

# Acetabular fractures treated surgically: Which of the parameters affect prognosis

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## ABSTRACT

**BACKGROUND:** This study aims to evaluate the surgical approaches, complications, clinical and radiological findings in acetabular fractures treated with surgical methods and to determine the parameters affecting prognosis.

**METHODS:** Out of 144 patients undergone surgical treatment with the diagnosis of displaced acetabular fractures between 1994 and 2014, a total of 103 patients with 75 male and 28 female with a mean age of 36.3 years (range 19–67 years) whom clinical and radiologic follow-ups (mean: 34 months, range 2–8 years) were performed at least for two years were included in this study.

**RESULTS:** Clinically excellent to good outcomes were obtained in 64% of the patients and moderate to poor outcomes were recorded in 36% of the patients, while radiologically excellent to good outcomes were achieved in 57.3% of the patients and moderate to poor outcomes were recorded in 42.7% of the patients. Presence of one of the complications, creating mechanical block (chi-square  $p < 0.001$ ), complex fractures (chi-square  $p = 0.023$ ), increased duration between trauma and operation ( $p = 0.039$ ), operational time taking longer than six hours (chi-square  $p < 0.001$ ), more than 3 mm intra-articular step (Fisher's  $p = 0.033$ ), avascular necrosis ( $p < 0.001$ ), arthritis ( $p = 0.006$ ) and heterotopic ossification ( $p = 0.007$ ) worsened the clinical outcomes (chi-square  $p < 0.001$ ). The age of the patient was not effective on the clinical outcome ( $p = 0.461$ ).

**CONCLUSION:** It was found that three major parameters affecting the prognosis of acetabular fractures are as follows: type of fracture, operational time and reduction quality. The duration between trauma and operation indirectly affects the outcomes. Avascular necrosis, heterotopic ossification and arthritis may cause negative effects only on long term outcomes.

**Keywords:** Acetabular fractures; acetabulum; fractures; pelvic fractures; prognosis of acetabular fractures; surgical treatment of acetabular fractures.

## INTRODUCTION

Surgical treatment techniques of acetabular fractures (AFs) are still one of the important and discussed topics due to the complex anatomy of this region, severity of complications and variety of factors affecting prognosis.<sup>[1–5]</sup>

The present study aims to investigate the factors affecting prognosis by evaluating: the surgical approaches applied for displaced AFs, complications and clinically and radiological results.

## MATERIALS AND METHODS

Among 219 patients with 219 pelvic and AFs underwent surgical treatment between 1994 and 2014, out of 144 patients surgically treated for displaced AFs, a total of 103 patients (75 male, 28 female), mean age of 36.3 (range 19–67 years), were followed-up at least for two years (mean follow-up duration: 34 months; range 2–8 years) included in this study. Left acetabular fracture (AF) in 57 patients and right AF in 46 patients; 57 of the fractures caused by in-

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vehicle accident, 31 out-of-vehicle accidents and 15 falling from a height.

Three radiographic series described by Judet used with Computerized Tomography (CT) and 3D reconstruction methods used for diagnosis, while the classification of the fractures was made according to the classification described by Judet and Letournel.<sup>[6]</sup>

Surgical treatment was performed for the fractures with displacement >3 mm, roof arch angle <45°, intact posterior wall fragment <50%, in the presence of intra-articular free fragment, marginal impaction >3 mm and in femoral head fractures or the fractures accompanied by sciatic nerve lesions. The fourth author (H.Ö.) attended to all operations and worked for the follow-up of all patients.

Low-molecular-weight heparin (LMWH) was used against the risk of thromboembolism from hospitalization of the patient up to the postoperative 6<sup>th</sup> week. Patients were put on compression socks up to the 3<sup>rd</sup> month for the same purpose.

Infection prophylaxis was applied using 1<sup>st</sup> generation cephalosporin, beginning 12 hours before the surgery, repeating once every three hours during the surgery and three doses up to the postoperative 3<sup>rd</sup> day.

Prophylaxis for heterotopic ossification (HO) was applied using Indometazine 75 mg, started on postoperative 1<sup>st</sup> day, and continued over six weeks. Displacement of the articular

surface was measured with postoperative acetabular graphy series and evaluated according to Matta criteria. A displacement of 0–1 mm was considered as anatomic, 1–3 mm acceptable and ≥3 mm as inadequate reduction.

