

HIGH RATES OF REDUCTION IN CONSERVATIVE TREATMENT OF GERIATRIC DISTAL RADIUS FRACTURES

Geriatrik Distal Radius Kırıklarının Konservatif Tedavisinde Yüksek Redüksiyon Oranları

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ABSTRACT

ÖZ

Objective: The aim of this study is to evaluate the early reduction results in conservative treatment of distal radial fractures in geriatric patients.

Material and Methods: Patients aged over 60 years with displaced distal radius fractures who were treated with conservative treatment were included in the study. Follow-up X-rays of the patients at the 1st week were evaluated. Patients' data were obtained from hospital information management system. We evaluated the patient's age, sex, fracture side, the mechanism of injury, type of AO/OTA classification, loss of reduction, and treatment methods.

Results: One hundred and nineteen patients of 132 geriatric patients with distal radius fracture were eligible for the inclusion criteria. 97.6% of patients with AO type 2R3A fracture were found to be within acceptable degrees of reduction in the 1st week of conservative treatment. Seven patients had a loss of reduction. Six had a high degree of dorsal angulation, and one had over 2mm step off. There was no significant difference in terms of conservative treatment success between extra-articular fractures and partial and complete intra-articular fractures (p=0.584).

Conclusion: We demonstrated that initial closed reduction and cast immobilization is an effective treatment method in the management of elderly patients with AO type 2R3A, 2R3B, and 2R3C distal radius fractures.

Keywords: Distal radius fractures, geriatric fractures, conservative treatment, closed reduction

Amaç: Bu çalışmanın amacı, geriatrik hastalarda radius distal uç kırıklarının konservatif tedavisinde erken redüksiyon sonuçlarını değerlendirmektir.

Gereç ve Yöntemler: Radius distal uç kırığı olan 132 geriatrik hastanın 119'u çalışmaya dahil edilmiştir. Yer değiştirmiş radius distal uç kırığı olan ve konservatif olarak tedavi edilen 60 yaş üstü hastalar çalışmaya alındı. Hastaların birinci haftadaki takip röntgenleri değerlendirildi. Hasta verileri hastane bilgi yönetim sisteminden elde edildi. Hastaların yaşı, cinsiyeti, kırık tarafı, yaralanma mekanizması, AO/OTA sınıflandırması tipi, redüksiyon kaybı ve tedavi yöntemleri taranmıştır.

Bulgular: AO tip 2R3A kırığı olan hastaların %97,6'sında konservatif tedavinin birinci haftasında kabul edilebilir bir redüksiyon derecesi elde edilmiştir. Yedi hastada redüksiyon kaybı vardı. Altı hastada yüksek derecede dorsal açılma ve bir hastada ise 2 mm'nin üzerinde bir basamaklanma mevcuttu. Eklem dışı kırıklar ile kısmi ve tam eklem içi kırıklar arasında konservatif tedavi başarısı açısından anlamlı fark yoktu (p=0.584).

Sonuç: AO tip 2R3A, 2R3B VE 2R3C radius distal uç kırığı olan yaşlı hastaların ilk tedavisinde kapalı redüksiyon ve alçı immobilizasyonunun etkili bir tedavi yöntemi olduğunu gösterdik.

Anahtar Kelimeler: Radius distal uç kırıkları, geriatrik kırıklar, konservatif tedavi, kapalı redüksiyon



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Received / Geliş Tarihi: 05.03.2020

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Accepted / Kabul Tarihi: 25.08.2020

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INTRODUCTION

Distal radius fractures (DRFs) are one of the most common wrist injuries and their incidence has been reported to be increasing worldwide, particularly in elderly patients (1-3). Treatment options are controversial and variable, ranging from conservative treatment (closed reduction and casting) to surgical procedures (external fixation, percutaneous pinning, open reduction, and plating) (4-7). There have been a few studies in which the results were inconclusive (8-10). The goal of treatment is to obtain a painless extremity with good function (11). Surgical management may improve radiographic parameters, but improvement in these parameters may not mean better clinical outcomes. In addition, the American Academy of Orthopaedic Surgeons guidelines also did not recommend the surgical treatment of distal radius fractures in geriatric patients (12). Given the lack of these outcome data, there is currently no clear guideline to direct the treatment of distal radius fractures in geriatric patients.

The aim of this study is to evaluate the early reduction results in conservative treatment of distal radius fractures in geriatric patients.

