

Article— Variable angle locking plate versus multiple k-wire fixation for intra-articular distal radius fracture: a prospective comparative study of functional outcome in elderly

VARIABLE ANGLE LOCKING PLATE VERSUS MULTIPLE K-WIRE FIXATION FOR INTRA-ARTICULAR DISTAL RADIUS FRACTURE: A PROSPECTIVE COMPARATIVE STUDY OF FUNCTIONAL OUTCOME IN ELDERLY

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[DOI: 10.58542/jbota.v6i1i02.117](https://doi.org/10.58542/jbota.v6i1i02.117)

Abstract— Distal radius fracture (DRF) is a common wrist injury and it accounts for about one-sixth of emergency department visits. In spite of availability of various treatment options, none is universally effective for comminuted intraarticular fracture, because of varied fractures patterns. Two commonly used surgical methods are multiple K-wire fixation and open reduction and internal fixation by variable angle locking plates. Objective of the study was to compare functional outcomes of variable angle locking plate and multiple K wire fixation for intra-articular distal radius fracture in elderly. Prospective observational study was conducted among the patients of distal radius fractures with age more than 50 years. Patients were divided in to two groups with 24 cases in each group. Group one included patients treated with variable angle locking plate and group two included patients treated with multiple K-wires. Post surgery patients were assessed at 6 weeks, 3, 6 and 12 months. Evaluation was done clinically, and the outcomes were assessed by using the Disabilities Arm, Shoulder and Hand (quickDASH) score (primary outcome), Patient-Rated Wrist Evaluation (PRWE) score, range of motion, grip strength and were compared between the groups. Patients treated with variable angle locking plate was found to have better functional outcome than those treated with multiple K-wire initially during the study, but later by the end of the study at 12 months, both groups were found to be having similar outcomes, with no significant difference between the groups. This signifies that among variable angle locking plate and multiple K-wire fixation, no single procedure is superior to the other in long term. **Keywords**— Distal radius fracture, elderly patients, multiple K-wire fixation, Variable angle locking plate.

1. INTRODUCTION

Distal radius fractures are the most common fractures seen in the emergency with incidence of greater than 640,000 annually in the United States alone. In the Western world, for example, 6% of women will have sustained such a fracture by the age of 80 and 9% by the age of 90¹.

All age groups are affected; younger patients often sustain complicated high energy injuries involving the wrist joint, but fractures of the distal radius are also common in older patients, who are more likely to sustain low energy fractures related to osteoporosis. The common injury mechanism that results in a fracture of the distal radius is a fall on to the outstretched hand from standing height.

There are numerous treatment options for the management of radius fractures including nonoperative, external fixation and internal fixation. The purpose of treatment of a distal radius fracture is to maintain normal strength, mobility, and function in the hand and wrist.

Traditionally, these fractures in the elderly have been treated nonoperatively with use of casting alone. The use of nonoperative treatment has been based on the perceived low functional demands in the elderly population; however, it has been shown that casting alone for the treatment of unstable osteoporotic distal radial fractures can result in collapse of the fracture fragments and the development of a malunion⁵

In spite this much high incidence, there is no consensus regarding optimal treatment strategy among the current treatment options There is high controversy in current literature concerning the treatment of distal radial fractures⁶.

Among the surgical strategies, several authors investigated minimally invasive procedures using Kirschner wire fixation, demonstrating good clinical and radiographic results¹⁰. On the other hand, since the early 2000s open reduction and internal fixation with plate and screws has increased in popularity.

Open reduction and internal fixation have the benefit of improved functional and radiographic results and avoiding the complications related to non-operative treatment¹².

2. METHODOLOGY

Prospective observational study was conducted among elderly patients with intra-articular distal radius fracture. Inclusion criteria was patients with displaced intra-articular distal radius fracture (AO type c) of age >50 years (Type-C fracture was defined as that with fracture lines in both distal metaphysis and epiphysis. The displaced fracture was defined as a displacement of at least 2 mm in the articular surface or a gap of 2 mm.) Patients who give consent for the study.

Exclusion criteria was Pathological fractures. Patients lost for follow up. Metaphyseal fractures with articular extension but without articular displacement were excluded. Partial articular fractures (AO type-B) were also excluded. Open fracture or concomitant bone injury to the ipsilateral upper extremity.

Patients were randomly allocated to group 1 and group 2. Group 1 included patients who underwent treatment with variable angle locking plate and Group 2 included patients treated with multiple K-wire fixation.

These patients were followed up at intervals - 6 weeks, 3, 6 and 12 months post-surgery. Clinical assessment will be performed with the Disabilities Arm, Shoulder and Hand (quickDASH) score (primary outcome), Patient-Rated Wrist Evaluation (PRWE) score, range of motion, grip strength and was compared between the groups . the range

of motion of the wrist was assessed with a standard goniometer. Grip strength was measured with a dynamometer.

