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Comparison of Outcome of Extra Articular Lower End Radius Fracture Treated with Percutaneous Pinning and Volar Locking Plate in Skeletal Mature Patient

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ABSTRACT
It was determined to compare two of the most widely used treatment modalities since distal radius fractures are the most common fractures of the upper extremities and there are no clear criteria for the manner of intervention. This study compared the functional result at a substantial follow-up period of a group of patients who had extra-articular lower end radius fractures treated with volar plating and percutaneous wiring. To assess and compare the final outcome in various fracture pattern of fracture of distal end radius managed by percuteneous pinning and volar locking plate. The present study was a Prospective observational study. This Study was conducted from January 2021 to June 22 at Department of KPC Medical College, Jadavpur, Kolkata. Total 40 patients were included in this study. In k wire, 1 (5.3%) patient had Bony prominance at fracture site 1 (5.3%) patient had 0-10 Ulner deviation at 12 months, 1 (5.3%) patient had Bony prominance in latarel aspect, 13(68.4%) patients had Nothing Significant, 3(15 .8%) patients had Pin tract infection. In Locking Plate, 1 (4.8%) patient had Flexor tenosinovitisat wrist 13 (68.4%) patients had Nothing Significant,1(4.8%) patient had Plate Prominance. Association of Ulner deviation at 12 months with Group was not statistically significant (p=0.1709). In conclusion, For patients with skeletal maturity, volar locking plate fixation and percutaneous pinning are both effective treatments for extra-articular lower end radius fractures. Every method, though, has unique benefits and drawbacks. Although percutaneous pinning is less intrusive and might result in quicker recovery periods, it could not give as much stability in cases of comminuted fractures. On the other hand, the volar locking plate offers additional stability, particularly in more complicated fractures and may lead to improved functional results as well as a quicker recovery of wrist mobility. To attain the best results, the course of therapy should ultimately be customized, taking into consideration the unique features of the fracture, the patient's circumstances and the surgeon's experience.

INTRODUCTION

It was determined to compare two of the most widely used treatment modalities since distal radius fractures are the most common fractures of the upper extremities and there are no clear criteria for the manner of intervention. This study compared the functional result at a substantial follow-up period of a group of patients who had extra-articular lower end radius fractures treated with volar plating and percutaneous wiring. Distal radius fractures are most common fractures of upper limb presenting at emergency rooms, compromising of more than 16% of all fractures. Distal radial fractures have a bimodal type of age distribution with high-energy trauma contributing in younger and low energy trauma in elderly population. Females are more liable to distal radius fractures when compared with males[1] mainly because of more severe osteoporosis and a higher liability of elderly women to falls[2] compared to the age-matched men. Until about 60 years ago, it was general notion that most distal radial fractures could be treated conservatively with satisfactory results. Only recently, it was clinically proved that intra-articular step-off and radial shortening corrected by surgery had improved patient outcome[3]. These issuesdon't affect elderly people and low-demand patients probably due to low functional and physical demand. In general anatomic reduction should be pursued in younger and high-demand elderlypatients with extra-articular fracture or intra-articular fractures. Low-demand elders with severely displaced intra-articular fracture or median nerve compression require surgical management but otherwise the prime focus in this group should be on joint movement[4]. The mainstay of care for distal radius fractures has been close reduction and cast immobilization., however, this approach frequently leads in fracture malunion and distal radioulnar joint displacement or dislocation, which impairs functional, radiological and aesthetic outcomes[5]. The persistent worsening of the wrist deformity interfered with the extrinsic hand musculature's mechanical advantage by negatively affecting wrist mobility and hand function[6].Due to arthrosis of the distal radioulnar and radiocarpal joints, it also results in discomfort, reduced grip strength and limitations in forearm mobility[7]. The objective is to evaluate and contrast the results in different distal end radius fracture patterns treated with volar locking plates and percuteneous pinning.