MATERIALS AND METHODS

This study was approved by the local ethics committee (*Kırıkkale University Non-Interventional Research Ethics Committee, 08.01.2020-2020.01.06*). This is a cross sectional retrospective study involving 132 geriatric distal radius fractures (women, n=87 (65.9%); men, n=45 (34.1%); mean age, 70.7±8.8 (range: 60-93). Patients aged over 60 years with displaced distal radius fractures who were treated with conservative treatment were included in the study.

Patients with pathological fractures, old or open fractures, metabolic bone disease, fractures with nerve or vascular injury, and inadequate or absent of radiographic data were excluded. Patients who underwent initial open reduction and plate fixation, closed reduction and percutaneous pinning, external fixation, and limited internal fixation combined with external fixation were considered to have an operative management. Moreover, patients who underwent closed reduction and long/short arm cast or splint immobilization were considered to have a conservative management. Follow-up X-rays of the patients at the 1st week were evaluated. Patients' data were recorded including the patient's age, sex, fracture side, the mechanism of injury, type of AO/OTA classification, loss of reduction, and treatment methods. We defined unacceptable criteria for closed reduction as >10mm radial shortening, >10° radial inclination, >5mm ulnar variance, >20° radial dorsal angulation, and >2mm step-off (13,14). The outcomes were obtained from post-reduction radiographs of the injured wrist in anteroposterior and lateral views with a PACS integrated hospital information management system. All X-rays were obtained from a 1-meter distance from the tube.

The Statistical Package for the Social Sciences (SPSS for Windows Release 21.0 Standard Version Copyright SPSS, Illinois, USA) program was used for statistical analysis. Descriptive statistics related to categorical variables are shown as numbers and percentages, and those associated with numerical variables are presented as mean, standard deviation, median, minimum, and maximum values. McNemar's test was used to compare categorical variables in dependent groups. Chi-square and Fisher's exact tests were used to compare categorical variables in independent groups. A significance level of 0.05 was set (p<0.05 if there was a significant difference; p>0.05 if no significant difference was stated).

RESULTS

One thousand four hundred and eighty-two patients with distal radius fracture were scanned in the hospital information management system. One hundred and nineteen geriatric patients of 132 patients with distal radius fracture (2R3A, (n=82); 2R3B, (n=28); 2R3C, (n=22)) were compatible with inclusion criteria. Most patients were AO type 2R3A2.2 (60-45%). Patients were treated mostly with conservative management (89%). Patients' demographic characteristics are shown in Table 1. Most frequent mechanism of injury was fall from a standing height (91%). Details of mechanism of

injury are given in Table 2. 97.6% of patients with AO type 2R3A fracture were found to be within acceptable degrees of reduction at the 1st week of conservative treatment according to the criteria mentioned above. Seven patients had loss of reduction. Six had a high degree of dorsal angulation and one had over 2mm step off. Details of conservative treatment success are shown in Table 3a,b. There was no significant difference in terms of conservative treatment success between extra-articular (AO type 2R3A) fractures and partial (AO type 2R3B) and complete intra-articular (AO type 2R3C) fractures (p=0.584).

Table 1: Demographic data of patients with distal radius fractures

Variables	Values
Number of patients	132
Age (year)	70.7 ± 0.7
Sex	
Male	45 (34.1%)
Female	87 (65.9%)
Side of extremity	
Right	72 (54.5%)
Left	60 (45.5%)
Types of fractures	
2R3A	82 (62%)
2R3B	28 (21%)
2R3C	22 (17%)
Number of patients with unacceptable reduction	7
Methods of treatment	
Conservative treatment	119 (90.2%)
Surgical treatment	13 (9.8%)

Table 2: Distribution of treatment methods (initial and after loss of reduction) and mechanism of injury according to fracture

