

Comparison of Hand Grip Strength in patients with Distal Radius Fracture that are treated by Closed Reduction with Cast versus Open Reduction and Internal Fixation in Haji Adam Malik Hospital Medan

Adri Yandra Hidayat^{1*}, Nino Nasution², Iman Dwi Winanto²

¹Resident of Orthopaedic & Traumatology, Faculty of Medicine University North Sumatra/ Haji Adam Malik General Hospital-Medan, Indonesia

²Consultant of Orthopaedic and Traumatology, Upper Division, Faculty of Medicine University North Sumatra / Haji Adam Malik General Hospital-Medan, Indonesia

Abstract : Background- Distal radius fracture is quite often found in emergency settings. There are many options to assess the outcome of treatment in distal radius fracture cases. One option that can be done is to measure the strength of the injured handgrip. Patient often complained about the decrease in ability to grasp and rotate and bear the burden after distal radius fracture. **Objective-**To find out the comparison of the hand grip strength in patients with distal radius fractures that are treated by closed reduction and casting to open reduction and internal fixation. **Material and Methods-**The study was conducted in a retrospective, observational analytic study with a cross sectional approach, which aimed to analyze the comparison of hand grip strength in patients with distal radius fractures that are treated by closed reduction and casting to open reduction and internal fixation 12 months after treatment. Target population was all patients with distal radius fracture who underwent closed reduction and casting and open reduction and internal fixation in all inpatient at Adam Malik Hospital, Medan. **Results-** In this study the distribution of the number of samples was as many as 57 subjects with 17 are women (29.8%) and 40 are men (70.2%). 18 years old is the youngest age of the samples and the oldest is 76 years old with a mean of 32.77 ± 14.03 years. Based on the mechanism of injury : motor vehicle accidents is the most common mechanism of injury, it accounts 45 people (78.9%). According to time arrivals mostly patient came <24 hours. There are 11 extraarticular fractures (19.3%) and 46 intraarticular fractures (80.7%), there were 24 people (42.1%) fracture in the right hand and 33 people (57.9%) in the left hand. Statistical analysis shows that there is no difference in the ratio of hand grip strength with significance value of (p value) 0.881 (> 0.05). **Conclusion-** There were no significant differences in the clinical outcome of the patient's hand grip strength in patients that are treated with closed reduction and casting to open reduction internal fixation after 12 months post therapy.

Key words: Radial fracture, cast, Open Reduction Internal Fixation, Close Reduction Internal Fixation, Hand Grip.

Introduction

Distal radius fracture is a fracture that is quite often found in the emergency room. It is estimated that 3% of all fractures of the upper limb are distal radius fractures with an incidence of more than 640,000 cases each year in the United States. Distal radius fractures have a bimodal distribution, with a peak at ages 5-24 years, generally a male population that experiences high-energy sports or accident injuries. The next peak in old age (> 65 years), dominated the female population with a mechanism of injury with low energy due to bone fragility. The United States census data indicates the percentage of fractures at the age of 65 or older in the United States will increase from 12% to 19% every 25 years.¹

Data in Taiwan shows the incidence of fracture of the distal radius of 10.2-14.5 per 10,000 populations within 8 years. Studies from the Nigata prefecture of Japan in 2004 received an incidence of 76.9 per 100,000 populations with a ratio of men and women 1: 3.2 and an average age of 60.2 years. National data in Indonesia have not been summarized, but some medical education centers describe the number of distal radius fractures. At the hospital Dr. M. Djamil Padang found distal radius metaphysical fractures in 122 cases out of 612 cases of radius fracture, from January 2011 - June 2012. At the Surakarta Orthopedic Hospital in 2011 a total of 275 patients, with more female patients than men^{2,3,4}

The choice of managing a distal radius of the fracture is very wide at this time. The development of kinematic understanding, bone quality, and muscle force that play a role in fractures has increased attention to relative stability, as well as the innovation of devices or implants to fight muscle force and restore bone stability. Innovations have emerged in closed management, percutaneous fixation, external fixation and especially in internal fixation implants. However, new tools and techniques require a careful assessment of efficacy, risks and benefits when applied, because the incidence of distal radius fractures will increase in the elderly population.¹