Knee and hip isometric exercises were initiated on the postoperative 2<sup>nd</sup> day. All of the patients were mobilized by a double crutch without weight-bearing in the same weeks after providing the security of the operation area.

Clinical and radiological results were evaluated through the scoring system of Merle D'Aubigne modified by Matta<sup>[7]</sup> (Table 1). Statistical analysis was performed using SPSS (Statistical Package for Social Sciences for Windows 18.0) software. Spearman's correlation test was used to investigate the relationships of the quantitative data with each other. Pearson's chi-square test or Fisher's exact test were used to evaluate the connections between categorical data. P-values less than 0.05 were considered as statistically significant results.

## RESULTS

Twenty-four (23.3%) of the patients had isolated AF, and 79 (76.7%) had AF accompanied with another injury (Table 2).

Thirty-four (33%) of the fractures were simple and 69 (67%) were complex type fractures. Posterior wall fracture (16.6%) was the most common type among simple fractures; the most frequent type in both complex fractures and among all fractures was double-column AF (25.3%) (Table 3).

**Table 1.** Clinical and radiological criteria at follow-up

Clinical criteria					
Pain		Walking		Range of motion	
None	6	Normal	6	95%–100%	6
Slight or intermittent	5	No cane but slight limp	5	80%–94%	5
After walking but resolves	4	Long distance with cane or crutch	4	70%–79%	4
Moderately severe but patient is able to walk	3	Limited even with support	3	60%–69%	3
Severe, prevents walking	2	Very limited	2	50%–59%	2
		Unable to walk	1	<50%	1
Clinical grade		<b>Excellent: 18 Good: 17–16–15 Fair: 14–13 Poor: &lt;13</b>			
Radiographic criteria					
Excellent	Normal appearance of the hip				
Good	Small osteophytes, moderate (1 mm) narrowing of joint & minimum sclerosis				
Fair	Intermediate changes, moderate osteophytes, Moderate (<50%) narrowing of joint & moderate sclerosis				
Poor	Advanced changes, large osteophytes, severe (>50%) narrowing of the joint, collapse or wear of the femoral head, and acetabular wear. Collapse or wear of the femoral head, and acetabular wear				

**Table 2.** Additional injuries to acetabulum fractures

Additional injuries	n	%
Exremity injury	56	52.9
Hip luxation	23	21.6
Intracranial injury	8	7.6
Intra-abdominal injury	7	6.6
Chest injury	6	5.7
Nerve paralysis	3	2.8
Spinal injury	3	2.8

The posterior hip dislocation was found in 19 (17.9%) patients and central hip dislocation in four (3.7%) patients. Neurological deficit due to fracture was identified in two patients with the posterior hip dislocation (one sciatic and one peroneal nerve), and in one patient with transverse + posterior wall fracture (peroneal nerve).

The duration between trauma and operation (T-O time) was between 0 and 28 days (mean 8.3 days). Surgical treatment was performed on the same day of the trauma in five patients, within one and 20 days after trauma (mean 8.3 days) in 96 patients and on the 21<sup>st</sup> and 28<sup>th</sup> days in each one patient (Table 4).

Surgical procedures were performed using Kocher Langenbeck (K-L), Iliioinguinal (II), Iliofemoral (IF), Triradiate (TR), Modified Transtrochanteric (MT) and combined incisions (CI) (Table 3).

The anatomic reduction was achieved in 78 (75.7%), acceptable reduction in 15 (14.6%) and non-acceptable reduction in 10 (9.7%) patients (Table 3).

Reconstruction plates with screws were used in 95 of 103 patients. Semi-tubular and reconstruction plates with screws were used together in seven patients and one patient was treated using only screws. These types of materials used in the surgical procedure had no significant effect on the clinical and radiological outcomes.

Five patients had superficial and five patients had a deep infection during follow-up (Tables 3, 4). Infection was regressed with antibiotic therapy in patients who had a superficial infection and after repetitive debridements and antibiotherapy in those with deep infection. None of the patients required removal of the implant.

Avascular necrosis (AVN) was found in 16 (15.5%) patients. AVN was seen in mean 22.8 months (range 6–52 months). The relationship between types of incision and types of fractures was reported in Table 3.

