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# Percutaneous Kirschner's Wires Fixation versus Volar Locked Plate Fixation for Elderly Patients with Distal Radial Fracture; A comparative study

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**Abstract:**

**Background:** In the senior population, distal radius intraarticular fractures are likely to result in poor clinical results. In the literature, fracture treatment is a contentious topic with conflicting findings. The aim of this study is to compare the functional outcomes of Percutaneous Kirschner's wires fixation versus volar locked plate fixation for elderly patients with intraarticular distal radial fractures.

**Methods:** The patients were divided into two groups: There were 25 patients in VLP group and 25 patients in Kwires group. Radiological parameters include radial volar tilt, radial length, and radial inclination will be assessed at pre-operative, post-operative 4 weeks and 3 months. Functional recovery was measured in terms of Green O' Brien Scoring system. Measurements will be taken at the conclusion of 12 weeks follow-up

**Results:** Mean age of patients in group A was 65.56 and in group B was 65.36 years old. There was no significant difference between groups regard complication distribution. There was no significant difference regards overall result categories distribution between groups.

**Conclusion:** If early functional postoperative care is important, volar locked plate fixation is an ideal treatment due to the earlier return to activities of daily living that is observed with this method. Otherwise, K-wire fixation is a good minimally invasive alternative with comparable clinical results, shorter operation time and shorter hospital stay. This is better accepted by older patients.

**Keywords:** Distal radius fracture; Elderly; Volar locking plate; Kirschner wires; Functional outcome; Radiological outcome.

**Introduction:**

About 17.5% of all fractures, particularly in the elderly, are distal radial fractures, making them the most frequent fractures seen in medical care. Closed reduction and casting fixing are typically the first treatments. To get a better reduction and acceptable radiological parameters, surgery may be a possibility if a good reduction cannot be obtained in the initial trial or maintained in subsequent trials (1).

The proper management of these fractures is becoming more and more crucial as the older population's life expectancy rises. In the early stages, cast immobilization and closure reduction can be used to treat stable fractures with good results. External immobilization is insufficient to sustain closed reduction for unstable fractures, and further fixation is recommended (2). Since the advent of locking plate fixation (VLP), older patients with VLP have been more likely to have their distal radial fractures managed, and the number of elderly patients undergoing

surgery has steadily increased over the years (3).However, it has not yet been demonstrated that nonoperative treatment is preferable to surgical treatment with a volar locking plate for unstable fractures in the senior population (4). The necessity of pursuing anatomical alignment is questionable because a good functional outcome does not always follow from a radiograph alignment that is deemed satisfactory. Abraham Colles first put forth this idea in 1814 when he saw that individuals who suffered from his name-brand fracture were eventually able to regain complete wrist functionality, even if the deformity persisted (5).

The obvious indications for surgical therapy become more debatable when geriatric distal radial fractures are taken into account. After closed reduction, cast immobilization can be used to treat stable fractures in young children with satisfactory to outstanding outcomes. Operative treatment is recommended for unstable fractures that cannot be stabilized in a cast. Anatomical alignment and fracture reduction, however, are not associated with functional outcomes in older individuals (6). Distal radial fractures in older patients can be effectively managed with volar locking plate fixation, which is common these days, as well as other surgical techniques such bridging or non-bridging external fixators and percutaneous K-wire fixation with cast (7).

There isn't much consensus on how to treat all of these injuries, even though they are widespread. In his 2008 study comparing T-plating with K-wires for fixing distal radius fractures, Radwan M. reported conflicting findings (8).

Because of its stability, short immobilization duration, and early return to prior active life, plate fixation has advantages. In the treatment of distal radius fractures, a locking plate fixation has become more and more common in recent years. Early osteoarthritic alterations are prevented and functional recovery is encouraged by anatomical restoration of the articular surface and fragment alignment. K-wires are a common choice because they are simple to insert, cause less tissue damage, have atraumatic insertion, and have reduced stiffness and swelling. K wire has additional benefits, such as improved fracture healing and a lower risk of infection (9).

