

## ORIGINAL RESEARCH

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# Mid-term functional results of surgically treated acetabulum fractures

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### Abstract

The aim of the study was to evaluate the type of trauma, additional injury, age, additional diseases, need for ICU and blood transfusion, postoperative complications, mid-term patient satisfaction and hip functions of the patients who underwent surgical treatment for acetabulum fracture in our clinic. A total of 17 patients (15 males, 2 females, mean age 40,7 years ) who admitted to the emergency department between 2013 and 2016, and treated surgically due to acetabulum fractures were included in the study. According to Judet Letournel classification, 7 anterior wall fractures, 4 anterior column fractures, 3 posterior column fractures and 3 both column fractures were determined. Mean hospital stay was 14.5 days (range 3-45 days) and mean follow-up was 26 months (14 to 57 months). ICU needed in 3 (17.6%) cases, mean stay was 10.3 days (range 1-29 days). 6 (35.2%) patients required blood transfusion, mean amount was 4.1 units (range 2-6 units). Harris hip scores were excellent - good in 12 cases (70.5%) and 5 cases (29.5%) had moderate - poor results at 12th month. There was no statistically significant relationship between severity of trauma, type of injury, age, additional diseases, intensive care and blood transfusion requirements, postoperative complications and patient satisfaction ( $p > 0.05$ ). In selected acetabular fracture cases with proper planning according to fracture type, in early period, surgery may lead to satisfactory results in terms of patient satisfaction and hip functions.

**Keywords:** Acetabular fracture, internal fixation, surgery, outcome

### Introduction

Acetabular fractures are usually injuries caused by high-energy traumas and 60-70% of them are traffic accidents [1]. 50 % of these patients are accompanied by orthopedic and systemic injuries [5]. Acetabular fractures associated with pelvic region injuries are the second worst group in terms of mortality and morbidity after head trauma in cases requiring surgical intervention [16]. Because the hip is one of the most weight bearing joint, acetabular fractures are particularly important aspect of functional orthopedic problems [2].

The main goal in acetabulum fractures is to prevent or delay osteoarthritis of the hip joint in order to provide early mobilization of the trauma patient and achieve optimal functional outcome in the long term [4,17-19]. The incidence of complications in the treatment of acetabular fractures decreases with increasing surgical experience. Surgical treatment of complex acetabulum fractures is often difficult and the learning curve of the technique is challenging [6]. The most important factor affecting the surgical outcome is the successful reconstruction of the acetabulum loading surface [7-8]. Judet and Letournel, who lead the surgical treatment of acetabular fractures, recommend open reduction and internal

fixation in all displaced acetabulum fractures [3-9]. Pennal et al. said the results of acetabular fracture surgery is better than conservatively, also argued for the better the results will affect the future arthroplasty performed [4].

Complications encountered in surgical treatment of acetabular and pelvic fractures can be considered in three groups; intraoperative, early and late postoperative. Complications encountered during surgery; vascular nerve injuries, malreduction, joint penetration of used hardware and death. In the early postoperative period; deep vein thrombosis, pulmonary embolism, skin necrosis, infection, loss of reduction, and death; late complications include heterotopic ossification, chondrolysis, avascular necrosis of the femoral head and post-traumatic arthrosis [6,22].

In our study, the parameters that can affect the treatment process of acetabulum fractures were examined, the radiological and functional results were recorded after surgery and compared with the literature.

### Materials and Methods

The files of 17 patients (15 males, 2 females) with acetabular fractures who underwent surgery between January 2013 and September 2016 were investigated retrospectively. Conservatively treated acetabular fractures and patients with an obstacle to the operation such as the advanced age ( $> 70$  years), uncorrectable hemodynamic instability, hemostasis disorder, life-threatening

