

# Operative management of acetabular fracture: A 10-year experience in Isfahan, Iran

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## Abstract

**Background:** Pelvic and acetabular fractures constitute 2% of all fractures. The aim of the present study was to present acetabular fracture outcome in patients who underwent operative treatment.

**Materials and Methods:** This study was a prospective cohort study, which was performed in Isfahan, Iran. During the period study, all patients who admitted to Alzahra Hospital with acetabular fracture and underwent acetabular surgery were evaluated. Data about age, sex, associated fractures, Intensive Care Unit admission, the time between admission and surgery were gathered. Patients were encouraged to return to the hospital after 1 week, 4 weeks, 6 months, and then yearly for the follow-up.

**Results:** Sixty-five patients with acetabular fractures were referred to our hospital. Of them, 30 patients were indicated for surgical intervention and recruited in the study. The most frequent type of fracture involved posterior wall accounting for 49.9% of all fractures. More than 80% of study patients reached satisfactory results (excellent or good) based on Harris Hip Score (HHS). Female patients had significantly lower HHS in comparison with male patients ( $P = 0.01$ ). Heterotopic ossification (HO) formation was more common in whom surgery was performed after 2 weeks ( $P = 0.005$ ), however, there was no significant difference in HHS between these groups ( $P = 0.28$ ).

**Conclusions:** It is concluded that the female gender had an impact on the surgical outcome of acetabular fracture and indicated the lower functional outcome. Although there is an increase in HO formation in patients who do not undergo surgery during 2 weeks after the trauma, however, it does not influence the surgical outcome.

**Key Words:** Acetabular surgery, heterotopic ossification, long-term outcome

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## INTRODUCTION

Pelvic and acetabular fractures constitute 2% of all fractures.<sup>[1]</sup> There are two peaks in the acetabular fracture age distribution; first in young patients in which the fractures occur due to high energy trauma, the second peak is in elderly in which the

fractures occur with low-energy trauma.<sup>[2]</sup> These fractures are associated with high mortality and morbidity rate due to their associated injuries.<sup>[3,4]</sup> Recently, there has been an increase in acetabular fracture, the combination of greater longevity with a more active lifestyle and rising number of traffic accidents.<sup>[5]</sup>

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Judet *et al.* classified acetabular fractures as simple fractures and the more complex associated fracture types.<sup>[6]</sup> This classification have been described several indications for operative treatment.

A fracture characteristic is one of these indications. Acetabular fractures with 2 mm or more of displacement in the dome of the acetabulum. Posterior wall fractures with more than 33% involvement of the articular surface of the posterior wall or clinical instability with hip flexion to 90° are indications for surgery.<sup>[1]</sup>

There are some previous studies, which showed the superior results of operative treatment in comparison with nonoperative treatment. Nowadays surgery is the treatment of choice for most displaced acetabular fractures,<sup>[7-10]</sup> however, data about the long-term outcome are lacking, and thus we designed this study to address this question.

The aim of the present study was to present the acetabular fractures outcome in patients who underwent operative treatment.

## MATERIALS AND METHODS

This study was a prospective cohort study, which has been performed at Alzahra Hospital, a Tertiary Referral Centre in Isfahan, Iran. During the period from January 2003 to January 2013 all patients who admitted to Alzahra Hospital with acetabular fracture and underwent acetabular surgery were evaluated.

In all patients, X-rays containing antro-posterior pelvic views, as well as Judet views were taken. Computerized tomography (CT) scan was also performed in all patients. Fractures were classified according to Judet *et al.* criteria for acetabular fractures.<sup>[6]</sup> In all patients, surgery was performed by a single expert orthopedic surgeon (MRE) using ilioinguinal, extended iliofemoral, and Kocher-Longenbech approach. After surgery, patients were receiving 75 mg indomethacin, in three divided doses daily for 6 weeks as a prophylaxis for heterotopic ossification (HO).<sup>[11]</sup> For the prevention of deep vein thrombosis, low-molecular-weight heparin was administered during a hospital stay.