Compared to using K-wires for percutaneous fixation, open reduction has the disadvantages of skin scarring, potential tendon damage, requiring a second treatment to remove the plate, being more expensive, and requiring more technical expertise. Less rigid fixation, peripheral neurovascular injury, and wire migration are K wiring complications. According to our research, patients who undergo a more recent surgical approach do not face any more hazards than those who get a more conventional procedure (10).

In general, elderly people are among the fastest-growing demographic groups. Their higher life expectancy and more active lifestyles have necessitated a greater focus on fracture care. We are looking at which surgical fixation works best for older patients with higher functional needs because distal radius fractures are becoming more common in these patients.

## METHODS:

This clinical trial was prospective and randomized. conducted at the hospital of Badr University. According to approved validity, we selected the patients for our study between March 22, 2022, and March 21, 2023, for a one-year study term.

Patients who were 60 years of age or older, had an intraarticular fracture of the distal radius (C1, C2), were of either gender, and had a fracture that was no more than two weeks old were all eligible.

Forearm fractures, open fractures, extra-articular fractures, patients who were not followed up with, and fractures older than two weeks were all excluded.

The following is an evaluation of the clinical data of the patients who met the inclusion criteria:

### A. Preoperative evaluation:

**1. Clinically:** We chose patients from Badr University Hospital's emergency room or outpatient clinic. The normal surgical procedures were administered to the patient who did not meet the selection criteria. A and B were the two groupings. Using Microsoft Excel, a randomization process was used to choose the group. Group (A) is wearing

a plaster cast and K-wires inserted percutaneously under c-arm guidance. Using a volar locking plate and tourniquet control, Group (B) was operated using volar approach.

Prior to surgery, each patient signed an informed consent form. Examining the patient's medical history, including hypertension, diabetes mellitus, smoking, dyslipidemia, obesity, stress, and a positive family history of fragility fractures, as well as their name, age, sex, occupation, address, dominant hand, date, time, and trauma mechanism.

Local and general examination:

General: Conscious, Aware, and Alert. temperature, pulse, and blood pressure.

Local: Perform a thorough examination of the upper limbs to assess any possible and clinically discernible concurrent lesions.

Examination of the skin reveals color, sinus, scarring, and pigmentation; muscle wasting and hypertrophy; swelling, both localized and widespread; and limb abnormalities, including flexion, extension, adduction, and abduction.

Temperature, pulse, and tenderness were all palpable.

There were additional musculoskeletal problems.

2. Anteroposterior (AP) and lateral views of the elbow, forearm, and wrist are used for radiological examination. CT scan (computed tomography). Radial length, radial inclination, and radial volar tilt are examples of radiological parameters that should be evaluated both before and right after surgery.

3. Management Strategy: Temporary decrease in displaced fractures: (fig. 1)

Manual traction and counter traction were used to accomplish closed reduction. Restoring radial height while simulating volar tilt and anatomic radial inclination was the aim of the reduction. A temporary splint keeps the reduction in place.

Under general anesthesia or supraclavicular block, patients will be operated on a normal radiolucent operating table. Group (A) will be performed by volar approach with tourniquet control and a volar locked plate, while Group (B) will be operated via percutaneous K-wires under c-arm guidance and plaster cast.

**Operative Technique:**

**K-wire Technique (fig.2)**

• The affected hand was kept free within range of the image intensifier while the patient was in the supine posture. • While under sedation. • The distal radial fracture was closed under fluoroscopic control, and the appropriate K. wire was used for percutaneous pinning through the lateral nonarticular portion of the styloid radius. One K. wire or wires were drilled into the opposite proximal cortex, and another wire was inserted through the dorsoulnar portion of the radius to the opposite proximal cortex.

• Fluoroscopy was utilized to assess alignment and stability following pin insertion. To make sure no tendons have been tied, passive flexion of the fingers and wrists is assessed. A blade is used to release any skin tethering.

• For ease of removal, K-wires were trimmed short outside the skin and bent at a right angle. K-wire was covered with a sterile dressing that included sponge cushioning. Around the K-wire, a well-pad is attached. After surgery, a well-padded cast is applied to preserve stability. • The wires were removed after 4-6 weeks, and the casts will be removed at 3-4 weeks.