Despite indomethacin prophylaxis, HO, varying between stages I and 4 according to Brooker classification<sup>[8]</sup> was ob-

served in 17 (16.5%) patients (Fig. 1). Meralgia due to postoperative lateral femoral cutaneous nerve damage was seen in 2 of 20 patients operated by II incision and 1 of 3 operated using IF incision. Relationship between paralysis, HO and type of fractures, type of incision were all introduced in Table 3. None of the patients who had paralysis showed complete healing.

Symptomatic deep vein thrombosis and pulmonary embolism have not been observed except for a 63-year-old patient with posterior wall + column fracture.

Excellent to good clinical outcomes were recorded in 79.4% of the simple fractures (Fig. 2) and 56.5% of the complex fractures (Fig. 3). A significant correlation was found between the type of fracture and clinical outcome. (chi-square=5.185 p=0.023).

There was a significant correlation between T-O time and clinical outcomes ( $r=0.204$  p=0.039). However, when T-O time was categorized as 0–7 days, 8–14 days and 15–28 days; it did not show a significant effect on clinical outcome (chi-square=1.365 p=0.505).

Clinic outcomes were worsened by increasing at the operational time ( $r=0.318$  p=0.001). When the operational time was categorized as 0–3 hours, 3–6 hours and >6 hours, it statistically significantly affected clinical outcomes of the groups (chi-square=15.752 p<0.001). The relationship of the groups with each other was examined in order to find out which group caused significant effect. An operational time between 0–3 hours and 3–6 hours did not significantly affect clinical outcomes (Fisher's<0.999). However, there was a statistically significant correlation between clinical outcomes of the patients with an operational time of 0–3 hours and >6



**Figure 1.** Heterotopic ossification (shown with arrow).



**Table 4.** The relationship between age, fracture type, duration between trauma and operation, surgical time and complications, clinical and radiological results

	Age		Fracture type						T-O time				Operational time						Displacement						Complication					
	Simple		Complex						T-O time				Operational time						Displacement						Complication					
	0-20	20-40	40-60	<60	Posterior wall column	Anterior column	Transfers posterior wall	Posterior column	Transfers anterior wall	T type	Hemitransfers	Both column	0-7 days	7-14 days	14-28 days	0-3 hour	3-6 hour	<6 hour	0-1 mm	1-3 mm	<3 mm	AVN	HO	Arthrosis	Paralysis	Infection				
Patient	7	51	38	7	16	3	2	6	6	7	10	21	6	6	26	45	48	10	17	55	31	78	15	10	16	17	19	7	10	
Clinical	2	13	8	0	5	2	1	0	3	3	4	1	1	3	3	15	3	21	1	1	1	1	4	1	4	1	2	0	0	
Excellent	2	22	15	4	7	1	1	6	1	2	4	11	2	2	8	15	23	5	8	27	8	34	7	2	0	2	6	3	5	
Good	0	10	7	1	3	0	0	0	1	1	0	3	2	1	8	7	10	1	4	5	9	11	5	3	3	4	5	1	2	
Fair	3	6	8	2	1	0	0	0	2	2	3	3	1	2	7	7	8	4	0	8	11	12	2	4	12	7	7	1	3	
Poor	2	10	5	1	2	1	1	2	3	1	3	1	1	3	3	12	6	0	1	13	4	16	1	1	1	3	1	2	0	
Excellent	1	24	15	1	11	2	1	4	2	4	10	2	1	4	4	17	19	5	14	23	4	37	5	0	0	3	3	4	4	
Good	2	7	8	3	2	0	0	0	1	2	4	0	2	9	7	12	1	2	8	10	12	5	3	2	2	5	1	3	3	
Fair	2	10	10	2	1	0	0	0	1	3	4	4	3	2	10	9	11	4	0	11	13	13	4	6	13	9	10	1	3	
Poor	2	7	5	2	1	0	0	0	3	3	3	3	0	1	5	9	6	1	1	6	9	12	4	0	0	4	3	1	3	
Complications	1	9	6	1	0	0	1	0	1	2	4	2	1	6	7	7	3	3	8	6	7	5	5	5	4	0	8	0	4	
AVN	1	12	5	1	1	0	0	0	2	0	4	4	1	7	7	9	3	3	8	8	6	6	7	6	3	8	0	1	1	
HO	2	4	1	0	1	0	0	0	0	0	4	1	1	0	4	3	0	2	3	2	6	1	0	1	0	1	0	1	1	
Arthrosis	2	6	2	4	0	0	1	1	1	0	0	1	1	2	4	2	5	3	0	2	8	5	1	0	3	4	1	1	1	
Paralysis	2	6	2	4	0	0	1	1	1	0	0	1	1	2	4	2	5	3	0	2	8	5	1	0	3	4	1	1	1	
Infection	2	6	2	4	0	0	1	1	1	0	0	1	1	2	4	2	5	3	0	2	8	5	1	0	3	4	1	1	1	