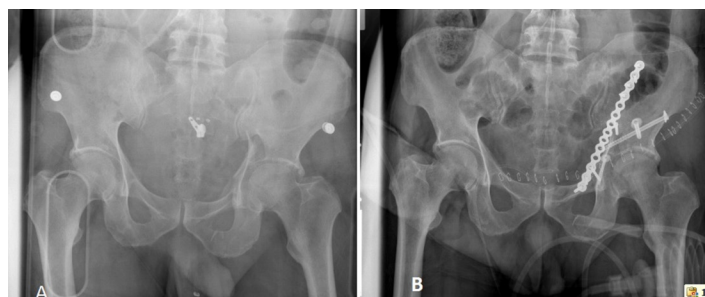
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systemic illness or injury were excluded from study. Fracture typing were made by reviewing computed tomography images of the patients based on the Judet-Letournel classification. The age, gender, mechanism of injury, fracture type, blood transfusion requirements, hospital stay, intensive care unit (ICU) stay, outpatient follow-up period, injuries associated with acetabular fractures, preoperative waiting times, used surgical incision, intraoperative and postoperative early complications have been evaluated for all patients. In every patient, 75 mg indomethacin was administered orally for at least 4 weeks routinely for HO prophylaxis. Within the first 3 days, passive hip exercises have been started to the extent that pain can be overcome. Every patient were mobilized with crutches in the first 2 weeks and partial load was allowed after 4 weeks. Full loading was allowed only after seen radiographic evidence of solid bone healing. In outpatient controls, if any, late complications were noted after surgery, healing status and heterotrophic ossification (HO) presence were questioned by radiographic examination. Harris hip scores were determined by face-to-face interview at 12th. month postoperatively. Patient's hip functions were scored between 0-100 and 5 groups were divided into excellent, very good, good, moderate and bad, according to the total scores. All data obtained were statistically analyzed using the chi-square test with SPSS 22.0 program and the results were compared with the literature data.

## Results

2 female (11.7%), 15 male (88.3%) patients included in study with mean age of 40.7 (range 22-62 years). Injury mechanism were falling from height in 7 cases (41.1%) and traffic accidents in 10 cases (58.9%). In 7 cases, there were additional injuries accompanying the acetabular fracture (Table 1). According to the Judet-Letournel classification, posterior wall (11.7%) in 2 cases, posterior column (23.5%) in 4, anterior column (17.6%) in 3, anterior + posterior column (17.6%) in 3, anterior wall + the anterior column (11.7%) in 2 and posterior wall + posterior column fractures (17.6%) in 3 cases were identified (Figure 1).

The mean follow-up period was 26 months (range 14 to 57 months), the mean duration of hospital stay was 14.5 days (range 3 to 45 days), and the mean time to surgery was 6.4 days (range 0 to 30 days). Blood transfusion was performed in 6 (35.2%) cases and the average transfusion volume was 4.1 units (range 2-6 units). Apart from these, 23 units of blood transfusion were performed due to intraabdominal solid organ injury to 1 patient. 3 cases (17.6%) were intensive care follow-up and mean ICU stay was 10.3 days (range 1-29 days). Kocher-Langenbeck was used in 6 cases, ilioinguinal approach was used in 10 and Kocher-Langenbeck + ilioinguinal approach was used in 1 case.



**Figure 1.** Left acetabulum JL: The case with both column fractures, preoperative (A) and early postoperative (B) radiographic images.

Harris hip scoring were performed by face to face interview at 12th. month postoperatively. Scores were excellent in 5 (29.4%), very good in 4 (23.5%), good in 3 cases (17.6%), moderate in 2 cases (11.7%) and poor in 3 cases (17.6%). 3 patients with poor functional outcomes, had sciatic nerve injury before surgery (Table 2).

**Table 2.** Distribution of functional outcomes according to Harris hip scores

| Harris HipScoring | Number of cases | %    | Total % |
|-------------------|-----------------|------|---------|
| Excellent         | 5               | 29,4 | %       |
| Verygood          | 4               | 23,5 | 70,5    |
| Good              | 3               | 17,6 |         |
| Moderate          | 2               | 11,7 | %       |
| Poor              | 3               | 17,6 | 29,5    |
| Total             | 17              | 100  | 100     |

At early and late postoperative follow up HO, incisional hernia, superficial wound infection and hip joint dislocation complications were seen in one cases each. Dislocated patient reduced surgically. In the other 3 cases, chondrolysis were found in the hip joint. In 1 of these cases early total hip prosthesis surgery was performed due to pain.

There was no statistical correlation between the severity of trauma, type of injury, age, additional diseases, comorbid injuries, ICU and blood transfusion requirements, postoperative complications and patient satisfaction ( $p > 0.05$ ).