• The average operating time was thirty minutes.

**Figure (1):** K-wires fixation.

**Volar Plate Technique**

The affected hand was held on the side table or table side arm while the patient was in a supine position under general or regional anesthesia. Tourniquet control was applied after the fracture was revealed.

**Palmar approach (modified Henry approach)**

**Landmarks**

Feel the radius's styloid process. It is the farthest point on the radius's lateral side. Next, move in an ulna direction to feel the thick, immovable flexor carpi radialis tendon. At wrist level and just next to the ulnar side of the radial pulse, the flexor carpi radialis muscle and tendon are radial to the palmaris longus muscle.

**Incision**

Make a longitudinal cut across the flexor carpi radialis tendon. Start the incision right above the wrist's skin crease and work your way up the forearm's volar aspect. The length of the plate to be utilized for fixing is typically 7 cm, and the length of the incision will depend on the kind of fracture pathology (2).

The tendon retracts towards the ulna as the flexor carpi radialis sheath opens (Figure 3). The muscle known as the flexor pollicis longus is located beneath the FCR sheath. The pronator quadratus muscle must be exposed by releasing and retracting this ulnarly. Figure 4: Deepen the incision between the radial artery and the flexor pollicis longus.

The palmar cutaneous branch of the median nerve on the ulnar side and the radial artery on the radial side must be protected.

An L-shaped sharp dissection should be used to elevate the pronator quadratus muscle so that it is exposed. The watershed line is where the horizontal limb is positioned. A hypodermic needle inserted into the joint can be used to determine the position of the joint line, which is located a few millimeters proximal to this. The distal radius is visible due to an incision made on the radial boundary of the vertical limb. Along with the periosteum, it is removed from the distal radius (Figure 35, 36).

**Figure (1):** The skin is incised longitudinally along the course of the flexor carpi radialis (FCR) tendon.

**Figure (2):** The FCR sheath is opened and the tendon retracted to the ulnar side.

**Figure (3):** Underneath the FCR sheath lies the flexor pollicis longus muscle this must be released and retratced ulnarly.

**Figure (4):** Releasing the flexor policis longus muscle and revealing the pronator quadratus muscle.

**Figure (5):** The pronator quadratus muscle should be elevated using an L- shaped incision.

**Fracture reduction and fixation:**

The fracture site was exposed and the hematoma and soft tissue were removed, then the fracture and the articular surface was reduced anatomically by traction and derotation and provisionally held in place with small bone holding forceps or preliminary k.wire **Figure (7)**.


**Figure (6):** Fracture site, reduction and fixation.

**Plate position preliminary fixation:**

The self-locking plate was put in place and its location was verified. It is crucial to make sure the volar plate is supported by a tiny plate holder or preparatory k and does not protrude over the Watershed Line.wires (Figure 8).

Following the insertion of convetional screws into the oval plate hole, the drill bit was guided by a locking sleeve, and the subarticular region was fixed using locked screws after the correct screw length was measured. The proximal screws were then inserted using the same technique as shown in Figure 9.

By using direct viewing, rotation and angulation alignment were examined both before and after the fracture was internally fixed.

Incision closure:

Following internal fixation, the tourniquet was taken off, hemostasis was performed, and the pronator quadrates was sutured back to cover the plate using wide, loose sutures. No drain was used in any case, and absorbable

sutures were used to close the subcutaneous tissue before non-absorbable sutures were used to close the skin (Figure 10).

The mean operation time was 70 minutes, and the below elbow slab was applied until the stitches were removed after 15 days.

