

Comparison of locked plate and External fixators outcomes, two different treatment modalities for intra-articular distal radius fractures

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Abstract: Distal radius fractures are actually the reason for 16 % of all the surgery treated fractures. Treatment modalities for these fractures have gone through significant changes during the last 20 years. This study compared treatment outcomes of two of these modalities, plate fixation and external fixator, on 20 to 50 years old patients. 80 patients with intra-articular distal radius fracture in the age range of 20 to 50 were included in this study. Two modalities; plate fixation or External fixator were used for treatment. Then they were followed 2 weeks, 6 weeks and 6 months postoperative. Demographic features and standard radiographic values were documented and MAYO, DASH and SF -36 exams were performed and finally results were all compared between the two groups. No significant age or gender difference was seen between the two groups. Acceptable radiographic values, Volar tilt and radial length were more seen in plate fixation group and grip power was significantly different between the 2 groups but no significant differences was detected in range of motion. In addition, MAYO score was significantly higher in plate fixation group according to SF -36 test general mental and physical health, social personal and physical function were all in a higher level in plate fixation group while mental and physical discomfort were more prevalent postoperatively in external fixator group. DASH score was not significantly different between the two groups. Plate is more preferred than external fixator for treatment of intra articular distal radius fracture.

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1. Introduction

16% of all the fractures treated by orthopedists are distal radius fractures. According to national ambulatory medical care survey there were 644985 cases of distal radius fractures treated in the United States in 1998. According to recent findings distal radius fracture is getting more incidents both in male and female especially in women older than 40 this raise is sharper which might be a consequence of estrogen withdrawal and loss of bone density (1).

Distal radius is actually a direct contact point of cartilage which works as a ligament origin and its length and shape alter forearm rotation. Any impairment in articular surface may lead to cartilage damage. Anatomic abnormalities of distal radius that alter length and rotation can cause the same damage (2, 3).

Wrists function depends on radius alignment and its positions in carpal and ulnar joints. Any impairment in this complex can significantly disturb wrist and hands function (4). Since this fracture is prevalent at any age and can effect day life function, different treatment modalities have been developed for it. From casting as the oldest to external fixator, percutaneous pin insertion and open fixation with plate as the novel one. While most of the distal radius fractures are simple and can be treated with close reduction and casting, but unstable and intra-articular fractures can impair congruency of the joint surface and its kinematic (1).

Fractures pattern, stability and comminution of fracture are the important factors for selecting treatment modality. Biochemical and clinical assessments have shown that even 1-2 mm displacement in fractures can lead to joint damage

(1). We administered this study to compare external fixator with plate fixation in treatment of intra-articular distal radius in 20 to 50 years-old patients to determine which of these two methods is more effective and will lead to sooner rehabilitation.

2. Material and Methods

This study was a randomized trial performed on 80 intra-articular distal radius fractures. These patients underwent either plate fixation or external fixator procedure after regarding include / exclude values. They were visited at 2 weeks, 6 weeks and 6 months after treatment and control radiography was taken and in the last visit. MAYO, DASH and SF36 questioners were filled out for the patients. Plain x-ray used to evaluate radiological values and to assessing grip power we used dynamometer. Orthopedic ruler was used to evaluate range of motion. Treatment results were assessed using SF-36, DASH and MAYO question (5, 6). MAYO consists of 4 ranking parts including pain, Range of motion, grip power and function, each of which can be scored

from 0 to 25 and 25 in all of these 4 sections shows favorable function of the wrist (7).

DASH (disability of arm, shoulder and hand) consists of 30 questions which assess mental and physical health condition considering physical function, physical role limitation, pain, general health, energy, fatigue, social function, emotional role limitation and mental health (8). All these data were collected and then statistical analyses were performed.

3. Results

This was a clinical trial performed on 80 cases with intra-articular distal radius fracture and the results were as followed: The mean ages for external fixator and plate groups were 40.1 and 38.3 years old respectively. No significant age distribution was seen between the two groups (PV: 0.207). Data normality was only accepted about age (p>0.05) (Table 1). In external fixator group 22 of the cases (55%) were female and 18 of them (45%) were male. These rates were 14 (35%) female and 26 (65%) male respectively in plate group.