The radiographic assessment with standardized posteroanterior & lateral views of the wrist at presentation and at six weeks and one year after injury. Radiographs of the contralateral wrist was taken at six weeks and was considered as standard for the assessment of palmar tilt, radial height, radial inclination, and the presence of an intra-articular step-off or gap of ≥ 2 mm

3. RESULTS

Age of patients selected for the study ranged from toThe mean age in Group A was found to be 60.88 ± 5.16 and in Group B was 62.08 ± 6.83 and the difference in mean age was not found to be significant ($p=0.493$)

Parameter	Group A	Group B	P value
Age	60.88 ± 5.161	62.08 ± 6.827	0.493
Females / males	13/11 (54.2%/45.8%)	14/10 (58.3%/41.7%)	0.771
Dominant / Non-dominant hand	15/9 (62.5%/37.5%)	14/10 (58.3%/41.7%)	0.768
Intraarticular step off on affected side	Present in 14 cases (58.3%)	Present in 13 cases (54.2%)	0.771

Table 1:demographic parameters

Palmar tilt at the affected side was -23.58 ± 5.62 and -25.50 ± 5.56 in group A and group B respectively with no significant difference between the groups ($p=0.241$). At 6 weeks palmar tilt becomes 8.17 ± 2.69 in Group A and 2.79 ± 1.93 in Group B and the difference in palmar tilt was found to be significant($p<0.001$). At 12 months palmar tilt in Group A and B remains the same as in 6 weeks.(table 2,graph 1)

Palmar tilt	Group A	Group B	P value
At presentation	-23.58 ± 5.62	-25.50 ± 5.56	0.241
At 6 weeks	8.17 ± 2.69	2.79 ± 1.93	<0.001
At 12 months	8.17 ± 2.69	2.79 ± 1.93	<0.001

Table 2: palmar tilt

Radial height on the affected side was 3.96 ± 2.24 in Group A and 3.54 ± 2.19 in Group B with no significant difference between the groups ($p=0.517$). At 6 weeks radial height becomes 10.04 ± 1.30 in Group A and in Group B it becomes 9.08 ± 1.25 , this difference between group A and B was found to be statistically significant($p=0.012$). This radial height remains as the same until 12 months(table 3,graph 2).

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Radial height	Group A	Group B	P value
At presentation	3.96±2.24	3.54±2.19	0.517
At 6 weeks	10.04±1.30	9.08±1.25	0.012
At 12 months	10.04±1.30	9.08±1.25	0.012

Table 3: radial height

Radial inclination on affected side in Group A was 14.75±4.53 and in Group B was 15.00±4.40 with no significant difference (p=0.847) between the groups. At 6 weeks radial inclination in Group A becomes 22.58±0.776 and in Group B it becomes 22.25±0.794 and the difference was not statistically significant (p=0.148) At 12 months radial inclination in group A remains the same but in Group B it slightly reduces to 21.46±4.21. the difference still remains statistically not significant (p=0.205) (table 4, graph 3).

Radial inclination	Group A	Group B	P value
At presentation	14.75±4.53	15.00±4.40	0.847
At 6 weeks	22.58±0.776	22.25±0.794	0.148
At 12 months	22.58±0.776	21.46±4.21	0.205

Table 4: radial inclination

Quick Dash score was assessed at 6 weeks 3 months, 6 months and 12 months. In Group A at 6 weeks Quick DASH score was found to be 39.33±6.44 which decreased to 21.33±5.78 at 3 months. At 6 months Quick DASH score became 12.54±2.99, which further reduced to 10.46±1.93 at 12 months.

In group B Quick DASH score was 50.50±7.37 at 6 weeks, which decreased to 28.83±6.39 at 3 months and 14.79±3.51 at 6 months. At 12 months Quick DASH score became 11.63±3.09

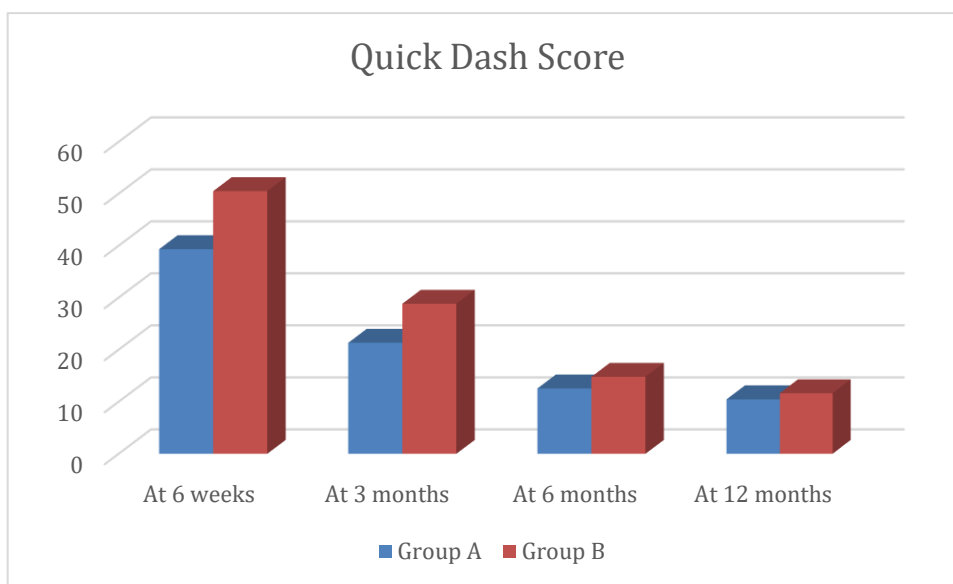
At 6 weeks Quick DASH score in group A was 39.33±6.44 which was lesser than that in Group B which is 50.50±7.37. this difference was found to be significant (P<0.001). At 3 months Quick DASH score in both the groups decreases to 21.33±5.78 in group A and 28.83±6.39 in group B. This difference was also found to be significant (p<0.001) indicating that Group A was better than Group B. when assessed at 6 months even when Quick DASH score decreases in both the groups to 12.54±2.99 in group A and 14.79±3.51 in group B, the difference between both the groups was not significant (p=0.021). At 12 months Quick DASH score in Group A becomes 10.46±1.93 and in Group B it becomes 11.63±3.09 with no significant difference between the groups (p=0.124) (table 5, graph 4).