MATERIALS AND METHODS

Study Setting: KPC Medical College, Jadavpur and Out Patient Department for subsequent follow-up.

Definition of Population: Patients >30 years of either sex was included in this study who wants to participate in this study.

Timeline: January 2021 to June 22.

Inclusion Criteria:

- Skeletally mature patients of either sexes.
- Patients with distal end of radius (extra-articuler) fracture those who are willing to take part in the study.

Exclusion Criteria:

- Pathological fracture.
- Pediatric age group/skeletally immature 3. Lost to follow-up.
- Compound fracture.

Study Design: Prospective observational study.

Sample Size with Justification: Consecutive 40 patients was taken from the opd as their consent to participate in this study during this time frame.

Statistical Software: Sample size has been calculated with help of Epi Info (TM) 3.5.3. EPI INFO which is a trademark of the Centers for Disease Control and Prevention (CDC). For statistical analysis data was entered into a Microsoft excel spreadsheet and then analyzed by SPSS 27.0. and Graph Pad Prism version 5. Data was summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. Unpaired proportions are compared by Chi-square test or Fischer's exact test, as appropriate. p-value $\leq$0.05 was considered for statistically significant.

RESULTS AND DISCUSSIONS

Table 1: Association Between Complication: Group

GROUP			
Complication	**k wire**	**Locking Plate**	**TOTAL**
Bony prominance at fracture site	1	0	1
Row %	100	0	100
Col %	5.3	0	2.5
Bony prominance dorsal aspect	1	0	1
Row %	100	0	100
Col %	5.3	0	2.5
Bony prominance in latarel aspect	1	0	1
Row %	100	0	100
Col %	5.3	0	2.5
Flexor tenosinovitisat wrist	0	1	1
Row %	0	100	100
Col %	0	4.8	2.5
Nothing Significant	13	19	32
Row %	40.6	59.4	100
Col %	68.4	90.5	80
Pin tract infection	3	0	3
Row %	100	0	100
Col %	15.8	0	7.5
Plate Prominance	0	1	1
Row %	0	100	100
Col %	0	4.8	2.5
TOTAL	19	21	40

Table 2: Association Between Radiological Status: Group

GROUP			
Radiological status	**k wire**	**Locking Plate**	**TOTAL**
All prameters are maintained	0	21	21
Row %	0	100	100
Col %	0	100	52.5
Fracture collapse	2	0	2
Row %	100	0	100
Col %	10.5	0	5
Fracture collapsed	2	0	2
Row %	100	0	100
Col %	10.5	0	5
Palmer tilt reduced	1	0	1
Row %	100	0	100
Col %	5.3	0	2.5
Parameters maintianed	10	0	10
Row %	100	0	100
Col %	52.6	0	25
Radial height reduced	1	0	1
Row %	100	0	100
Col %	5.3	0	2.5
Radial height reduced	3	0	3
Row %	100	0	100
Col %	15.8	0	7.5
TOTAL	19	21	40
Row %	47.5	52.5	100
Col %	100	100	100

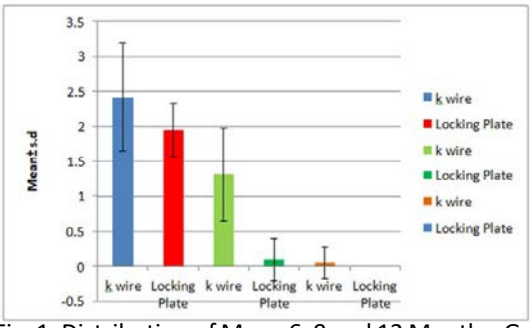

Fig. 1: Distribution of Mean 6, 9 and 12 Months: Group

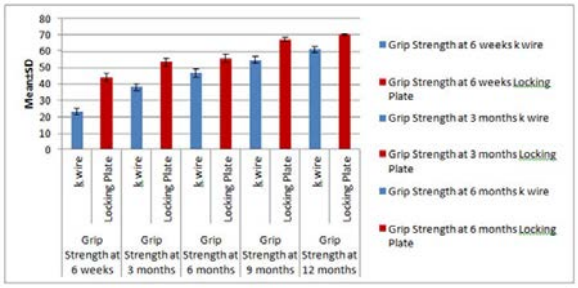

Fig. 2: Distribution of Mean 6 Weeks, 3 Months, Grip Strength at 6 Months, 9 Months and 12 Months: Group