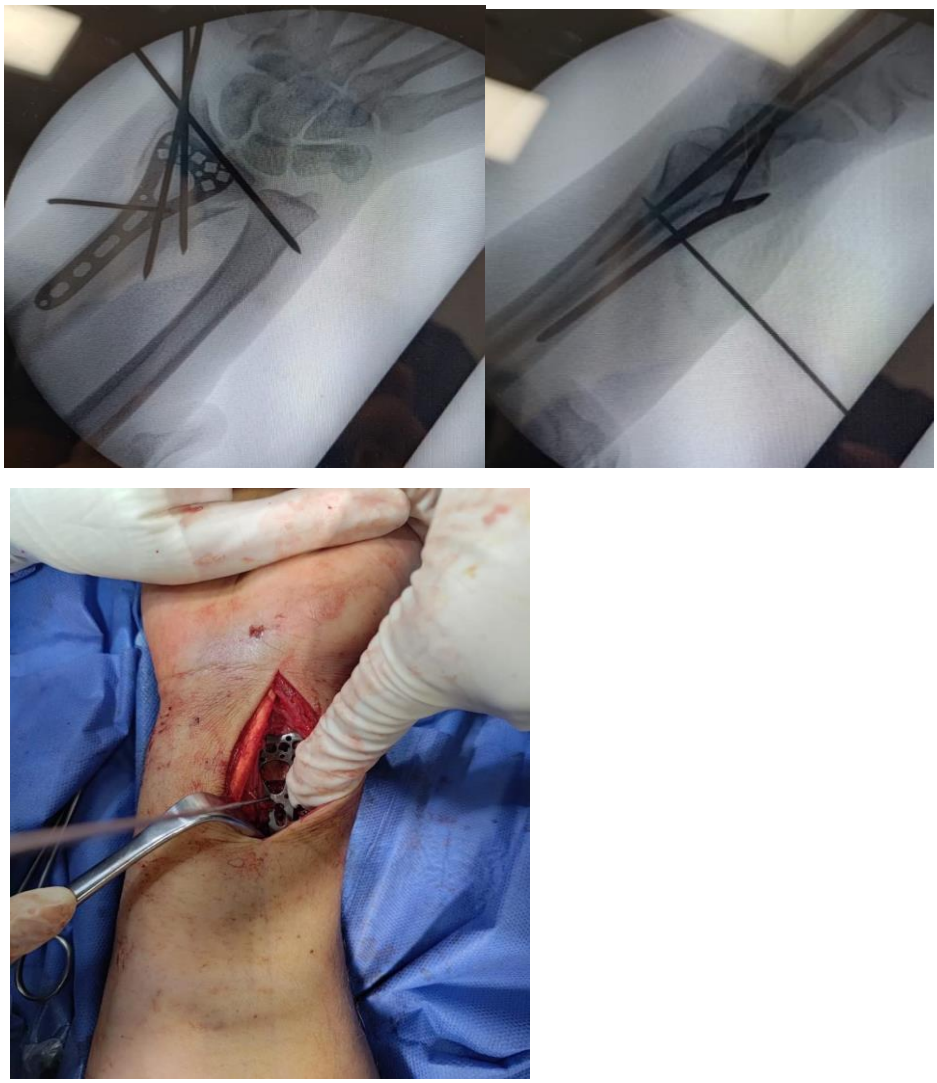

**Figure (7):** Plate position preliminary fixation.

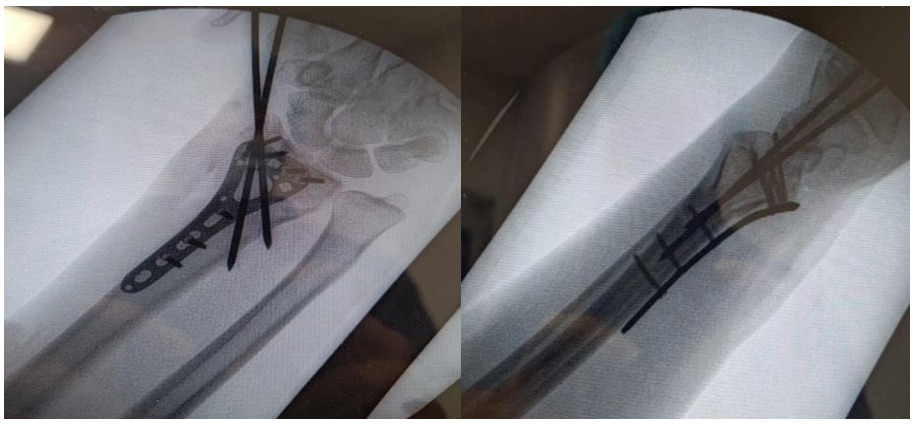

**Figure (8):** Ap. And Lat. Views post fixation.

**Figure (9):** Skin Suture.

**Early postoperative care**

• Analgesics, a cephalosporin antibiotic, anti-edema drugs for two weeks, and limb elevation were used to treat postoperative discomfort and inflammation. The reduction of fracture was confirmed by immediate postoperative check x-rays taken in the lateral and anterior-posterior planes. From day one, patients were asked to make vigorous movements with their fingers, elbows, and shoulders. following making sure their fingers had adequate distal circulation, patients were released 24 hours following surgery.