Quick Dash Score	Group A	Group B	P
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At 6 weeks	39.33±6.44	50.50±7.37	<0.001
At 3 months	21.33±5.78	28.83±6.39	<0.001
At 6 months	12.54±2.99	14.79±3.51	0.021
At 12 months	10.46±1.93	11.63±3.09	0.124

Table 5: quick DASH score



Graph 4: quick DASH score

PRWE was assessed at 6 weeks 3 months, 6 months and 12 months. In Group A at 6 weeks PRWE score was found to be 82.63±4.85 which decreased to 53.00±6.35 at 3 months. At 6 months PRWE score became 21.83±3.44, which further reduced to 12.54±1.79 at 12 months.

In group B PRWE score was 88.25±3.48 at 6 weeks, which decreased to 59.58±4.41 at 3 months and 27.08±3.73 at 6 months. At 12 months PRWE score became 13.75±2.59

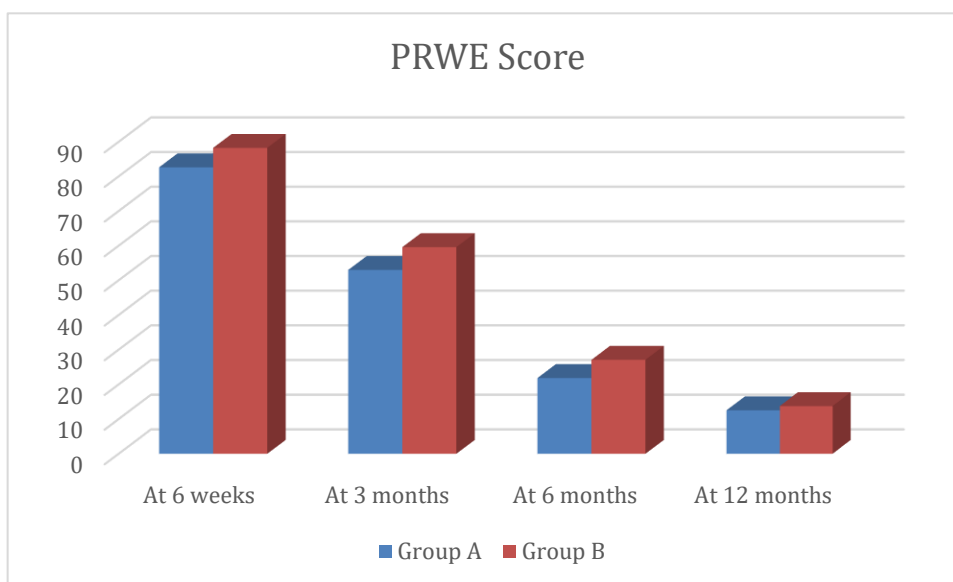
At 6 weeks PRWE score in group A was 82.63±4.85 which was lesser than that in Group B which is 88.25±3.48. this difference was found to be significant (P<0.001). At 3 months PRWE score in both the groups decreases to 53.00±6.35 in group A and 59.58±4.41 in group B. this difference was also found to be significant (p<0.001) indicating that Group A was better than Group B. When assessed at 6 months even when PRWE score decreased in both the groups to 21.83±3.44 in group A and 27.08±3.73 in group B, the difference between both the groups remained significant (p<0.001). At 12 months PRWE score in Group A becomes 12.54±1.79 and in Group B it becomes 13.75±2.59 with no significant difference between the groups (p=0.124). This signifies

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that at the end of assessment at 12 months there is no significant difference between Group A and Group B as per patient evaluation. (table 6,graph 5)

PRWE score	Group A	Group B	P
At 6 weeks	82.63±4.85	88.25±3.48	<0.001
At 3 months	53.00±6.35	59.58±4.41	<0.001
At 6 months	21.83±3.44	27.08±3.73	<0.001
At 12 months	12.54±1.79	13.75±2.59	0.067

Table 6: PRWE score



Graph 5: PRWE score

Range of motion: flexion, extension, supination and pronation, was assessed at each follow up visit and was documented as percentage of range of motion of uninjured (contralateral) limb

Flexion was assessed at 6 weeks 3 months, 6 months and 12 months. In group A flexion was 54.92±5.35 at 6 weeks which increased to 76.63±5.09 at 3 months, 83.25±3.56 at months and finally reached 88.71±3.32 at 12 months.

Flexion for group B was 46.92±5.56 at 6 weeks which increased to 75.75±4.88 at 3 months, 81.25±4.00 at 6 months and finally 87.08±3.72 at 12 months.

