 1). The quality of fracture reduction, which was graded as anatomical, imperfect, or poor, was evaluated based on the residual displacement as defined by Matta [4]. This evaluation will determine whether the factors affected the results of ORIF, including the GS, PWMI, CPWF, PDH, FHI, QPF, and quality of reduction.

The final follow-up clinical outcome was evaluated according to Harris hip score (HHS): excellent (90–100 points), good (80–89 points), fair (70–79 points), or poor (≤69 points); and modified Merle d'Aubigne-Postel score: excellent (18 points), good (15–17 points), fair (12–14 points), or poor (3–11 points) [16,17].

Table 1
Patient demographics ($n = 52$).

Gender	
Male	43
Female	9
Average age (SD; range)	69.9 years (6.2; 60–90))
Comorbidity (n)	
Hypertension	28
Anaemia	11
Cardiopathy	5
Diabetes mellitus	4
Pulmonary	2
Cerebrovascular accident	2
Mechanism of injury	
Fall < 1.5 m	15
Fall > 1.5 m	19
Auto vs. pedestrian	17
Crush injury	1
Fracture types	
PW	5(9.6%)
PC	1(1.9%)
TV	4(7.7%)
AW	8(15.4%)
AC	5(9.6%)
AC + PHTV	1(1.9%)
PC + PW	1(1.9%)
TV + PW	4(7.7%)
T-shaped	6(11.5%)
ABC	15(28.8%)
IQP	1(1.9%)
AW + AC	1(1.9%)
Associated injuries	
SJD	1
RLS	1
TSF	1
HT	1

PW, posterior wall; PC, posterior column; TV, transverse; AC, anterior column; AW, anterior wall; AC + PHTV, anterior column + posterior hemitransverse; PC + PW, posterior column+ posterior wall; TV + PW, transverse + posterior wall; ABC, associated both column; IQP, isolated quadrilateral plate; AW + AC, anterior column + anterior wall. RLS, rupture of the liver and spleen; SJD, sacroiliac joint dislocation; TSF, thoracic spine and scostal fracture; HT, head trauma.

Table 2
Operative approach for each fracture type.

Fracture type (n)	Number	Operative approach		
		Kocher-Langenbeck	Ilioinguinal	Kocher-Langenbeck and Ilioinguinal
PW	5	5		
PC	1	1		
TV	4	1		3
AW	8		8	
AC	5		5	
AC + PHTV	1			1
PC + PW	1	1		
TV + PW	4	2		2
T-shaped	6	1		5
ABC	15			15
IQP	1			1
AW + AC	1		1	
Total	52	11	14	27