



## Bilateral Intra-Articular Distal Radius Fractures and Concomittant Organ injuries

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**Aims:** In this study we aimed to show the short term treatment results in patients with bilateral intra-articular distal radius fracture and the probable frequency of coexistence other organ pathologies.

**Material and Methods:** Between January 2002 and February 2003, we evaluated 4 patients with bilateral intra-articular distal radius fractures. Mean age of the patients was 38 years (range 21-52) and mean follow up period was 16.5 months (range 13-23). Of these we encountered splenic rupture in three, kidney injuries in two, sacrum non-displaced fracture in one, non-displaced acetabular fracture in one, sacroiliac separation in one and non-displaced tibial fracture in one, fracture-dislocation of left elbow in one as concomittant injuries. All had fallen from a height. Fractures were classified according to Frykman; five being type seven and three being type eight. Despite a patient who was treated with open reduction and limited osteosynthesis, the rest of the patients were treated with closed reduction and limited osteosynthesis with K-wires and unilateral external fixators.

**Results:** Radiologic results were evaluated according to Stewart, whereas the functional outcome was evaluated with Demerit-Point Rating System. Regarding the radiological results, the outcome was fair in two and poor in six of the patients. However, the functional evaluation revealed one good, five fair and two bad results.

**Conclusion:** The outcome of the short-term results of bilateral intra-articular distal radius fractures, caused by falling from a height, that were treated with bilateral external fixators are poor and concomittant injuries, especially spleen injuries, were frequent.

**Key Words:** Distal Radius, Distal Radius Fracture, External Fixators, Spleen

### Bilateral İntraartiküler Distal Radius kırıkları ile Beraber Organ Yaralanmaları

**Amaç:** Bu çalışmada bilateral distal radius kırıklı hastalardaki kısa dönem tedavi sonuçlarını ve beraberinde olabilen organ yaralanmalarının sıklığının sunulması amaçlanmıştır

**Gereç ve Yöntem:** Ocak 2002 ile Şubat 2003 arasında, bilateral intraartiküler distal radius kırıklı ortalama yaşı 38 yıl (21-52) olan dört hasta değerlendirmeye alındı. Ortalama takip süresi 16.5 (13-23) ay idi. Ek organ yaralanması olarak, olguların üçünde dalak rüptürü, ikisinde böbrek yaralanması, birinde sakrum nondeplese kırık, birinde sakroiliyak ayrışma, birinde nondeplese tibia kırığı ve birinde dirsek kırıklı çıkığı mevcuttu. Distal radius kırıkları (DRK), Frykman'ın sınıflamasına göre, kırıkların beşi tip yedi, üçü tip sekiz idi. Bir hasta açık redüksiyon + k-telleriyle minimal osteosentez+ unilateral eksternal fiksator ile tedavi edildi. Üç hastada kapalı redüksiyon + k-telleriyle minimal osteosentez+ unilateral eksternal fiksator ile tedavi edildi.

**Sonuçlar:** Stewart'a göre yapılan radyolojik değerlendirmede, iki orta ve altı kötü sonuç bulundu. Demerit-point rating system'e göre fonksiyonel değerlendirmede ise bir DRK'da iyi, beşinde orta ve ikisinde kötü sonuç bulundu.

**Results:** Bilateral distal radius kırıkları yüksekten düşme nedeniyle meydana gelmekte ve kısa dönem sonuçları kötü bulunmuştur. Bu kırıklar yanında hastada, başta dalak yaralanmaları olmak üzere, ek organ yaralanmalarının sıklığı fazladır.

**Anahtar Kelimeler:** Distal Radius, Distal Radius Kırığı, Eksternal Fiksator, Dalak

There are several similarities found in blunt trauma injuries to humans sustained as a result of vertical deceleration (falling) and those sustained as a result of deceleration in a horizontal plane (automobile accidents). However, examination of the patterns of skeletal injuries can distinguish those injuries associated with falling from heights from those associated with automobile accidents. While there is considerable variation within each type of blunt trauma injury dependent on the angle at which one falls or is struck, there are several characteristic skeletal features

associated with each type of trauma.<sup>1</sup> In this study we aimed to evaluate the outcome of short term results of bilateral intra-articular distal radius fractures caused by falling from a height and were treated with bilateral external fixators, and the concomittant organ, especially splenic, injuries.

**PATIENTS and METHODS**

We evaluated 4 patients with bilateral intra-articular distal radius fracture who were treated surgically between January 2002 and February 2003. Three patients were female and one of them was male. Mean age of the patients was 38 years (range 21-52) and follow up period was 16.5 months (range 13-23). Etiology in all patients was falling from a height. Distal radius fractures were classified according to Frykman, five being type seven and three being type eight.<sup>2</sup>

Radiologic evaluation was made according to the Stewart anatomical scoring that is based on the dorsal angulation and loss of radial length and radial angle.<sup>3</sup> The pre-operative and post-operative radiographs of one of our patients is illustrated on figures 1-3.

**Figure 1.** Case 1. A twenty one-year-old man's anteroposterior and lateral radiographs pre-operative (a-b) post-operative (c-d) after fixation of the right distal radius



Functional evaluation was made according to the Demerit point rating system.<sup>4</sup> Grip strength and key pinch were measured and these values were

compared with the normal population.<sup>5</sup> Semmes Weinstein Monofilament (SWM) test was applied for sensory evaluation.<sup>6</sup>

**Figure 2.** Pre-operative (a-b) and post-operative (c-d) anteroposterior and lateral radiographs of the left distal radius.