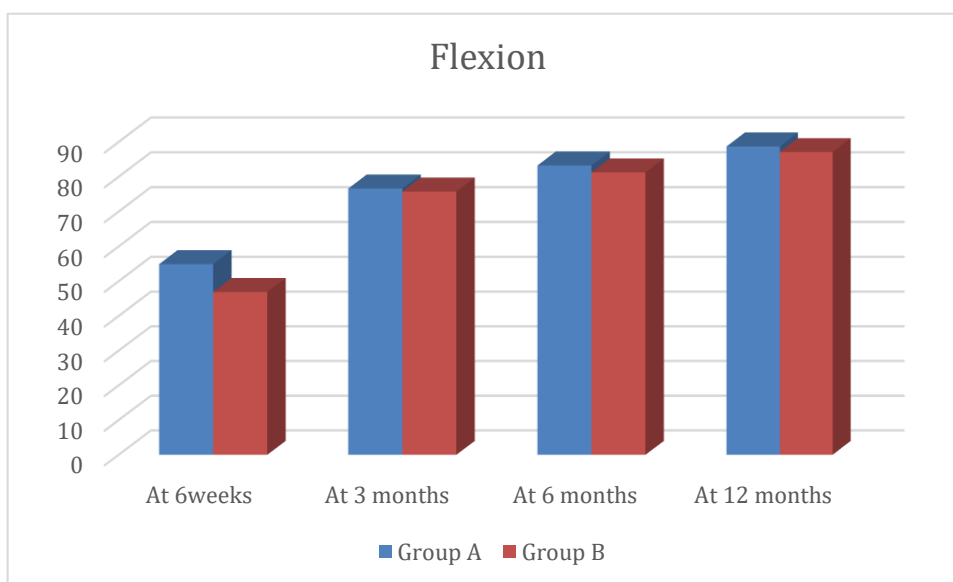
Difference in flexion between group A and group B at 3 weeks was 54.92±5.35 and 46.92±5.56 ($p<0.001$) which was significant. At 3 months this difference become 76.63±5.09 and 75.75±4.88 ($p=0.55$) which is not significant. At 6 months difference in flexion between group A and B becomes 83.25±3.56 and 81.25±4.00 ($p=0.074$) 0.074 which is again not significant. At 12 months flexion in Group A was 88.71±3.32

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and group B was 87.08 ± 3.72 . even though at the end of the study, flexion is better in group A, that difference is not statistically significant ($p=0.117$). (table 7, graph 6)

Flexion	Group A	Group B	P value
At 6weeks	54.92 ± 5.35	46.92 ± 5.56	<0.001
At 3 months	76.63 ± 5.09	75.75 ± 4.88	0.546
At 6 months	83.25 ± 3.56	81.25 ± 4.00	0.074
At 12 months	88.71 ± 3.32	87.08 ± 3.72	0.117

Table 7: ROM – flexion



Graph 6: ROM - flexion

Extension was assessed at 6 weeks 3 months, 6 months and 12 months. In group A extension was 46.79 ± 4.58 at 6 weeks which increased to 74.04 ± 4.43 at 3 months, 86.08 ± 3.12 at 6 months and finally reached 92.46 ± 2.96 at 12 months.

Extension for group B was 22.92 ± 5.14 at 6 weeks which increased to 74.04 ± 4.43 at 3 months, 84.75 ± 3.12 at 6 months and finally 92.38 ± 2.62 at 12 months.

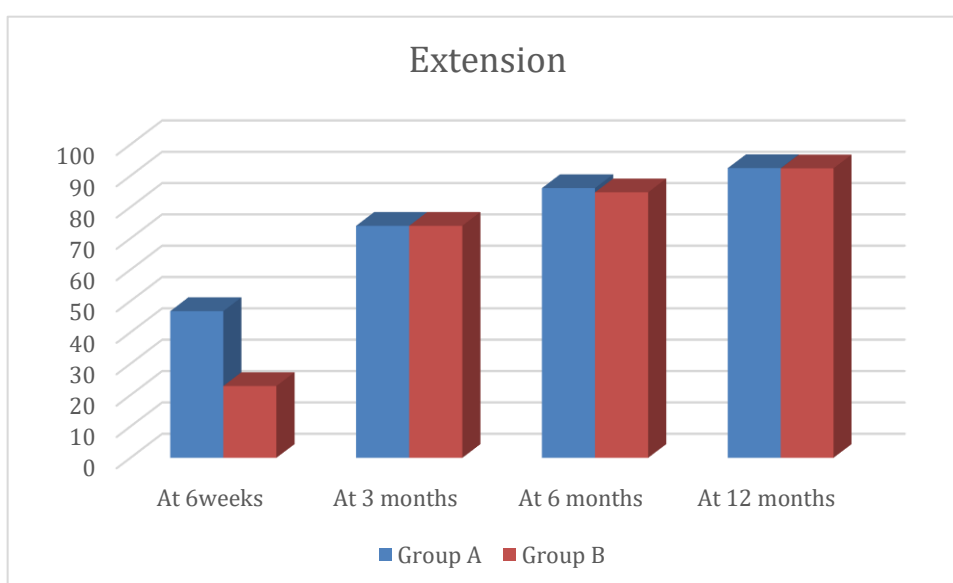
Difference in flexion between group A and group B at 3 weeks was 46.79 ± 4.58 and 22.92 ± 5.14 ($p < 0.001$) which was significant. At 3 months this difference become 74.04 ± 4.43 and 74.04 ± 4.43 ($p = 0.02$) which again significant. At 6 months difference in extension between group A and B becomes 86.08 ± 3.12 and 84.75 ± 3.12 which became not significant ($p = 0.14$). At 12 months extension in Group A was 92.46 ± 2.96 and