AO Classification	Treatment Methods										Mechanism of Injury								Treatment methods of after loss of reduction		
	CR and Casting		OR and Plate Fix.		CR and Pining and Ex-Fix.		CR and Pining		CR and Ext-Fix.		Fall from standing height		Fall from high		Industrial injury		Traffic Accident		OR and Plate Fix.	CR and Pining	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%			
2R3A1	2	1,5	0	0	0	0	0	0	0	0	0	2	1,5	0	0	0	0	0	0	0	0
2R3A1.2	1	0,8	0	0	0	0	0	0	0	0	0	1	0,8	0	0	0	0	0	0	0	0
2R3A2.1	19	14,3	0	0	0	0	0	0	0	0	0	17	12,8	0	0	0	0	2	1,5	0	0
2R3A2.2	52	39	6	4,5	0	0	1	0,8	1	0,8	56	42	0	0	0	0	4	3	4	1	
2R3A2.3	2	1,5	0	0	0	0	0	0	0	0	2	1,5	0	0	0	0	0	0	0	0	0
2R3A3.1	2	1,5	0	0	0	0	0	0	0	0	2	1,5	0	0	0	0	0	0	0	0	0
2R3A3.3	2	1,5	0	0	0	0	0	0	0	0	1	0,8	0	0	0	0	1	0,8	0	0	0
2R3B1.1	9	6,8	0	0	0	0	0	0	0	0	7	5,3	0	0	0	0	2	1,5	0	0	0
2R3B1.3	2	1,5	0	0	0	0	0	0	0	0	1	0,8	1	0,8	0	0	0	0	0	0	0
2R3B2.1	1	0,8	0	0	0	0	0	0	0	0	1	0,8	0	0	0	0	0	0	0	0	0
2R3B2.2	5	3,8	0	0	1	0,8	1	0,8	0	0	4	3	0	0	0	0	3	2,2	1	0	0
2R3B3.1	1	0,8	0	0	0	0	0	0	0	0	1	0,8	0	0	0	0	0	0	0	0	0
2R3B3.3	2	1,5	0	0	0	0	0	0	0	0	1	0,8	0	0	1	0,8	0	0	0	0	0
2R3C1.1	4	3	0	0	0	0	0	0	0	0	4	3	0	0	0	0	0	0	0	0	0
2R3C1.2	4	3	1	0,8	0	0	0	0	0	0	5	3,8	0	0	0	0	0	0	0	0	0
2R3C1.3	1	0,8	0	0	0	0	0	0	0	0	1	0,8	0	0	0	0	0	0	1	0	0
2R3C2.1	4	3	0	0	0	0	1	0,8	0	0	5	3,8	0	0	0	0	0	0	0	0	0
2R3C2.2	2	1,5	0	0	0	0	0	0	0	0	2	1,5	0	0	0	0	0	0	0	0	0
2R3C2.3	1	0,8	0	0	0	0	0	0	0	0	1	0,8	0	0	0	0	0	0	0	0	0
2R3C3.1	2	1,5	1	0,8	0	0	0	0	0	0	1	0,8	1	0,8	1	0,8	0	0	0	0	0
2R3C3.2	1	0,8	0	0	0	0	0	0	0	0	1	0,8	0	0	0	0	0	0	0	0	0

Table 3a: Details of conservative treatment success according to AO types. 2 cells (50,0%) have expected count less than 5. The minimum expected count is 2,29.

AO Classification		Conservative treatment	Loss of reduction	Total
2R3A	Count	75	5	80
	%	93,8%	6,3%	100,0%
2R3B-C	Count	37	2	39
	%	94,9%	5,1%	100,0%
Total	Count	112	7	119
	%	94,1%	5,9%	100,0%

Table 3b: Details of conservative treatment success according to AO types. Computed only for a 2x2 table

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,060 ^a	1	,807		
Continuity Correction ^b	,000	1	1,000		
Likelihood Ratio	,061	1	,805		
Fisher's Exact Test				1,000	,584
Linear-by-Linear Association	,059	1	,808		
N of Valid Cases	119				

DISCUSSION

As the patients get older, more patients may have contraindications to surgical procedures due to their systemic diseases, and more patients may wish to receive conservative management instead of surgical management. In this study, we assessed the early radiological outcomes of conservative treatment of geriatric distal radius fractures. We found that there was no significant difference between fractures types in terms of success of early reduction parameters. Surgical intervention is a less preferred treatment of distal radius fractures in geriatric patients than young patients due to low functional expectation in elderly patients. However, reduced bone quality due to prolonged life leads to more distal radius fractures in geriatric patients. On the other hand, increased number

of employees over 60 years, forces orthopedics into a search for different treatment methods that will allow early return to work. Yao-sen Wu et al. suggested surgical treatment because it provides an early return to work (15). However, they underlined that mainly, the severity of the fracture and associated distal radioulnar instability influenced the decision of the surgery. In contrast, we demonstrated that elderly patients with AO type 2R3A, 2R3B and 2R3C radius distal fractures had low loss of reduction rates in initial views. Therefore, we highly recommend ortho-surgeons to consider conservative treatment option in the management of these fractures particularly in geriatric patients.