• For three months, both groups participated in a comparable rehabilitation program that included assisted and active range-of-motion activities.

B. Outcome measures and postoperative evaluation:

1. Clinically• Assessments were conducted at the third and sixth months.

• In comparison to the other healthy wrist, we assess the postoperative range of motion in all directions. • The Green O' Brien Scoring system was used to quantify functional recovery (11). At the end of the 12-week follow-up, measurements were made.

**System of clinical scoring**

The Green O'Brien Scoring System is a clinical scoring system (11). Range of motion, grip strength, functional status, and discomfort are the basis for this rating system. The patients were classified as poor if their total score was less than 65, good if their total score was between 80 and 89, fair if their total score was between 65 and 79, and excellent if their total score was between 90 and 100.

**2-Radiologically**

• Four weeks and three months after surgery, we performed X-rays.• A lateral view and an anteroposterior (AP) view of the wrist.

• Radial volar tilt, radial length, and radial inclination are among the radiological characteristics that were measured before surgery, just after surgery, and six weeks after surgery.

Sample Size Calculation: Using the PASS 11 program, sample size was calculated with power set at 80% and alpha error set at 5%. Results from a prior study (3) were reviewed, and the results indicated variation in the way

distal radius fractures were treated in the US between 2010 and 2015. According to the literature review, no prior comparable study comparing the two study methods in the same age range had been conducted. A sample size of at least 50 patients (25 patients in each research group) was required based on these results after a 10% adjustment for dropout rate. We continued to accept all patients who met the selection criteria until we had 50 patients.

Moral considerations:

The ethical approval, which has the serial number 27-2022 and is valid from 2/3/2022 to 21/3/2023, was acquired from the Helwan University faculty of medicine's ethical committee. Participants in the study gave their informed consent, covering the risks, rewards, compensation, and withdrawal rights. The management of Helwan University Hospital granted administrative approval.

**Statistical analysis:**

The data were coded, inputted, and processed in Microsoft Excel before being imported into SPSS version 20.0 for statistical analysis. Qualitative data were represented as numbers and percentages, whilst quantitative data were articulated as mean ± standard deviation (SD). The Chi-square ($X^2$) test was used to compare and find connections between qualitative variables, while the Student's t-test was used to compare quantitative independent groups. The arithmetic mean ($\bar{X}$) was utilized to characterize central tendency, whereas the standard deviation (SD) was employed to quantify dispersion. A 95% confidence interval was used, with a 5% margin of error. The p-value was declared not significant (NS) if it was greater than 0.05, significant (S) if it was less than 0.05, and highly significant (HS) if it was less than 0.01.

**RESULTS:**

**Demographic characters of studied group**

**Table (1):** Demographic data distribution between studied groups

| | | | K Wire Group A | Plate Group B | t/ X2 | P |
|---|---|---|---|---|---|---|
| **Age** | | | 65.56±3.77 | 65.36±3.43 | 0.196 | 0.846 |
| **Sex** | **Female** | **N** | 10 | 10 | | |
| | | **%** | 40.0% | 40.0% | | |
| | **Male** | **N** | 15 | 15 | 0.00 | 1.0 |
| | | **%** | 60.0% | 60.0% | | |
| **Occupation** | **Light work** | **N** | 15 | 12 | | |
| | | **%** | 60.0% | 48.0% | | |
| | **Manual heavy work** | **N** | 10 | 13 | 0.72 | 0.39 |
| | | **%** | 40.0% | 52.0% | | |
| **Co- morbidity** | **NAD** | **N** | 7 | 7 | | |
| | | **%** | 28.0% | 28.0% | | |
| | **DM** | **N** | 6 | 6 | | |
| | | **%** | 24.0% | 24.0% | | |
| | **HTN** | **N** | 6 | 5 | 0.11 | 0.97 |
| | | **%** | 24.0% | 20.0% | | |
| | **HTN, DM** | **N** | 3 | 3 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | **%** | 12.0% | 12.0% | | |
| | **Smoker** | **N** | 8 | 7 | | |
| | | **%** | 32.0% | 28.0% | | |
| **Total** | | **N** | 25 | 25 | | |
| | | **%** | 100.0% | 100.0% | | |