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group B was 92.38 ± 2.62 which was almost similar and the slight difference was found to be not statistically significant ($p=0.92$). (table 8, graph 7)

Extension	Group A	Group B	P value
At 6 weeks	46.79 ± 4.58	22.92 ± 5.14	<0.001
At 3 months	74.04 ± 4.43	74.04 ± 4.43	0.02
At 6 months	86.08 ± 3.12	84.75 ± 3.12	0.14
At 12 months	92.46 ± 2.96	92.38 ± 2.62	0.92

Table 8: ROM-extension



Graph 7: ROM-extension

Pronation was assessed at 6 weeks 3 months, 6 months and 12 months. In group A pronation was 80.54 ± 6.63 at 6 weeks which increased to 84.75 ± 4.65 at 3 months, 90.13 ± 2.85 at months and finally reached 93.79 ± 3.02 at 12 months.

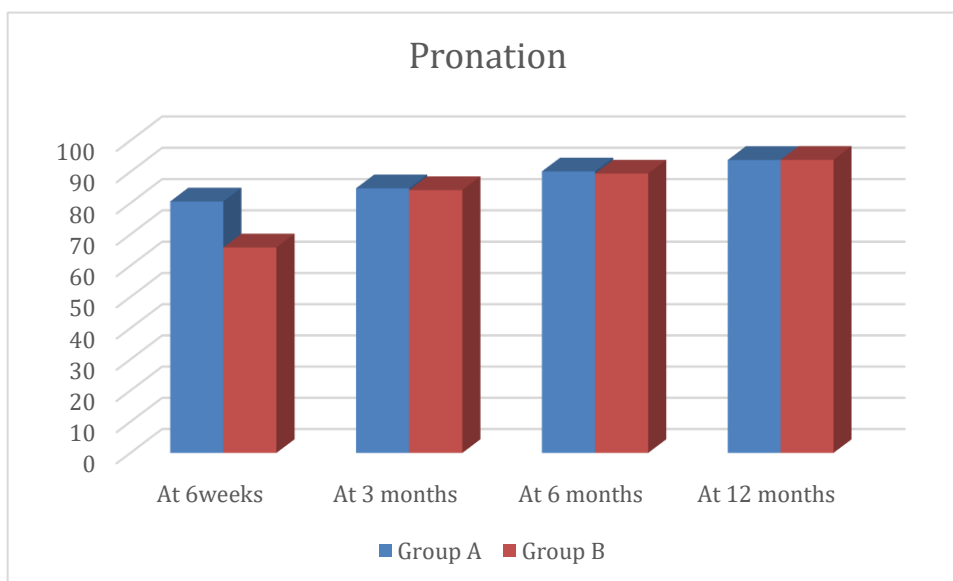
Pronation for group B was 65.83 ± 9.52 at 6 weeks which increased to 84.17 ± 4.64 at 3 months, 89.42 ± 2.13 at 6 months and finally 93.83 ± 1.93 at 12 months.

Difference in pronation between group A and group B at 3 weeks was 80.54 ± 6.63 and 65.83 ± 9.52 ($p=<0.001$) which was significant. At 3 months this difference become 84.75 ± 4.65 and 84.17 ± 4.64 ($p=0.67$) which is not significant. At 6 months difference in pronation between group A and B becomes 90.13 ± 2.85 and 89.42 ± 2.13 ($p=0.33$) which is again not significant. At 12 months pronation in Group A was 93.79 ± 3.02 and group B was 93.83 ± 1.93 with no much difference in pronation between the groups and the difference found was not statistically significant ($p=0.96$). (table 9, graph 8)

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Pronation	Group A	Group B	P value
At 6weeks	80.54±6.63	65.83±9.52	<0.001
At 3 months	84.75±4.65	84.17±4.64	0.67
At 6 months	90.13±2.85	89.42±2.13	0.33
At 12 months	93.79±3.02	93.83±1.93	0.96

Table 9: ROM-pronation



Graph 8: ROM – pronation

Supination was assessed at 6 weeks 3 months, 6 months and 12 months. In group A supination was 73.58±6.31 at 6 weeks which increased to 84.67±4.91 at 3 months, 90.88±3.48 at months and finally reached 94.00±2.95 at 12 months.