In k wire, 1 (5.3%) patient had Bony prominance at fracture site 1 (5.3%) patient had 0-10 Ulner deviation at 12 months, 1 (5.3%) patient had Bony prominance in latarel aspect, 13(68.4%) patients had Nothing Significant, 3(15 .8%) patients had Pin tract infection. In Locking Plate, 1 (4.8%) patient had Flexor tenosinovitisat wrist 13 (68.4%) patients had Nothing Significant, 1(4.8%) patient had Plate Prominance. Association of Ulner deviation at 12 months with Group was not statistically significant (p=0.1709). In k wire, 2 (10.5%) patients had Fracture collapse, 2 (10.5%) patients had Fracture collapsed, 1 (5.3%) patient had Palmer tilt reduced, 10 (52.6%) patients had Parameters maintianed, 1 (5.3%) patient had Radial height reduced and 3 (15.8%) patients Radial height reduced. In Locking Plate, all 21 (100.0%) patients had All prameters are maintained. Association of Radiological status with Group was statistically significant (p<0.0001). In k wire, the mean VAS at 6 months (mean±s.d.) of patients was 2.4211±.7685. In Locking Plate, the mean VAS at 6 months (mean±s.d.) of patients was 1.9524±.3842. Distribution of mean VAS at 6 months with Group was statistically significant (p=0.0179). In k wire, the mean VAS at 9 months (mean±s.d.) of patients was 1.3158±.6710. In Locking Plate, the mean VAS at 9 months (mean± s.d.) of patients was .0952±.3008. Distribution of mean VAS at 9 months with Group was statistically significant (p<0.0001). In k wire, the mean VAS at 12 months (mean±s.d.) of patients was .0526±.2294. In Locking Plate, the mean VAS at 12 months (mean±s.d.) of patients was .0000±.0000. Distribution of mean VAS at 12 months with Group was not statistically significant (p=0.2991). In k wire, the mean Grip Strength at 6 weeks (mean± s.d.) of patients was 23.4579±1.6101. In Locking Plate, the mean Grip Strength at 6 weeks (mean±s.d.) of patients was 44.1905±2.6082. Distribution of mean Grip Strength at 6 weeks with Group was statistically significant (p<0.0001). In k wire, the mean Grip Strength at 3 months (mean±s.d.) of patients was 38.2789±1.8405. In Locking Plate, the mean Grip Strength at 3 months (mean±s.d.) of patients was 53.4857±2.5629. Distribution of mean Grip Strength at 3 months with Group was statistically significant (p<0.0001). In k wire, the mean Grip Strength at 6 months (mean±s.d.) of patients was 46.7053±2.3158. In Locking Plate, the mean Grip Strength at 6 months (mean±s.d.) of patients was 55.7538±2.6282. Distribution of mean Grip Strength at 6 months with Group was statistically significant (p<0.0001) In k wire, the mean Grip Strength at 9 months (mean±s.d.) of patients was 54.7526±2.1188. In Locking Plate, the mean Grip Strength at 9 months (mean±s.d.) of patients was 67.2167±1.2268. Distribution of mean Grip Strength at 9 months with Group was statistically significant (p<0.0001). In k wire, the mean Grip Strength at 12 months (mean±s.d.) of patients was 61.0684±1.8980. Jagiasi[8] found that to ascertain, at a tertiary teaching hospital, the functional result of surgical treatment for distal radial fractures using a volar locking plate system. The mean age of the group consisted of 11 females and 14 males. In our study, out of 100 patients most of the patients were 31-40 years old [17 (42.1%)]. 8 (56.7%) in k wire and 9 (42.9%) patients were 31-40 years of age in Locking