Factors that show perceptions of patient satisfaction with the success of various surgical therapies are still difficult to understand even though there has been good progress in decades with the increase in validated outcome instruments such as the Disabilities if Arm, Shoulder and Hand questionnaire (DASH), Patient-Rated Wrist Evaluation (PRWE), and the Michigan Hand Outcome, conducted with a questionnaire that reflects the opinions of the patient's disability, there is little evidence to determine the definite factor which is the best factor for assessing outcome of the distal management of the fracture radius.¹

Another assessment that can be done is to assess the strength of the handgrip in a measured manner. A decrease in the ability to grasp and rotate and to bear the burden is a function complaint that is common in patients after a distal radius fracture. Grasping strength can be assessed during the fracture healing process and is able to carry out activities by loading on the hand. Hung et al. Found handgrip better in operative patients compared to cast (mean 0.69: 0.52 [kg / kg]) in fractures of the distal radius⁵

Method

The study was conducted in a retrospective, observational analytic study with a cross sectional approach, which aimed to analyze the comparison of hand grip strength from the action of cast-covered reduction with open reduction of internal fixation in the distal radius fracture 12 months post-action, target population was all patients with distal radius fracture who underwent cast-reduction and internal fixation open reduction operations totaling 57 samples, the sampling method was carried out consecutively, which was based on the order of admission to the hospital until the desired number was fulfilled in a certain period. The research sample was obtained from medical record data and had complete data. The statistical analysis used if data is normally distributed is an unpaired T test, but if the distribution data obtained is not normal, the statistical analysis used is Mann-Whitney. The level of significance used was 5 (p <0.05) and the significance level of the trend was 10% (p <0.1). The study was conducted in all inpatient units of Adam Malik Hospital, Medan, after being approved by the USU FK Research Ethics Committee.

Results

All data are processed and presented in table form then subsequently classified into general description, demographic description of distal radius fracture subjected to cast-covered reduction and open internal fixation surgery, test demographic and clinical data normality of the subject to hand grip ratio and comparative analysis between grip strength the patient's hand distal radius is reduced by cast and open reduction internal fixation.

Variable	Total
Female, n (%)	17 (29,8%)
Male, n (%)	40 (70,2%)
Youngest age	18 year old
Oldest age	76 year old
Age average	32,77 ± 14,03

Distribution of demographic characteristics of subjects with distal radius fractures

Table 1. Shows that the distribution of the number of samples is 57 subjects with women as many as 17 people (29.8%) and men as many as 40 people (70.2%). With the youngest age of the research subjects 18 years and the oldest age of the study subjects 76 years with a mean and standard deviation of 32.77 ± 14.03 years

Distribution of demographic characteristics of distal radius fracture subjects undergoing action based on the mechanism of injury

No	Mechanism of injury	Total
1	Motorcycle accident	45 (78,9%)
2	Falling from a height	6 (10,5%)
3	Falling slipping	4 (7%)
4	Hit when walking	1 (1,8%)
6	Hit by a building	1 (1,8%)
Total		57 (100%)

Table 2. Shows that the distribution of the demographic characteristics of subjects with distal radius fractures based on the mechanism of injury is 45 motorbike accidents (78.9%), falls from a height of 6 people (10.5%), falls slipping by 4 people (7%), hit one person while walking as much as 1 person (1.8%), and hit by a building as many as 1 person (1.8%)

Distribution of demographic characteristics of distal radius fracture subjects who underwent action based on the time of arrival to the hospital

No	Time	Total
1	<24 hours	33 (57,9%)
2	24 hours - 2 weeks	14 (24,6%)
3	> 2 weeks	10 (17,5%)
Total		57(100%)

Table 3. Shows that the distribution of demographic characteristics of distal radius fracture subjects based on arrival time: <24 hours as many as 33 people (57.9%), 24 hours to 2 weeks a total of 14 people (24.6%), > 2 weeks as many as 10 people (17, 5%).