In all patients, data about age, sex, associated fractures, Intensive Care Unit admission (ICU), the time between admission, and surgery were gathered.

After being discharged from the hospital, patients were encouraged to return to the hospital after 1 week, 4 weeks, 6 months, and then yearly for the follow-up. The follow-up was consisting of radiological evaluation

using X-rays and functional evaluation, by the Harris Hip Score (HHS). HHS at the last visit considered for the analyses. HO was evaluated using Brooker classification.<sup>[12]</sup>

Data analyses were performed by a statistician on a personal computer using SPSS software (18.0 for Windows, SPSS Inc., Chicago, Illinois, USA). Quantitative and qualitative variables were compared using *t*-test and Chi-square tests, respectively.

Written informed consent was obtained from all patients at the beginning of the study for the use of their medical records in a research study. The study protocol was approved by Ethics Committee of Vice chancellery for research of Isfahan University of Medical Sciences.

## RESULTS

During the period of study, 65 patients with acetabular fractures were referred to our University Hospital. Of them, 30 patients, including 26 (86.6%) men and 4 (3.4%) women with the mean age of  $32.2 \pm 12.4$  ranged between 19 and 58 were indicated for surgical intervention and recruited in the study. Eight patients required ICU treatment. The mean follow-up time in this study was  $49.2 \pm 22.8$  months.

In 28 (93.3%) patients, surgeries were performed via Kocher-Longenbech approach, 1 (3.3%) via ilioinguinal, and 1 (3.3%) via extended iliofemoral approach.

The most frequent type of fracture involved posterior wall accounting for 49.9% of all fractures. Both column fractures were seen in 23.3%. Table 1 shows the frequency distribution of fracture types according to Judet *et al.* criteria for acetabular fractures.

There were 12 (40%) patients with 15 associated fractures in extremities; the most frequent associated fracture was in femoral shaft (19.8%), and after that in plateau of tibia (13.2%), and shaft of tibia (13.2%). Detailed data are shown in Table 2.

**Table 1: Frequency distribution of fracture types among study patients**

Fracture types	Side involved (%)	
	Right	Left
Elementary fracture		
Posterior wall	5 (16.6)	10 (33.3)
Posterior column	2 (6.6)	0 (0)
Anterior column	1 (3.3)	0 (0)
Transverse	3 (10)	2 (6.6)
Associated fracture		
Both column	4 (13.3)	3 (10)

Data are presented as number (%)

More than 80% of study patients reached satisfactory results (excellent or good) based on HHS. Seventeen (56.6%) patients reached excellent, and 7 (23.3%) patients had a good outcome. Detailed data are shown in Table 3.

Data have been analyzed to determine whether there is any relation between demographic factors and functional outcome based on HHS. Female patients had significantly lower HHS in comparison with male patients ( $P = 0.01$ ). There was no statistically significant relation between the age and HHS ( $P = 0.60$ ).

Traumatic peripheral nerve palsy was noted in 4 (13.3%) patients considering their physical examination in the emergency department. All of them were to the sciatic nerve. Surgical explore was performed. Some degrees of nerve injury were found in all of them however, the nerve continuity was intact. There was no significant difference between the mean of final HHS in patients with or without sciatic nerve injury ( $P = 0.65$ ).

Eighteen (60%) patients underwent surgery within 2 weeks after trauma and in 12 (40%) patients; surgery was performed after 2 weeks (15–45 days) due to their medical condition. We did not find statistically significant difference in HHS between these groups ( $P = 0.28$ ). In 9 (30%) patients, follow-up radiographies showed different degrees of HO formation. HO formation was more common in whom surgery was performed after 2 weeks ( $P = 0.005$ ), however, there was no statistically significant difference in final HSS among patients with or without HO formation ( $P = 0.68$ ). Data about other demographic and clinical variables are shown in Table 4.