T-O: Duration between trauma and operation time; AVN: Avascular necrosis; HO: Heterotopic ossification ND: mm; millimeter.

hours and those with an operational time of 3–6 hours and >6 hours (chi-square=7.378 p=0.007 and chi-square=14.010 p<0.001; respectively). Briefly, the clinical outcome was worsened with a surgery lasting longer than six hours.

Clinical outcome was also worsened with the increase of the postoperative fracture displacement (r=0.248 p=0.011). When postoperative steps were categorized as 0–1 mm, 1–3 mm and >3 mm; no statistically significant difference was found between clinical outcomes of the patients with a step between 0–1 mm and a step between 1–3 mm (Fisher's =0.232). When step groups were categorized as 0–3 and >3 mm, excellent to good outcomes were found in 67.7% of the patients with a step between 0–3 mm, while this rate is 30% in the patients with a step >3 mm (Fisher's p=0.033).

When the step increases, the incidence of arthritis and HO also increased. Arthritis was found in 14% of the patients with the step between 0–3 mm and 60% of those with the step >3 mm (Fisher's p=0.002); while HO was observed in 12.9% of the patients with the step between 0–3 mm and 50% of those with the step >3 mm (Fisher's p=0.010).

A significant correlation was found between complication occurrence and type of fracture. Complications were developed in 23.5% of the simple fractures and 58% of the complex fractures (chi-square=10.857 p=0.001).

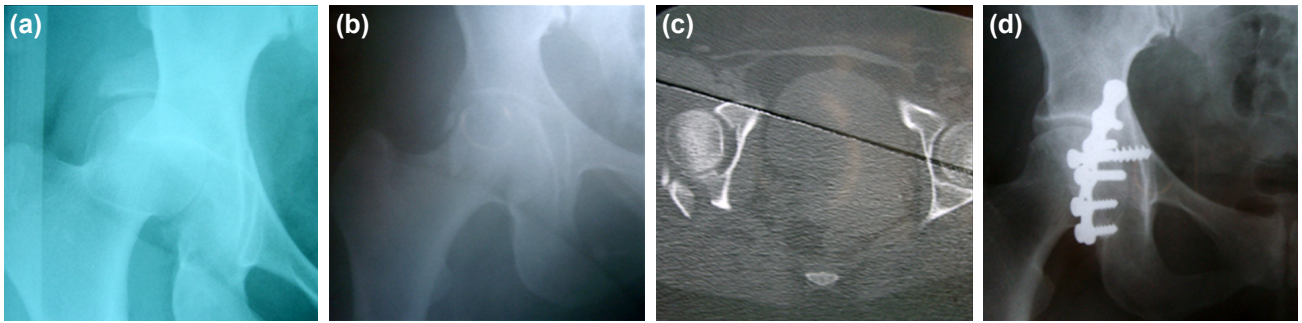
Clinical outcomes were excellence to good in 74.7% of the patients without AVN (chi-square=27.519 p<0.001), 70.2% of the patients without arthritis (chi-square=7.508 p=0.006) and 69.8% of the patients without HO (chi-square=7.328 p=0.007).

There was a significant correlation between clinical and radiological outcomes. Radiologically excellent to good outcomes were recorded in 83.3% of the patients with excellent to good and 10.8% of those with moderate to poor clinical outcomes (chi-square=50.959 p<0.001). It was determined that clinical and radiological outcomes were approximately 70% compatible with each other (kappa=0.696).