Plate but It was not statistically significant (p=0.9503). It was found that, mean Age was less in Locking Plate [38.1905±6.4701] compared to k wire [38.5789±6.8663] but this was not statistically significant (p=0.8548). We found that, male [26(65.0)] population was higher than the female population [14(35.0%)]. In k wire was not significant more observed in male patients [13 (68.4%)] compared to female patients [5 (10.0%)].(p=0.6661). We showed that, most number of [19 (100.0%)] patients had palmerflexion at 3 months (0-30) in k wire compared to palmerflexion at 3 months (0-60) Locking Plate [11 (52.4%)] but which was statistically significant (p<0.0001). We showed that, less number of [4 (21.1%)] patients had Palmar flexion at 6 months (0-60) in k wire compared to Palmar flexion at 6 months (0-65) Locking Plate [2(9.5%)] but which was statistically significant (p<0.0001). We showed that, higher number of [19 (100.0%)] patients had Palmar flexion at 9 months (0-50) in k wire compared to Palmar flexion at 9 months (0-70) Locking Plate [18 (85.7%)] but which was statistically significant (p<0.0001). Aktekin[9] (2010) showed that this study was to compare the functional and radiographic outcomes of dorsally displaced distal radius fractures, pronation, supination, grip strength, or pinch strength (clinically). Costa[10] (2014) found that to compare the clinical effectiveness of Kirschner wire fixation with locking plate fixation for patients, the EuroQol (EQ-5D), and complications related to the surgery. Goehre[11] showed that this prospective, randomized, controlled trial was to compare the results of two operative techniques used for the treatment of unstable. The most common complication was an intermediate post-traumatic median nerve irritation. Hagenaars[12] found that approximately 17 % of all fractures involve the distal radius. This minimally invasive technique has a much lower risk of iatrogenic soft tissue complications. We showed that, higher number of [3(15 .8%)] patients had Complication in Pin tract infection in k wire but It was not statistically significant (p=0.1709). Pin tract infection also develop the wrist pain. Its also inhibit the terminal movement of wrist.

We showed that, majority number of [10(52.6%)] patients had Radiological status (Parameters maintianed) in k wire compared to All prameters are maintained in Locking Plate [21 (100.0%)] but which was statistically significant (p<0.0001). In my study I got 9 out of 19 patients in the k-wire fixation group who had radiological evidence of fracture collapse. From the study I got 4 patients (21%) fracture collapse, radial height reduced in 4 patients (21%) but maintain the positive variance and 1 case (5.3%) neutral tilt reduced. It's may giving effects on the tendons length, radio-carpal ligament length alterations which is effecting on the movements. It was found that, mean VAS at 6 months (p=0.0179) 9 months which was statistically significant (p<0.0001) and VAS at 12 months but It was not statistically significant (p=0.2991). In our study, mean Grip Strength at 6 weeks, 3 months, 6 months, 9 months and 12 months but which was statistically significant (p<0.0001). Thus pain also inhibits the movements and threshold of exercise which is later reflected on ROM.

CONCLUSION

In conclusion, both percutaneous pinning and volar locking plate fixation are effective methods for treating extra-articular lower end radius fractures in skeletally mature patients. However, each technique has distinct advantages and limitations. Percutaneous pinning is less invasive and may offer shorter operative times, but it may not provide the same level of stability in comminuted fractures. The volar locking plate, on the other hand, provides greater stability, especially in more complex fractures and may result in better functional outcomes and faster recovery of wrist motion. Ultimately, the choice of treatment should be individualized, taking into account the specific characteristics of the fracture, patient factors and the surgeon's expertise to achieve optimal outcomes.

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