There was no substantial difference between groups about medical history or behaviors. (Table 1)

**Table (2):** Injury character distribution between studied groups

| | | | **Group** | | **X2** | **P** |
|---|---|---|---|---|---|---|
| | | | **K Wire Group Group A** | **Plate Group Group B** | | |
| **Side** | **Left** | **N** | 9 | 10 | | |
| | | **%** | 36.0% | 40.0% | | |
| | **Right** | **N** | 16 | 15 | 0.02 | 0.98 |
| | | **%** | 64.0% | 60% | | |
| **Dominant** | **Dominant** | **N** | 15 | 16 | | |
| | | **%** | 60.0% | 64.0% | | |
| | **Non dominant** | **N** | 10 | 9 | 0.085 | 0.77 |
| | | **%** | 40.0% | 36.0% | | |
| **Mechanism of injury** | **Fall** | **N** | 19 | 22 | | |
| | | **%** | 76.0% | 88.0% | | |
| | **RTA** | **N** | 6 | 3 | 1.22 | 0.26 |
| | | **%** | 24.0% | 12.0% | | |
| **Total** | | **N** | 25 | 25 | | |
| | | **%** | 100.0% | 100.0% | | |

Most of the time, the injury happened when someone fell, and there was no big difference between the two groups. (Table 2)

**Table (3):** Perioperative data distribution between studied groups

| | **K Wire Group Group A** | **Plate Group Group B** | **t** | **P** |
|---|---|---|---|---|
| **Time lapse before TTT/ hours** | 26.72±7.63 | 28.41±9.63 | 1.505 | 0.139 |
| **Time of operation/m** | 22.2±5.60 | 70.80±8.62 | 23.630 | 0.00** |
| **Hospitalization period/ Day** | 1.6±0.55 | 2.52±0.77 | 4.241 | 0.00** |
| **Time of union/ w** | 10.12±1.09 | 8.72±1.06 | 4.596 | 0.00** |

The K wire group's operating time was much shorter, with an average of 22.2±5.60 minutes compared to 70.80±8.62 minutes for the Plate Group. In group A, 14 patients stayed in the hospital for 1 day, 7 stayed for 2 days, and 4 stayed for 3 days, with a mean of 1.6±0.55 days. In group B, 4 patients stayed in the hospital for 1 day, 4 patients stayed for 2 days, and 17 patients stayed for 3 days, with a mean stay of 2.52 days. The plate group had a much longer hospital stay but a much shorter time of union. (Table 3)

**Table (4):** Clinical and functional outcome distribution between studied groups

| | **K Wire Group Group A** | **Plate Group Group B** | **t** | **P** |
|---|---|---|---|---|
| **Contralateral side flexion** | 80.5±8.56 | 85.46±10.88 | 0.175 | 0.811 |
| **Fracture side Flexion post** | 55.0±7.21 | 65.60±7.40 | 5.126 | 0.00** |
| **p** | 0.00** | 0.00** | | |
| **Contralateral side extension** | 70.0±7.36 | 70.5±7.69 | 0.001 | 0.989 |
| **Fracture side Extension post** | 50.0±7.21 | 55.0±7.21 | 2.449 | 0.018* |
| **p** | 0.00** | 0.00** | | |
| **Contralateral side Supination** | 75.0±10.26 | 80.0±9.52 | 0.168 | 0.828 |
| **Fracture side Supination post** | 53.0±7.5 | 60.80±10.07 | 3.106 | 0.003* |
| **P** | 0.00** | 0.00** | | |
| **Contralateral side Pronation** | 80.0±10.0 | 79.0±15.63 | 0.002 | 0.997 |
| **Fracture side Pronation post** | 59.80±6.37 | 68.80±10.53 | 3.655 | 0.001** |
| **P** | 0.00** | 0.00** | | |
| **Contralateral side Radial deviation** | 20.0±3.0 | 20.5±2.5 | 0.007 | 0.995 |
| **Fracture side Radial deviation post** | 14.0±3.81 | 15.0±4.08 | 0.894 | 0.376 |
| **P** | 0.00** | 0.00** | | |
| **Contralateral side Ulnar deviation** | 45.0±5.0 | 50.0±8.52 | 0.17 | 0.812 |
| **Fracture side Ulnar deviation post** | 32.05±9.16 | 34.40±7.81 | 1.329 | 0.190 |
| **P** | 0.00** | 0.00** | | |