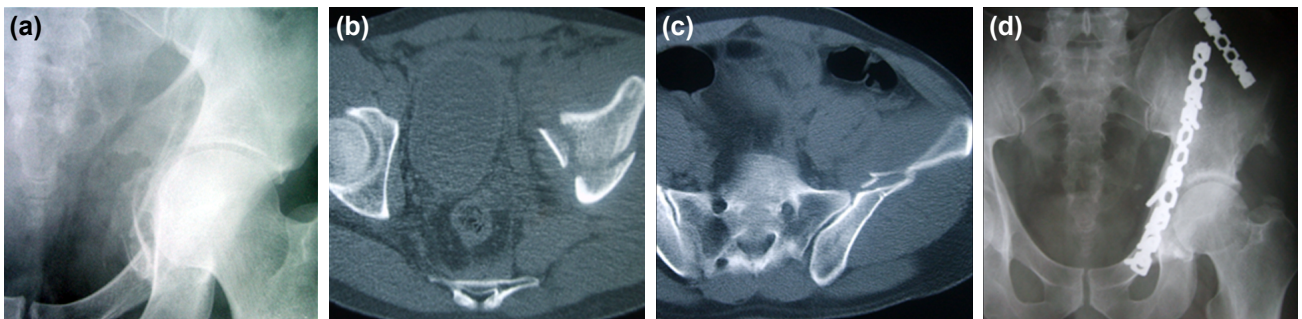
## DISCUSSION

Waiting for longer than 10 days for the surgical treatment of AFs causes difficulty in reduction due to the formation of granulation tissue, while





**Figure 2.** 42 years female, K-L incision, clinically excellent result; (a) Preoperative x-ray shows dislocated hip with posterior wall type acetabular fracture. (b) X-ray after reduction of the hip. (c) Preoperative CT. (d) 7<sup>th</sup> year, excellent radiological result.



**Figure 3.** 31 years old male, Il incision, clinically good results; (a) Preoperative x-ray. (b) Preoperative CT. (c) Preoperative CT scan shows iliac fracture. (d) 5<sup>th</sup> year postoperative x-ray shows good radiological result.

delays for longer than three weeks lead to reduction and stabilization problems due to resorption.<sup>[9-11]</sup> The mean T-O time was 8.3 days in patients in our study groups. It was found that if T-O time is prolonged, clinical outcome was worsened and operational time was prolonged and likely to become an anatomic reduction decreased in the cases that T-O time exceeding 14 days. Although not statistically significant, an interesting result found regarding T-O time was as follows: extensile or combined incisions were needed in 38.8% of the patients with T-O time between 7–14 days and 55.5% in the patients with a operation time longer than 14 days. All these data are important in suggesting that performing surgery for AFs within the first two weeks would mean a smaller incision, shorter duration of anesthesia, less soft tissue damage and better clinical and radiological outcomes, and the vast majority of the literature is consistent with our data.<sup>[12,13]</sup>

Although no randomized controlled trial was found in the literature to compare two different surgical approaches, recently, there is a tendency to shift from extensile or TR incisions toward K-L incisions,<sup>[9,14,15]</sup> whereas five different incisions were used in our study, the most commonly incisions used in the vast majority (84.5%) of the patients included KL, Il and a combination of them. Surgeons trained in the last ten years may never have seen extensile approaches other than in a laboratory or book, and these approaches are likely to become historical within the next decade or two.<sup>[16]</sup>

TR incision is a surgical approach that should be abandoned due to the high incidence of HO and infections. MT incision

and its numerous disadvantages are reported in the literature, is not an approach that should be avoided as reported in the literature<sup>[8,17]</sup> because of leading shortened operational time, low incidence of HO and infections as demonstrated in the present study; also can be used as an alternative to extensile and combined approaches in fragmented, complicated fractures.

Studies in the literature report localization and amount of the displacement, compliance between the femoral head and acetabulum and roof restoration as the most important prognostic indicators of AFs.<sup>[18,19]</sup> Rowe and Lowell<sup>[12]</sup> reported poor treatment results in cases of a displacement >3 mm, while Matta<sup>[15]</sup> reported the acceptable amount of displacement as 3 mm. In our study, clinical outcome was statistically worsened as the intra-articular step exceeds 3 mm while excellent to good outcomes were achieved in 70.5% of the patients could be reduced anatomically. Because of the 29.5% moderate to the poor rate of anatomically reduced fractures, it is important to show that anatomic reduction is not alone prognostic factor for AFs.