**Figure 3.** Bilateral anteroposterior (a) and lateral radiographs (b), after 18 months postoperatively.



Table1. Follow-up data

Case	Sex	Age (years)	Type of Fracture		Anatomical Scoring		Functional Scoring	
			Right	Left	R	L	R	L
1	Female	53	VIII	VII	3	3	20	23
2	Female	43	VII	VIII	6	1	19	13
3	Female	21	VII	VII	3	1	12	8
4	Male	37	VII	VIII	3	4	17	11

As the concomitant injuries, splenic rupture was observed in 3, sacroiliac separation in 1 and non-displaced tibial fracture in 1, kidney injuries in 2, non-displaced sacrum fracture in 1, non-displaced acetabular fracture in 1, fracture-dislocation of the left elbow in 1 patient. The mean period elapsed up to the operation time was 4 days (range 1-7). Three patients were treated with closed reduction and limited osteosynthesis by K wires and unilateral external fixators. One of the patients was treated by open reduction and limited osteosynthesis by K wires and unilateral external fixators for distal radius fractures. Controlled active and passive finger motion exercises were started the day after the operation. External fixation took six weeks and physical therapy was started thereafter.

**RESULTS**

Four patients with an average follow-up of 16.5 months were evaluated with the Demerit point-rating system.<sup>4</sup> Using this scale, five patients (%62) revealed fair results, two (25%) poor results, and one patient (%12) were classified as good. There were no excellent results. Stewart anatomical scoring was performed on the last AP and lateral radiography. Using this scale, six patients (%75) revealed good results and two of them were classified as fair.<sup>3</sup> There were no bad and excellent results.

Regarding the concomitant injuries with respect to the falling level, we observed that Case 1 fell from a 5 meters height and had a non-displaced tibia fracture. Case 2 fell from a height of 7 meters and had splenic rupture and sacroiliac (SI) separation, and treated with splenectomy and external fixator for SI separation. Case 3, who fell from a height of 10 meters, had splenic ruptures and kidney injuries treated with splenectomy and kidney repair. Case 4, fell from 18 meters height and had splenic rupture and kidney injuries and non-displaced sacrum and acetabular fractures, left fracture-dislocation of elbow. For splenic ruptures and kidney injuries, splenectomy and kidney repair were accomplished. Open reduction and internal fixation were

accomplished for the elbow fracture-dislocation. The non-displaced sacrum and acetabular fractures were treated with conservative methods. Cases 3 and 4, were reoperated for open reduction of the distal radius, due to the loss of reduction within the post-operative period

The loss of average grip strength was 68% on the right hand and 51% on the left hand. The loss of key pinch was 34% and 26% respectively. Average time to return to the previous job was 5.25 months (range 3-9). SWM test for sensorial exam was performed for radial, ulnar and median nerves. The result was D2.83, which could be accounted as normal.<sup>6</sup> The follow-up data is illustrated on Table1.

**Complication:** In one of the patients we observed Reflex Sympathetic Dystrophy, which was treated with physical therapy and drug administration. Post-operative infection was observed in one patient and healed by antibiotherapy.

**DISCUSSION**

Treatment of high velocity trauma induced unstable distal radius fractures in young adults is difficult and challenging and the incidence of post-traumatic arthritis is up to 40%, therefore, in these cases restoration of the articular congruity is essential for good results.<sup>7-11</sup> Especially severely comminuted intra-articular (Frykman type VII-VIII) fractures of the distal radius should be treated by open reduction and combined internal and external fixation.<sup>12-15</sup> External fixator alone generally fails to reduce the severe articular comminution adequately or to correct and maintain length through ligamentotaxis.<sup>16-17</sup> Seitz et al have confirmed that supplemental K-wire fixation directly increases fragment stability and prevents loss of reduction by musculotendinous forces.<sup>18</sup>

Three of our case were treated with closed reduction and limited osteosynthesis by K wires and unilateral external fixators. Two of these patients had to be reoperated because of loss of reduction. No additional

intervention was required for the case in who open reduction and limited osteosynthesis by K wires and unilateral external fixators were performed. The radiologic results were relatively good but the functional results were not satisfactory. The loss of grasping force was more significant than key pinch force. The unsatisfactory results in these patients may be due to; 1) the severe cartilage damage and subchondral collapse that occurred at the high velocity vertical deceleration trauma, 2) the associated injuries such as spleen rupture and kidney damage, that lead to disorganised general conditions, which in turn forced us to accomplish the operation faster than the normal conditions.

Distal radius fractures are usually associated with soft tissue injuries, compartment syndromes, ipsilateral fractures or dislocations of the upper extremity.<sup>19</sup> Rascovic found that spleen traumatic rupture is mostly caused by falls, accidents (traffic) and then by blows and fights.<sup>20</sup> Some authors reported that the traffic accidents are the most frequent cause of spleen rupture.<sup>21-25</sup> Several authors reported the overall mortality rate in traumatic splenic injuries is between 12-21%.<sup>20-25</sup> We observed an increased rate of concomitant injuries with the increased height of vertical deceleration in our patients.

## CONCLUSION

Bilateral intra-articular distal radius fractures come into existence as a result of high velocity trauma such as falling from a height. We observed that the radiologic results were relatively good but the functional results were not satisfactory in cases of severe intra-articular fracture. These unsatisfactory functional results may be related with concomitant injuries that influence the operation and the severe articular damage that may have occurred due to these high-energy traumas.

It must be recognized that, with the increased height of vertical deceleration, the rate of concomitant injuries also increase. Especially in emergency services, physicians must be aware of admitting such patients for concomitant organ pathologies,

particularly for splenic rupture and other musculoskeletal injuries.

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