Distribution of demographic characteristics of distal radius fracture subjects undergoing action based on fracture type

No	Type of fracture	Total
1	Extraartikular	11 (19,3%)
2	Intraartikular	46 (80,7%)
Total		57(100%)

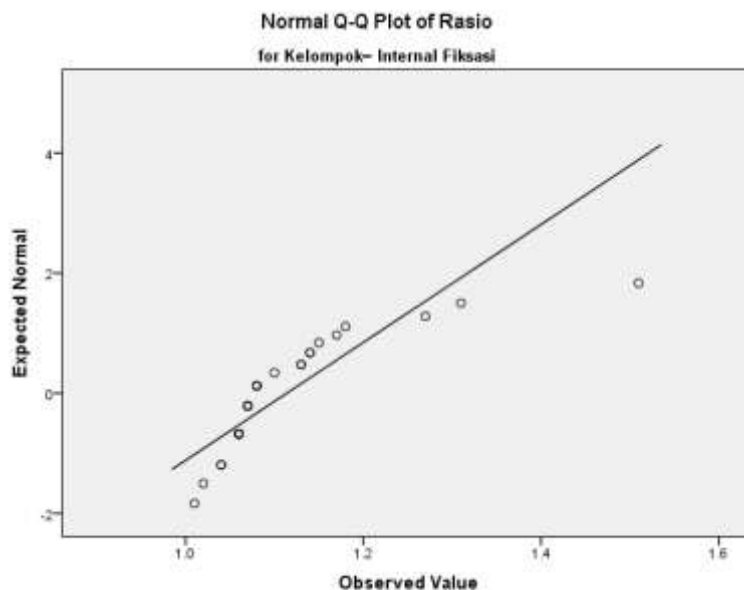
Table 4. It shows that the distribution of the demographic characteristics of subjects with distal radius fractures based on fracture type is 11 extraarticular fractures (19.3%) and 46 intraarticular people (80.7%).

Distribution of demographic characteristics of subjects with distal radius fractures based on fracture location

No	Fracture location	Total
1	Right hand	24 (42,1%)
2	Left hand	33 (57,9%)
Total		57 (100%)

Table 5. Shows that the distribution of the demographic characteristics of the subject of the distal radius fracture based on the location of the fracture is 24 people (42.1%) in the right hand and 33 people (57.9%) in the left hand.

Test the normality of the ratio of ratios to the hand



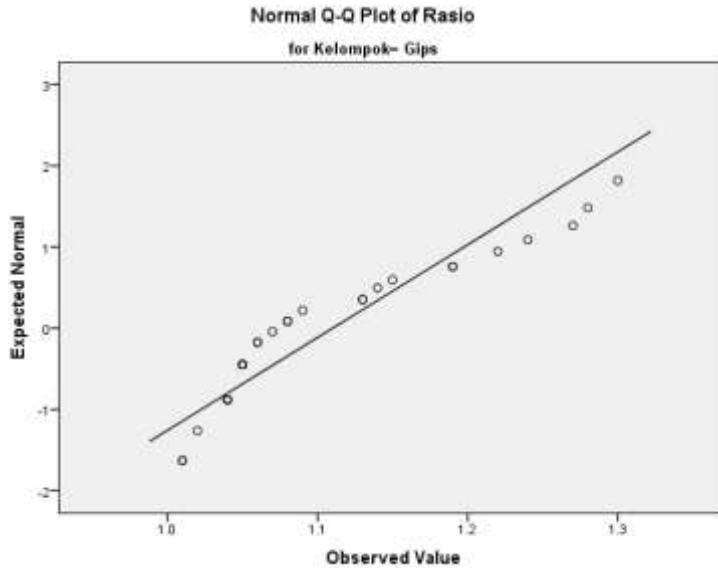


Table 6. It shows that from the results of the analysis of normality test data, it was found that the results of the p value obtained were 0.870 (> 0.05) indicating that the research data obtained was normally distributed

From the results of the normality test data, it was found that the research data was normally distributed.