## DISCUSSION

Our study results showed that more than 80% patients had satisfactory results following acetabular fracture surgery. This finding was within the range that reported in various studies in different countries.<sup>[3,13-16]</sup> Another study which has been performed in our country showed 70% satisfactory results.<sup>[1]</sup>

We evaluated the relation between some demographic and clinical factors with surgical outcome. Women had significantly lower HHS after surgery in comparison with men. Although we had few female patients, however, their HHS was obviously lower than men. None of the previous studies mentioned this relation. This inferiority can be partially explained by lower pain threshold in women, which can influence their function and HHS.<sup>[17]</sup>

**Table 2: Associated fracture in extremities**

Associated fractures	Number (%)
L1	1 (6.6)
L4	1 (6.6)
Shaft of humerus	1 (6.6)
Elbow	1 (6.6)
Head of femur	1 (6.6)
Inter trochanteric	1 (6.6)
Neck of femur	1 (6.6)
Shaft of femur	3 (19.8)
Tibial plateau	2 (13.2)
Shaft of tibia	2 (13.2)
Medial and lateral malleolus	1 (6.6)

**Table 3: Surgical outcome among study patients**

Surgical outcome	Number (%)
Excellent	17 (56.66)
Good	7 (23.33)
Fair	2 (6.66)
Poor	4 (13.33)

Data are presented as number (%). Excellent: 90-100, Good: 80-89, Fair: 70-79, Poor: <70

**Table 4: Relation between HHS and study variables**

Study variables	Number (%)	HHS	P
Gender			
Male	24 (80)	88.8±12.5	0.01*
Female	6 (20)	65.5±3.3	
ICU admission			
Yes	8 (26.6)	83.8±13.3	0.72
No	22 (73.3)	86.4±19.2	
Surgical approach			
Kocher-Langenbeck	28 (93.3)	86.6±18.2	0.89
Ilioinguinal	1 (3.3)	93±0	
Extended iliofemoral	1 (3.3)	81±0	
Fracture type			
Elementary	23 (76.6)	86.9±19.0	0.58
Associated	7 (23.3)	82.2±13.8	
HO			
Yes	9 (30)	87.7±14.8	0.68
No	21 (70)	84.8±19.0	

Data are presented as number (%) and mean±SD.  $P < 0.05$  considered statistically significant. HHS: Harris Hip Score, ICU: Intensive Care Unit, SD: Standard deviation, HO: Heterotopic ossification, \*: Statistically significant

We found a 30% rate of HO formation among the study patients which is within the range of previous reports.<sup>[18,19]</sup>

Previous studies mentioned that the ideal time for the surgery is within 2 weeks<sup>[9]</sup> and delayed in surgical intervention leads to decrease functional outcome after surgery by several factors such as an increase in HO formation.<sup>[3,19,20]</sup> In contrast to these studies, we found that although there is an increase in the risk of HO formation in patients with delayed surgery, however, there was no significant difference in the functional

outcome. We reveal that surgery could postpone until improvement in patients clinical condition and should not precipitate for surgical intervention.

Studies that performed before revealed that sciatic nerve injury have an impact on the surgical outcome. However, our data do not support this finding.<sup>[9,10]</sup>

The strength of our study was that all surgeries were performed by a single expert surgeon (MRE) which made the results more reliable, and our long-term follow-up is another point of strength.

This study also had a limitation that all study participants were younger than 60 years, and there was no patient older than 60. Further studies should focus on this age group because of the differences in bone quality and functional outcome.

In summary, it is concluded that the female gender had an impact on the surgical outcome of acetabular fracture and indicated the lower functional outcome. Although, there is an increase in HO formation in patients who do not undergo surgery before 2 weeks, however, it does not influence the surgical outcome.

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### Conflicts of interest

There are no conflicts of interest.

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