In the literature, the infection rate after AFs treated surgically have been reported between 4–5% and 19% is the highest one.<sup>[9,20,21]</sup> Infection rate, 9.7% recorded in our study, is higher than the literature because of the use of combined or extensile incisions in one-third of the patients and prolonged operational time due to lack of experience, especially in the first years (operational time was over eight hours in almost all patients who developed infections). The finding which is needed to be deliberated is that the infection rate is higher

in combined and extensile incisions by four times compared to single or limited incisions. This is meaningful for suggesting that single and limited incisions should be preferred, while extensile and combined incisions should be avoided.

The literature reports the incidence of HO as 15–50% and HO blocking hip joint movement (Brooker type III-IV) as 7%,<sup>[8,22–23]</sup> while in our study, the incidence of HO was found as 16.5% (17 patients) and HO blocking hip joint movement as 4.9%. The incidence of HO increased in all extensile incisions except MT. The rate of HO was 15% in the patients operated within two weeks after the trauma, while this rate raised to 30% after the 2<sup>nd</sup> week. HO was observed in 15.2% of the patients with the operational time between 0–6 hours and 19.4% in those with operations ending longer than six hours. The incidence of HO was found to be significantly decreased in simple fractures and in the cases with a step <3 mm could be provided. These data indicate that operating patients within the first two weeks, operational times shorter than six hours and preference of limited surgical incisions are important to avoid HO.

Another late complication of AFs is AVN. Letournel<sup>[24]</sup> reported the rate of AVN as 5.6%, Tile<sup>[5]</sup> as 18% and Alonso<sup>[4]</sup> as 2–25%. AVN is seen in a combination with arthrosis in the cases with delayed reduction and becomes radiologically marked within two years following injury. In our study, AVN was found in 15.5% of the patients. This rate was 26.3% in patients with posterior hip dislocation and 25% in those with central dislocation. Although not statistically significant, one-third of the patients who developed AVN had posterior dislocation and AVN was identified in one-third of the patients with posterior dislocation. These findings suggest a relationship between them. AVN was found in 20% of the patients operated within the first week after trauma; 12.5% of the patients operated between 1-2 weeks, and 10% of the patients operated after the 2<sup>nd</sup> week. Unlike information from the literature, in our study, prolonged T-O time did not increase the incidence of AVN. Posterior incisions (KL, MT, combined, TR) used in 15 of 16 patients developed AVN. AVN was found in 5.8% of the patients with an operational time between 0–3 hours, 10.9% of the patients with an operational time between 3–6 hours, and 29% of the patients with an operational time longer than six hours. The risk of AVN was increased by 2.7 times in the surgeries ending longer than six hours, compared to ending between 3-6 hours. These data demonstrate that the presence of dislocation, operational time and type of incision are parameters affecting the development of AVN. Although unlike the literature, increased T-O time was found as not increasing the incidence of AVN. It should be remembered that 98% of AVNs develop at the time of trauma and emergency reduction of the dislocation may prevent the development of AVN.

Arthritis is one of the late complications of AFs. Several predisposing factors have been reported as the risk of arthritis,

including cartilage damage at the time of trauma, collapses that may develop at the late period, multi fragmentation of the fracture, localization, amount of the residual displacement and patients >40 years-old. The most important factor is residual displacement caused by inadequate reduction. There is a consensus on that displacement >3 mm would result in arthritis.<sup>[1,25,26]</sup> Tile reported the rate of arthrosis as 10% in anatomic reduction and 36% in inadequate reduction.<sup>[27]</sup> In our study, arthritis was identified in 18.5% of the patients. Of the patients with arthritis identified, 84.2% had complex and 15.8% had simple fractures. Arthritis was observed in 14% of the patients with a step between 0–3 mm and 60% of the patients with a step >3 mm (Fisher's  $p=0.002$ ). Although the incidence of arthritis is significantly increased when the amount of displacement exceeds 3 mm, arthritis was found in 7.7% of the patients with anatomic reduction provided, and these findings suggest that other predisposing factors also play a role. Arthritis was found in 17.2% of the patients operated within the first two weeks after the trauma, while this rate was found as 30% in those operated after two weeks. Although not statistically significant, 1.8 times, the difference between these two groups is obviously seen. Our statistical analysis indicates that the incidence of arthritis is significantly higher in the complex fractures than the simple fractures (chi-square  $p=0.077$ ), and also arthritis was recorded in 66.6% of T type fractures and 26.9% of double-column fractures. The most remarkable point is that 57.9% of all identified arthritis cases were recorded in these two types of fractures. Based on this information, it can be said that the severity of trauma causing fracture is responsible for the type of fracture at least, T-O time, and reduction quality are responsible for the development of arthritis.