## Discussion

Acetabular fractures which come after high-energy traumas, can accompany many systemic injuries. Therefore, the general condition of the patient is important to determine the optimal time. Successful functional, clinical, and radiological results could be achieved, if a good anatomical reduction is achieved with a well-planned surgical intervention performed within a week [11]. In the literature, many authors said if surgery planned after 3 weeks from acetabular injury, the procedure became reconstruction rather than primary fracture treatment. A significant reduction in the clinical and radiological success of surgery has been reported if the operation can not performed within a week [4,11,20,21]. In our clinical practice, according to these rules and literature knowledge, we are planning the treatment and intervention in the first opportunity that the general condition of the patient is suitable for surgery. The average time to receive surgery for our cases is 6.4 days. There is only 1 case waiting for more than 10 days for surgical intervention. In this patient, life-threatening abdominal

**Table1.** Patologies Accompanying Acetabular Fracture

| Additional Injuries                | Number of Cases | %    |
|------------------------------------|-----------------|------|
| Traumatic knee dislocation         | 2               | 11   |
| Distal radius fracture             | 2               | 11   |
| Distal humeral fracture            | 1               | 5    |
| Bladder injury                     | 1               | 5    |
| Tarsal fracture                    | 1               | 5    |
| Sciatic nerve injury               | 3               | 17,6 |
| Head trauma                        | 1               | 5    |
| Intra-abdominal solid organ injury | 1               | 5    |
| Total                              | 7               | 41,1 |

solid organ injuries were present and acetabular surgery was planned after stabilization in coordination with the abdominal surgery team.

Letournel et al. reported a very good radiological and clinical outcomes in ratio 74% of their long follow-up in the 426 series of cases (3,10). Yanat et al. achieved good functional outcome in ratio 75,9% from 20 acetabulum fractures treated conservatively and surgically [11]. Okur et al. 48 months follow-up of 25 patients rate of good-very good functional results were 76% [12]. Erdoğan et al. conservative and surgically treated acetabulum fractures, functional outcomes in 12 surgically treated cases were 75% moderate to good [13]. Turanlı et al. the early functional outcomes of 26 surgically treated patients were 70.7% moderate to excellent [14]. The meta-analysis done by Giannoudis et al. demonstrated that the results of Harris hip score in 3 studies including 108 patients were excellent-good in ratio 78% with a median follow-up of 5 years [22]. At Gupta et al's study Harris hip scores were reported excellent to good in ratio 74.6% with average of 52 months follow-up in series of 63 cases [23]. Panagiotis found Harris hip scores 61.3% excellent and 18.7% good in 75 patients with a mean age of 34.6 years, in a long-term outcome with an average follow-up of 12.5 years. [24].

In our 17 cases' study with a mean follow-up of 26 months, a good-excellent result was obtained with a functional score of 70.5% according to Harris hip scoring (Table 2). This result is consistent with the literature [11]. In addition, three patients (17.6%) with moderate to poor results had sciatic nerve injuries due to primary trauma, preoperatively. Nerve injury can occur during the first trauma or during surgery. Nerve injury is seen in 16.4% of acetabulum fractures. Risk can increase up to 40% in cases with traumatic posterior hip dislocation [22]. The most at risk is the sciatic nerve. If it occurs during trauma, it is difficult to heal [6]. In our study, there were persistent sciatic nerve deficits in 3 cases with nerve injury. In 1 of these cases surgical intervention was performed, due to recurrent hip dislocation. Even if there are no statistically significant results due to insufficient number of cases, we think that neurological deficit before surgery has a negative effect on functional outcome after surgery.