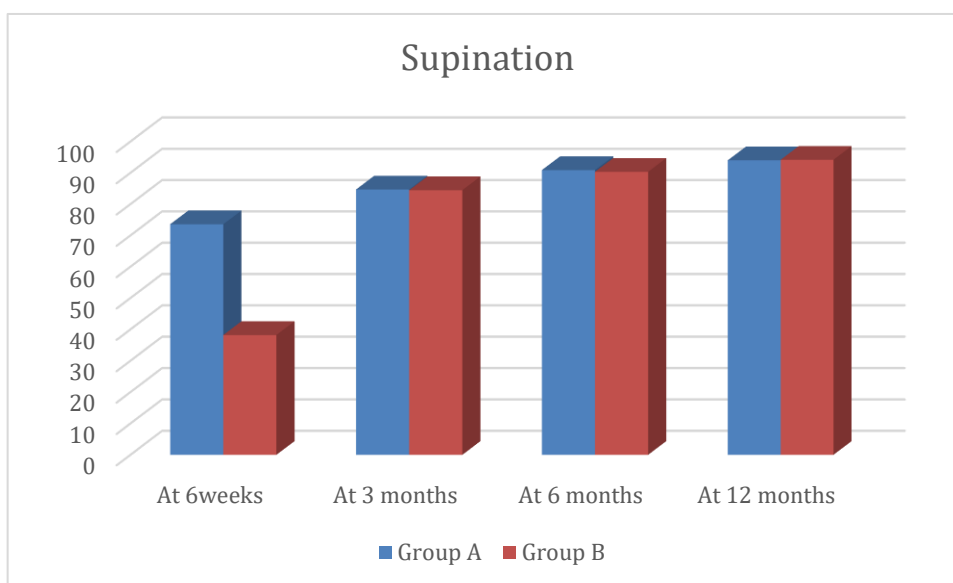
Supination for group B was 38.21±4.66 at 6 weeks which increased to 84.46±5.87 at 3 months, 90.33±3.75 at 6 months and finally 94.17±3.59 at 12 months.

Difference in supination between group A and group B at 3 weeks was 73.58±6.31 and 38.21±4.66 ($p < 0.001$) which was significant. At 3 months this difference become 84.67±4.91 and 84.46±5.87 ($p = 0.89$) which is not significant. At 6 months difference in supination between group A and B becomes 90.88±3.48 and 90.33±3.75 ($p = 0.61$) which is again not significant. At 12 months supination in Group A was 94.00±2.95 and group B was 94.17±3.59 with no much difference between the groups, this minimal difference present was also not statistically significant ($p = 0.86$). (table 10, graph 9)

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Supination	Group A	Group B	P value
At 6weeks	73.58±6.31	38.21±4.66	<0.001
At 3 months	84.67±4.91	84.46±5.87	0.89
At 6 months	90.88±3.48	90.33±3.75	0.61
At 12 months	94.00±2.95	94.17±3.59	0.86

Table 10: ROM – supination



Graph 9: ROM - supination

Grip strength was assessed at 6 weeks, 3 months, 6 months and 12 months and was documented as percentage of grip strength of uninjured limb. In Group A mean grip strength was 40.88±4.80 at 6 weeks which became 63.13±6.55 at 3 months and increased to 80.92±6.53 at 6 months. At the final assessment at 12 months, grip strength increased to 92.17±3.55.

The mean Grip strength assessed in group B at 6 weeks was only 10.17±1.95, which increased significantly to 43.88±6.80 at the end of 3 months and further increased to 69.08±5.45 at 6 months. At the final 12 months assessment mean grip strength in Group B was 84.46±6.09.

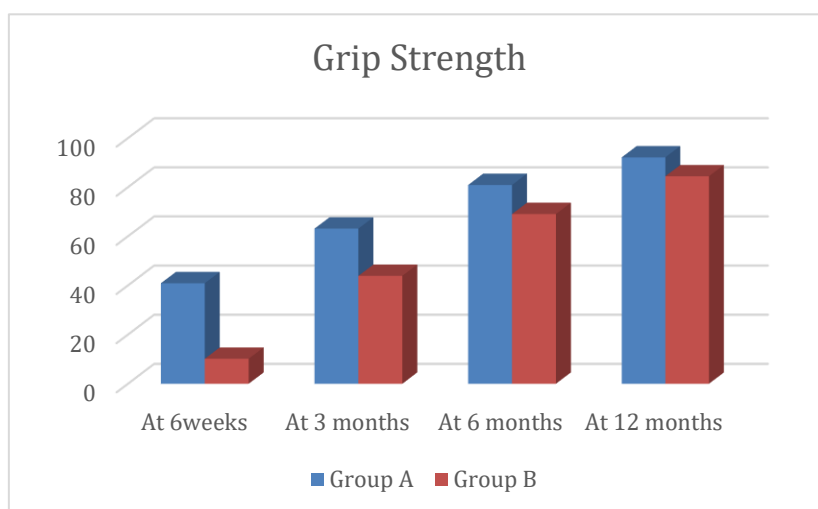
The difference in mean grip strength between Group A & Group B at 6 weeks was 40.88±4.80 and 10.17±1.95, where the mean grip strength of Group A was found to be significantly higher than that of Group B ($p < 0.001$). This difference becomes 63.13±6.55 & 43.88±6.80, where mean grip strength increases in both the groups but the Group A grip strength is significantly higher than Group B ($p < 0.001$). At 6 months Grip strength in Group A & B increases to 80.92±6.53 & 69.08±5.45 and the difference continues to be significant. At the final assessment at 12 months, grip strength in Group A remains higher as 92.17±3.55 and in Group B even when it increases to 84.46±6.09,