In our study, clinical outcomes were statistically significantly worsened in cases of complex fractures, prolonged T-O time, surgeries taking longer than six hours, intra-articular step >3 mm and presence of any of AVN, arthritis and HO. However, the age of the patients had no significant effect on clinical outcomes. All these results indicate that evaluating patients' pre-traumatic functional status rather than age is more significant when making a decision for the surgical treatment of AFs. It should be kept in mind that technological developments could help us, especially for the treatment of complex type fractures. For example, 3D printing assisted surgical technique would be preferred for these types.<sup>[28]</sup> It is difficult to be sure, but one would hope that the advances made during this time have led to improvements in outcome and that if modern-day techniques had been available to Letournel, even better results would be seen.<sup>[16]</sup>

Letournel pointed out that clinical outcomes are better than radiological ones. This is because of the late onset of patients' complaints despite the earlier onset of radiographic arthrosis findings.<sup>[24]</sup> According to Matta, excellent anatomic reduction term is used based on radiologic imaging, which often causes misleading.<sup>[15]</sup> The results of our study support this information.

In conclusion, results obtained in this study demonstrated that type of fracture, operational time and reduction quality are the three major parameters affecting the prognosis of AFs that are surgically treated. T-O time indirectly affects the outcomes and avascular necrosis, heterotopic ossification and arthritis bring on negative effects only on long term outcomes.

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ORİJİNAL ÇALIŞMA - ÖZET

## Cerrahi olarak tedavi edilen asetabulum kırıkları: Prognozu hangi parametreler etkiler?

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**AMAÇ:** Çalışmada, cerrahi yöntemlerle tedavi edilen asetabulum kırıklarında uyguladığımız cerrahi yaklaşımları, oluşan komplikasyonları ve elde edilen klinik ve radyolojik sonuçları değerlendirerek prognoz üstünde etkin olan parametreleri saptamak amaçlandı.

**GEREÇ VE YÖNTEM:** Ocak 1994–Ocak 2014 tarihleri arasında deplase asetabulum kırığı tanısıyla cerrahi tedavi uygulanan 144 olgudan, en az iki yıl süreyle klinik ve radyolojik takipleri yapılan (ortalama takip süresi 34 ay, dağılımı 2–8 yıl) ve yaş ortalaması 36.3 yıl (19–67 yıl) olan 75'i erkek, 28'i kadın toplam 103 hasta çalışmaya alındı.

**BULGULAR:** Hastaların klinik olarak %64'ünde mükemmel ve iyi, %36'sında orta ve kötü sonuç, radyolojik olarak ise %57.3'ünde mükemmel ve iyi, %42.7'sinde orta ve kötü sonuç elde edildi. Kırığın kompleks olması (ki-kare  $p=0.023$ ), travma ile operasyon arası sürenin artması ( $p=0.039$ ), cerrahi sürenin altı saatten uzun sürmesi (ki-kare  $p<0.001$ ), eklem içi basamaklaşmanın 3 mm'den fazla olması (Fisher's  $p=0.033$ ), mekanik blok oluşturan komplikasyonların gelişmesi (ki-kare  $p<0.001$ ) klinik sonuçları kötüleştirmekteydi. Hastaların yaşının klinik sonuç üzerine anlamlı etkisi yoktu ( $p=0.461$ ).

**TARTIŞMA:** Cerrahi olarak tedavi edilen asetabulum kırıklarının prognozuna etki eden üç temel parametrenin; kırık tipi, cerrahi girişim süresi ve reduksiyon kalitesi olduğu, travma ile operasyon arasında geçen sürenin sonuçları dolaylı olarak etkilediği, avasküler nekroz, heterotropik ossifikasyon ve artirtin ise sadece uzun dönem sonuçları üzerinde olumsuz etkiler yarattığı tespit edildi.

**Anahtar sözcükler:** Asetabulum; asetabulum kırıkları; asetabulum kırıkları cerrahi tedavisi; asetabulum kırıkları prognozu; kırıklar; pelvis kırıkları.

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