Shapiro-Wilk (p Value)		
Hand grip ratio	Gips	0,870
	Internal Fixation	0,723

Statistical analysis of the hand grip function of the strength of the Open Reduction Internal Fixation (ORIF) action with casts in the case of a distal radius fracture

	Mean	p value
Ratio	Internal fikcation	0,881
	Gips	

Table 7. It shows that there is no difference in the ratio of the strength of the hand grip between the cast-covered reduction with internal fixation of fixation in the case of distal radius fracture, with a significance value of (p value) 0.881 (> 0.05)

Discussion

Consecutive grouping of patients was based on gender (Table 1) and from this data the distribution of the number of distal radius fracture samples was 57 subjects with 17 females (29.8%) and 40 females (70.2 %). With the youngest age of the research subjects 18 years and the oldest age of the research subjects 76 years with

a mean and standard deviation of 32.77 ± 14.03 years. This is consistent with the research conducted by Sandeep, et al., More distal radius fractures in men, and in more men at the age of 30 to 50 years.⁵Based on the mechanism of injury from this study, there were 45 motorbike accidents (78.9%). This was also in accordance with the research conducted by Kate et al. Based on the time of arrival of the hospital, in this study it was found that at most <24 hours the patient came directly for treatment at the hospital. and based on the classification of fracture types, most were intraarticular fractures, which were as many as 46 patients (80.7%) and 11 patients (19.3%). In this study, it was also found that there were more locations in the left hand of 33 people (57.9%) than the right hand of 24 people (42.1%)⁶

The results of this study indicate that the assessment of hand grip from the open reduction internal fixation (ORIF) action in the case of distal radius fracture with the results of the statistical test $p > 0.05$, which means there is no significant difference in the strength of the hand between the internal fixation action and casts after 12 months of action. The difference occurs in the initial hypothesis because the reference journal uses a sample of patients with an average age of 65 years, while in this study, researchers used a sample with an average age of 32.77 years.⁵

Toon DH et al⁷revealed that there was no significant difference in hand grip strength between patients who were ORIF and non-operative. In his research the sample used was an average age of 52 years. Research by Chan et al., Which used a sample of the average age of 75.8 years after post-cast reduction and 12 months internal fixation internal reduction, did not find differences in hand grip strength in distal radius patients with cast-closed reduction with internal fixation open reduction . However, at the initial follow-up of 3 months and 6 months, ORIF actions were found to be better than casts.⁷

References

1. Wolfe WS. Distal radius fracture. In: Green's operative hand surgery. 6th Ed. Philadelphia: Elsevier; 2010. p561.
2. Sebastian SJ, Chung KC. An Asian perspective on the management of distal radius fractures. *Hand Clin.* 2012;28:151-56.
3. Burhan E, Manjas M, Riza A, Erkadius. Perbandinganfungsiiekstremitasatasapadafrakturmetafise distal radius usiamudaantaratin dakanoperatifdan non operatifdenganpenilaianklinis *quickdash score*. Diaksesdari<http://jurnal.fk.unand.ac.id> [22 September 2018]
4. Bimoseno AP, Heriyanto JM. Deskripsi fraktur radius distal di Rumah Sakit Ortopedi Surakarta periode 1 Januari – 31 Desember 2011 [skripsi]. Surakarta: Fakultas Kedokteran Universitas Islam Indonesia; 2011.
5. Hung LP, Leung YF, Lee YL. Is locking plate fixation a better option than casting for distal radius fracture in elderly people?. *Hong Kong Med J.* 2015;21(5):407-10.
6. Toon DH, Premchand AX, Sim J, Valkunthan R. Outcomes and financial implications of intra-articular distal radius fracture: a comparative study of open reduction internal fixation (ORIF) with volar locking plate versus nonoperative management. *J OrthopTraumatol*; 2017. 18:2. p229-34.
7. Chan YH, Foo TL, Yeo CJ, Chew YC. Comparison between cast immobilization versus volar locking plate fixation of distal radius fractures in active elderly patients, the Asian perspective. *Hand surgery*, vol 19; 2014. p19-23.