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it is still less than Group A with a significant difference ($p < 0.001$). (table 11, graph 10)

Grip Strength	Group A	Group B	P value
At 6weeks	40.88±4.80	10.17±1.95	<0.001
At 3 months	63.13±6.55	43.88±6.80	<0.001
At 6 months	80.92±6.53	69.08±5.45	<0.001
At 12 months	92.17±3.55	84.46±6.09	<0.001

Table 11: grip strength



Graph 10: grip strength

4. DISCUSSION

Oshige T et al⁷ in 2007 published a study among 62 consecutive patients over 60 years of age with dorsally angulated, unstable distal radius fractures comparing intra-focal pinning and volar locking plating. It was found that VLP, but not IFP, can maintain surgically corrected UV in distal radius fractures, independent of the degrees of initial UV and BMD. VLP enhances earlier recovery in range of motion and grip strength than IFP. In our study ulnar variance and bone marrow density was not evaluated. When compared with multiple K-wire fixation, volar locking plate was found to be giving better initial recovery and functional outcome. But at the end of 12 months there was no significant difference between 2 groups as evaluated by Quick Dash score and PRWE score.

In 2008 Egol et al⁶ published a prospective, randomised trial to evaluate the outcome after surgery of displaced, unstable fractures of the distal radius. A total of 280 consecutive patients were enrolled in a prospective database and 88 identified who met the inclusion criteria for surgery. They were randomised to receive either bridging external

fixation with supplementary Kirschner-wire fixation or volar-locked plating with screws. Both groups were similar in terms of age, gender, hand dominance, fracture pattern, socio-economic status and medical co-morbidities.

Although the patients treated by volar plating had a statistically significant early improvement in the range of movement of the wrist, this advantage diminished with time and in absolute terms the difference in range of movement was clinically unimportant. In our study similar result was observed where patients in volar locking plate group showed initial better outcome when compare to multiple K-wire fixation, but as time progressed the difference between the groups diminished to have no significant difference at the end of 12 months. Radiologically, there were no clinically significant differences in the reductions, although more patients with AO/OTA (Orthopedic Trauma Association) type C fractures were allocated to the external fixation group. The function at one year was similar in the two groups like the result in our study. No clear advantage could be demonstrated with either treatment but fewer re-operations were required in the external fixation group. In our study also no significant advantage was noticed for one group over the other group except for the initial early recovery in volar locking plate group.

McFadyen et al⁸ in 2011 published a study to ascertain if fixed-angle volar-locked plates confer a significant benefit over manipulation and Kirschner-wire stabilization. The study prospectively randomized 56 adult patients with isolated, closed, unilateral, unstable extra-articular fractures into two treatment groups, one fixed with K-wires and the other fixed with a volar locking plate. Functional outcomes were assessed using Gartland and Werley and Disabilities of the Arm, Shoulder and Hand (DASH) scores. These were statistically better in the plate group at 3 and 6 months. In our study statistically significant difference in Quick DASH score was observed between volar locking plate group and K-wire group at 6 weeks, 3 months and 6 months, where volar locking plate was found to be having better Quick DASH score. The study has found both superior functional and radiological outcomes at 3 and 6 months post-injury in injuries treated within locked internal fixation. Patients in this group also had significantly less complications than those treated with percutaneous pinning. Similar results were found in our study initially at 6 weeks, 3 months and 6 months, but at the end of study at 12 months the functional outcome in both groups were similar with no statistically significant difference

Alexia Karantana et al⁹ in 2013 published a randomized controlled trial among 130 patients with distal radius fractures comparing volar locking plate (66 patients) and conventional percutaneous methods (64 patients). It was found that use of a volar locking plate resulted in a faster early recovery of function compared with use of conventional methods. This was found in our study also. However, no functional advantage was demonstrated at or beyond twelve weeks. In our study statistically significant better outcome with VLP became statistically insignificant at 12 months Use of the volar locking plate resulted in better anatomical reduction and grip strength, but there was no significant difference in function between the groups at twelve weeks or one year. The earlier recovery of function may be of advantage to some patients with VLP, which was also found in our study.

In 2014 Matthew L Costa et al¹⁰ published a randomized controlled trial comparing percutaneous fixation with Kirschner wires and volar locking plate fixation in adults with dorsally displaced fracture of distal radius among 461 adult patients in 18 trauma

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centers in United Kingdom. Contrary to the existing literature, and against the rapidly increasing use of locking plate fixation, this trial found no difference in functional outcome in patients with dorsally displaced fractures of the distal radius treated with Kirschner wires or volar locking plates. Kirschner wire fixation, however, is cheaper and quicker to perform. Similar results were observed in our study where k-wire fixation had similar outcome as volar locking plate at the end of 12 months. However volar locking plate gave earlier functional outcome.