Although good functional results can be achieved despite an inadequate reduction, an excellent function

is more likely achieved if the anatomic reduction is restored. We found that most of the reason for the loss of reduction was unacceptable dorsal angulation. Ling de Kong et al. demonstrated that unacceptable alignment showed limited flexion which is considered to be influenced by dorsal angulation (16). However, patients with poor reduction did not have significantly worse clinical outcomes. Studies that involve long-term follow-up with clinical scoring are needed to understand the effect of reduction on functionality.

There are several limitations that should be considered. First, data of results were obtained retrospectively. Therefore, accuracy of study depended on the accuracy of documentation. If patients would have been evaluated with post-union follow up x-rays and had been scored clinically, more certain outcomes could be achieved. Finally, although relevant indicators were measured repeatedly, measurement error could not be avoided.

Management of the geriatric distal radius fractures with closed reduction and cast immobilization leads to satisfactory reduction parameters in most cases. We demonstrated that closed reduction and cast immobilization has lower loss of reduction rates. Thus, we recommend initial closed reduction and cast immobilization for even active elderly patients in the management of AO 2R3A, 2R3B, and 2R3C distal radius fractures.

Ethics Committee Approval: Kırıkkale University Non-Interventional Research Ethics Committee, 08.01.2020-2020.01.06.

REFERENCES

1. Karl JW, Olson PR, Rosenwasser MP. The Epidemiology of Upper Extremity Fractures in the United States, 2009. *J Orthop Trauma*. 2015;29(8):242-4.
2. Padegimas EM, Ilyas AM. Distal radius fractures: emergency department evaluation and management. *Orthop Clin North Am*. 2015;46(2):259-70.
3. Walenkamp MM, Rosenwasser MP, Goslings JC, Schep NW. A multicentre cross-sectional study to examine physicians' ability to rule out a distal radius fracture based on clinical findings. *Eur J Trauma Emerg Surg*. 2016;42(2):185-90.
4. Mauck BM, Swigler CW. Evidence-Based Review of Distal Radius Fractures. *Orthop Clin North Am*. 2018;49(2):211-22.
5. Wei DH, Raizman NM, Bottino CJ, Jobin CM, Strauch RJ, Rosenwasser MP. Unstable distal radial fractures treated with external fixation, a radial column plate, or a volar plate. A prospective randomized trial. *J Bone Joint Surg Am*. 2009;91(7):1568-77.
6. Koval K, Haidukewych GJ, Service B, Zirgibel BJ. Controversies in the management of distal radius fractures. *J Am Acad Orthop Surg*. 2014;22(9):566-75.
7. Chung KC, Shauver MJ, Birkmeyer JD. Trends in the United States in the treatment of distal radial fractures in the elderly. *J Bone Joint Surg Am*. 2009;91(8):1868-73.
8. Diaz-Garcia RJ, Oda T, Shauver MJ, Chung KC. A systematic review of outcomes and complications of treating unstable distal radius fractures in the elderly. *J Hand Surg Am*. 2011;36(5):824-35.
9. Lutz K, Yeoh KM, MacDermid JC, Symonette C, Grewal R. Complications associated with operative versus nonsurgical treatment of distal radius fractures in patients aged 65 years and older. *J Hand Surg Am*. 2014;39(7):1280-6.
10. Egol KA, Walsh M, Romo-Cardoso S, Dorsky S, Paksima N. Distal radial fractures in the elderly: operative compared with nonoperative treatment. *J Bone Joint Surg Am*. 2010;92(9):1851-7.

11. Levin LS, Rozell JC, Pulos N. Distal Radius Fractures in the Elderly. *J Am Acad Orthop Surg.* 2017;25(3):179-87.
12. Murray J, Gross L. Treatment of distal radius fractures. *J Am Acad Orthop Surg.* 2013;21(8):502-5.
13. Perugia D, Guzzini M, Civitenga C, Guidi M, Dominedo C, Fontana D et al. Is it really necessary to restore radial anatomic parameters after distal radius fractures? *Injury.* 2014;45:21-6.
14. Cooney WP. Management of Colles' fractures. *J Hand Surg Br.* 1989;14(2):137-9.
15. Wu YS, Yang J, Xie LZ, Zhang JY, Yu XB, Hu W et al. Factors associated with the decision for operative versus conservative treatment of displaced distal radius fractures in the elderly. *ANZ J Surg.* 2019;89(10):428-32.
16. Kong L, Kou N, Wang Y, Lu J, Tian D, Zhang B. The Necessity of Restoration of Radiologic Parameters by Closed Reduction in Elderly Patients with Distal Radius Fractures. *Med Sci Monit.* 2019;25:6598-604.