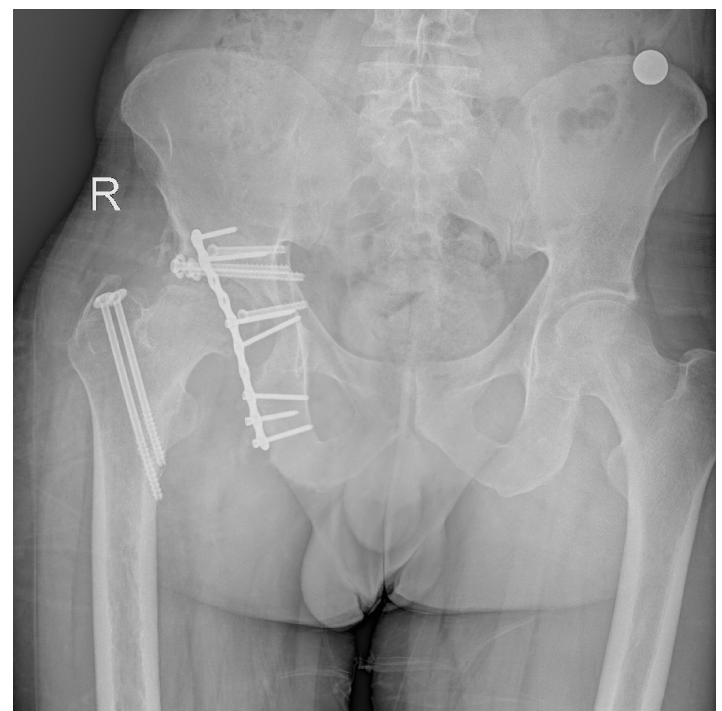
HO can usually occur in posteriorly extended approaches as a late postoperative complication [14]. Letournel reported a 26% HO in a group of patients treated with the Kocher-Langenbeck approach, and indicated that due to separation of gluteal muscles iliac bone during surgery [15]. Giannoudis et al reported in the meta-analysis involving 3760 patients, 20% of the cases had hip osteoarthritis and 10% had HO development, as late post-operative complications [22]. In our study, HO was detected in 1 case (Figure 2). This case was followed up in ICU due to accompanying head trauma and due to fracture type and reduction difficulty double incision (Kocher-Langenbeck + Ilioinguinal) was applied. All these components increase the risk of HO development.

The articular cartilage lesions due to crushing of the femoral head towards acetabular cartilage can be seen with high energy trauma. Even with anatomic reduction and stable fixation, cartilage degeneration can develops over time, and leads to post-traumatic arthritis and decreases in the clinical success rate [20,25]. In our

study, chondrolysis was detected in 3 cases (17.6%). In all of these patients, post-traumatic articular cartilage loss was detected on preoperative computerized tomography and intraarticular free cartilage fragment was removed during surgery. In one patient total hip replacement was performed at 14th. month postoperatively due to the collapse of the femur head (Figure 3). Even though adequate reduction and fixation of the acetabulum fractures is achieved surgically, we believe that the severity and energy of trauma is an important factor in the loss of cartilage and loss of functional outcomes in the patient.



**Figure 2.** Postoperatively 6th. month radiograph stage 4 HO was detected.



**Figure 3.** Radiograph of the patient who developed femoral head collapse at 8th. month postoperatively.

Although the incidence of infection in acetabulum fractures is reported to be the highest in the literature as 19%, this ratio is between 4% and 5% in the majority of the publications. Prophylactic antibiotics use during surgery, appropriate preoperative preparations, including lung imaging and urine analysis, drain usage, early removal of the urinary probe are useful to prevent infection [6]. In our study, one case has a superficial wound infection that could not respond to intravenous antibiotic therapy. *Pseudomonas aeruginosa* infection was determined with wound culture. In this case, which had been in intensive care for a long time due to additional injuries, there was a hospital-acquired pneumonia due to the same effect before surgery. Infection was relieved after recurrent surgical debridement. We suspect that an infection prior to surgery, the need for intensive care is the basis for surgical wound infections and it should be considered in pre-surgical planning.

## Conclusion

Acetabulum fractures which are life-threatening injuries, due to high-energy traumas and the current treatment is well determined surgical fixation. In the early period, with proper planning according to the type of fracture, surgery gives satisfactory functional results to the appropriate patients. However, it should not be forgotten that the severity of the trauma has a decisive influence on the surgical outcomes. Initial cartilage damage can affect the hip functions after surgery even if adequate reduction and fixation is provided. In the pre-surgical period, the focus of infection must be determined; the elimination of the infection among the matters to be considered during the preparation for the surgery.

## Competing interests

*On behalf of all authors, the corresponding author states that there is no conflict of interest.*

## Financial Disclosure

*The financial support for this study was provided by the investigators themselves.*

## Ethical approval

This work has been approved by the Institutional Review Board.

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