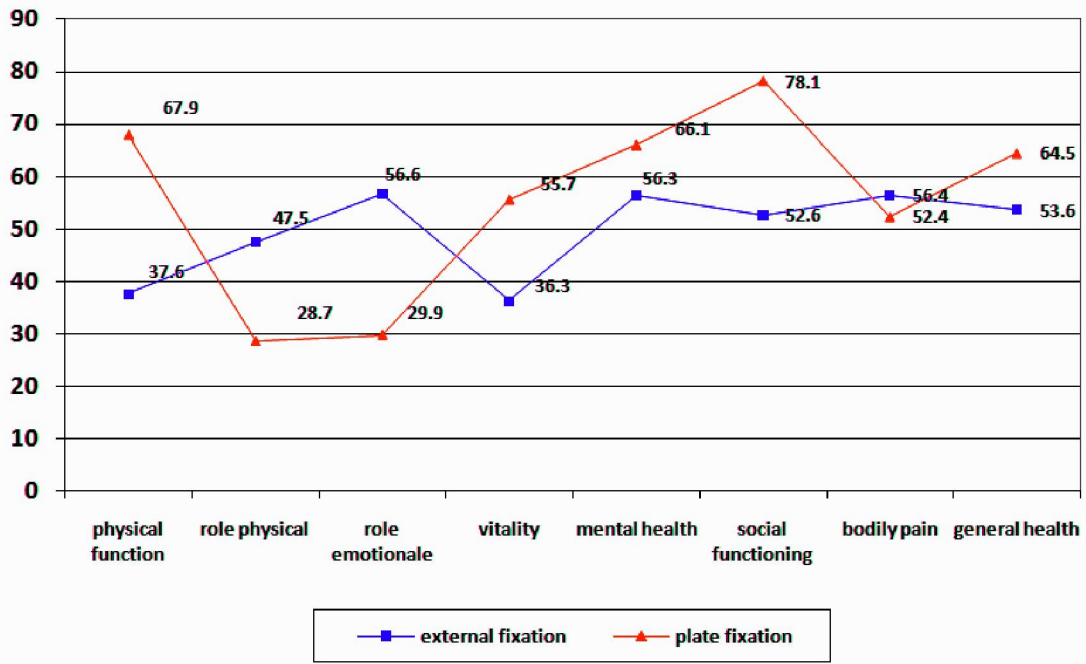


Diagram 1. Life quality (SF-36)

Table 1. Age distribution

Group	Minimum age	Maximum age	Mean	Standard deviation	P value
External fixator	27	49	40	6.4	T test P value 0.207
Plate	23	49	38.3	6.4	
All patient	23	49	39.2	6.4	

Table 2. Sex distribution

All patients	Plate fixation group	External fixator group	Gender
44 (55%)	26 (65%)	18 (45%)	Male
36 (45%)	14 (35%)	22 (55%)	Female
80 (100%)	40 (100%)	40 (100%)	All patients
Pearson chi-square p-value =0.072			Statistical Analysis

Sex distribution between the 2 groups was not significantly different (PV=0.072). No significant difference was seen in dominant hand (PV: 0.37). There was a significant difference in radial length (PV: 0.029). In order to evaluate the effect of age, sex and treatment modality on radial length a multivariable logistic regression modality had a significant effect (PV: 0.037) but age and sex did not (PV>0.05) (Table 2).

There was no significant difference in volar tilt between two groups (PV: 0.057). We assessed the effect of age, sex and the treatment modality on volar tilt using a multivariate logistic regression model which showed no significant effect (PV>0.05). There was a noticeable difference between grip powers of the two groups (PV<0.05). For assessing the effect of age, sex and treatment modality on grip power a multivariate linear model was used which showed that the effect was significant (PV<0.05). There was no significant difference between DASH scores of the groups (PV: 0.578). There was a noticeable statistic difference in MAYO scores of the groups (PV<0.05). Data about the patient's life quality is summarized in diagram 1.

4. Discussions

In this study, variables such as age, sex, dominant hands involvement, standard radiographic values, grip power and range of motion in flexion – extension were evaluated and SF-36, DASH and MAYO tests were performed and the results were compared between plate fixation and External fixation group. In external fixator group 55% were female and 45% were male. These rates in plate fixation group were 35% and 65% respectively. Sex distribution was not significantly different between the two groups. In Rizzo study the most of patients were female. Female/male ratio for external fixation and plate fixation groups were 8/6 and 25/6 respectively (9).

In our study mean age of external fixation and plate fixation patients were 40.1 and 38.3 years old respectively. Age distribution between the 2 groups did not show a noticeable difference. Rizzo study showed mean ages in external fixation and plate groups were 48 and 45 years old respectively. (9). JUDYS study suggested that performing plate fixation on youth will have more favorable outcomes. Generally neither of age or sex distribution had significant difference between the two groups which is

similar to Phandis results (10). Sakano study performed on 25 patients with unstable distal radius fracture who were treated with external fixation. The mean age was 45 years old (11).

In our study, in external fixator group, 55% of them had dominant hand involvement which this rate was 45% for plate fixation group and were not significantly different between these two groups. Our radiographic results in plate fixation group were more favorable than in external fixator. Percentage of cases with acceptable volar tilt and radial length in plate fixation group were 97.5% and in external fixator group they were 82.5% and 80% respectively. No significant difference was seen between volar tilt of the 2 groups, while it was significant for radial length. In Rizzo study number of cases with acceptable volar tilt and radial length in plate fixation were noticeably more than in external fixator which supports our results. Neander also indicated great outcomes of plate fixation in radiographic assessments, but Dorbetz showed that both plate fixation and External fixator give out same radiographic values, range of motion and grip power which was against our results (12, 13).

KILICK showed that postoperative radiographic values such as Volar tilt; radial length and ulnar length were completely different from preoperative ones and similar to the uninjured hand which also supports our results (14). Zhang's study also suggested that palmar tilt after performing plate fixation in distal radius fractures is quite different from the preoperative one and similar to the uninjured hand and that radius shortening or radial length decrease did not occur after plate fixation which also supports our results (14, 15). In our study using SF-36 test showed that general and mental health and physical and social function level was higher in plate fixation group. But postoperative pain and mental and physical discomfort were more seen after external fixator.

Mean DASH score was not significantly different between the two groups which show a same range of disability for both of these modalities. AKTEKIA estimated DASH score in external fixator group (21.9) was less than our results (16, 17). Phandis' study showed this score for plate fixation group (2.3) was also less than our result. In this study assessing radiographic and functional values after performing either external fixator of plate fixation on distal radius fractures showed that the latter has more

favorable outcomes and preferred if requirements are accessible and performing surgery is possible (18) (Diagram 1).

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