FIGURES:

1) Closed reduction k-wire fixation



Fig 30.1:Pre-op x-ray AP & Lateral view

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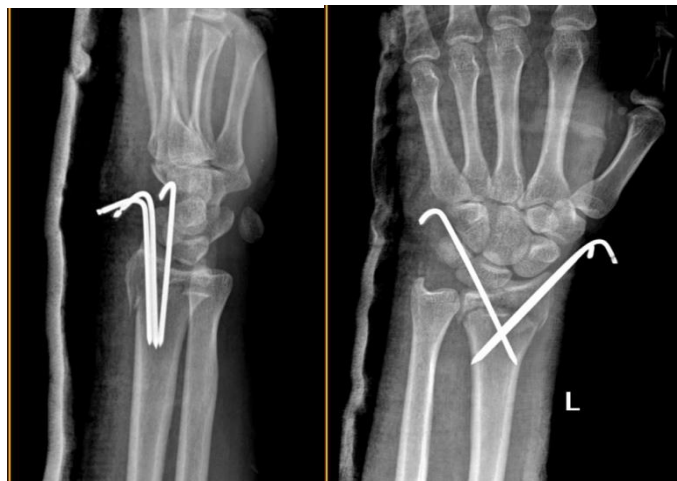


Fig 30.2: Post-op x-ray AP & lateral view



Fig 30.3: Post op flexion & extension



Fig 30.4: Post op pronation & supination

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2) OPEN REDUCTION INTERNAL FIXATION WITH VOLAR LOCKING PLATE



Fig 31.1:Pre-op AP & lateral views



Fig 31.2:Post-op AP & lateral view

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Fig 31.3: Post-op flexion & extension



Fig 31.4: Post-op pronation & supination

5. CONCLUSION

The study evaluated various parameters, including grip strength, range of motion (extension, flexion, pronation, supination), and functional outcomes using Quick DASH and PRWE scores. Additionally, radiological parameters like palmar tilt, radial height, and radial inclination were considered. Initially, all these parameters favoured the VLP group in the first follow-ups, but the differences between the groups diminished over time. By the end of one year, the distinctions were not significant for all parameters except for flexion, which remained significantly better in the VLP group. The conclusion drawn is that no single procedure proves superior to the other in terms of functional outcomes at the one-year mark.

The use of a volar locking plate resulted in a faster early postoperative recovery of function compared to K-wire fixation. Despite achieving better anatomical reduction and measured grip strength, the volar locking plate did not translate into a significant

functional advantage at one year. Nevertheless, the earlier recovery of function provided by volar plate fixation may be advantageous for certain patients, particularly those requiring earlier mobilization and better functional outcomes.

It's interesting to note that the other studies consistently emphasize the need for larger, well-designed, and adequately powered randomized controlled trials to definitively identify the optimal method of fixation for distal radius fractures. Our study acknowledges the limitation of a smaller sample size (48 total) and a follow-up period not extending beyond 12 months.

6. REFERENCES

1. Court-Brown CM, Caesar B. Epidemiology of adult fractures: a review. *Injury*. 2006;37(8):691–7.
2. Azad A, Kang HP, Alluri RK, Vakhshori V, Kay HF, Ghiassi A. Epidemiological and treatment trends of distal radius fractures across multiple age groups. *J Wrist Surg*. 2019;8(4):305–11.
3. Lindau TR, Aspenberg P, Arner M, Redlundh-Johnell I, Hagberg L. Fractures of the distal forearm in young adults. An epidemiologic description of 341 patients. *Acta Orthop Scand*. 1999;70(2):124–8
4. Mattila VM, Huttunen TT, Sillanpaa P, Niemi S, Pihlajamaki H, Kannus P. Significant change in the surgical treatment of distal radius fractures: a nationwide study between 1998 and 2008 in Finland. *J Trauma* 2011;71:939–942.
5. Chung KC, Spilson SV: The frequency and epidemiology of hand and forearm fractures in the United States, *J Hand Surg [Am]* 26:908-915, 2001.
6. Egol K, Walsh M, Tejwani N, McLaurin T, Wynn C, Paksima N. Bridging external fixation and supplementary Kirschner-wire fixation versus volar locked plating for unstable fractures of the distal radius. *J Bone Joint Surg Br*. 2008 Sep 1;90-B(9):1214-1221. <https://doi.org/10.1302/0301-620X.90B9.20521>
7. Oshige T Sakai A Zenke Yet al. A comparative study of clinical and radiological outcomes of dorsally angulated, unstable distal radius fractures in elderly patients: intrafocal pinning versus volar locking plating. *J Hand Surg Am* 2007;32:1385–92
8. McFadyen I, Field J, McCann P, Ward J, Nicol S, Curwen C. Should unstable extra-articular distal radial fractures be treated with fixed-angle volar-locked plates or percutaneous Kirschner wires? A prospective randomised controlled trial. *Injury*. 2011 Feb 1;42(2):162-6.
9. Karantana A, Downing ND, Forward DP, Hatton M, Taylor AM, Scammell BE, Moran CG, Davis TR. Surgical treatment of distal radial fractures with a volar locking plate versus conventional percutaneous methods: a randomized controlled trial. *J Bone Joint Surg Am*. 2013 Oct 2;95(19):1737-44.
10. Costa ML, Achten J, Parsons NR, Rangan A, Griffin D, Tubeuf S, Lamb SE; DRAFFT Study Group. Percutaneous fixation with Kirschner wires versus volar locking plate fixation in adults with dorsally displaced fracture of distal radius: randomised controlled trial. *BMJ*. 2014 Aug 5;349:g4807.

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