There was no significant difference between groups, except in Flexion, Extension, Supination, and Pronation post. Regarding the difference between the contralateral side and the fracture side post, the fracture side post was significantly lower in both groups across all aspects. (Table 4)

**Table (5):** Radiological outcome distribution between studied groups

| | K Wire Group Group A | Plate Group Group B | t | P |
|---|---|---|---|---|
| **Radial length pre** | 7.92±0.75 | 7.88±0.78 | 0.184 | 0.855 |
| **Radial length post** | 10.16±1.21 | 10.56±1.15 | 1.192 | 0.239 |
| **P** | 0.00** | 0.00** | | |
| **Radial inclination pre** | 18.44±1.15 | 18.51±1.28 | 0.011 | 0.908 |
| **Radial inclination post** | 21.20±1.19 | 22.88±0.78 | 5.198 | 0.00** |
| **P** | 0.004* | 0.002* | | |
| **Volar tilt pre** | 7.76±0.84 | 7.98±1.12 | 0.015 | 0.921 |
| **Volar tilt post** | 9.92±0.64 | 10.34±0.77 | 1.587 | 0.119 |
| **P** | 0.001** | 0.0003** | | |
| **Articular step off pre** | 3.96±0.84 | 3.88±0.93 | 0.015 | 0.901 |
| **Articular step off post** | 0.48±0.18 | 0.44±0.13 | 0.198 | 0.844 |
| **P** | 0.00** | 0.00** | | |

There was no significant difference between groups except in Radial inclination post, and regard change assessment both groups were significantly increased in all parameters except articular step off as it significantly decreased in both groups. (Table 5)

**Table (6):** Post Op score and overall result outcome distribution between studied groups

| | | | K Wire Group Group A | Plate Group Group B | t/ X2 | P |
|---|---|---|---|---|---|---|
| **Post op score (3 m follow up)** | | | 73.20±10.29 | 80.40±8.28 | 2.725 | 0.009* |
| **Overall results** | **Poor** | **N** | 4 | 1 | 4.77 | 0.18 |
| | | **%** | 16.0% | 4.0% | | |
| | **Fair** | **N** | 11 | 7 | | |
| | | **%** | 44.0% | 28.0% | | |
| | **Good** | **N** | 8 | 12 | | |
| | | **%** | 32.0% | 48.0% | | |
| | **Excellent** | **N** | 2 | 5 | | |
| | | **%** | 8.0% | 20.0% | | |
| **Total** | | **N** | 25 | 25 | | |
| | | **%** | 100.0% | 100.0% | | |

There was statistically significant difference in score in follow up for 3 months between K.W and Plate where the Plate fixation had good function out come more than K.W fixation (Table 6).

**Table (7):** Complications distribution between studied groups

| | | | Group | | X2 | P |
|---|---|---|---|---|---|---|
| | | | K Wire Group A | Plate Group Group B | | |
| **Complication** | **No** | **N** | **17** | **20** | **1.24** | **0.74** |
| | | **%** | **68.0%** | **80.0%** | | |
| | **Infection** | **N** | **4** | **2** | | |
| | | **%** | **16.0%** | **8.0%** | | |
| | **Malunion** | **N** | **2** | **1** | | |
| | | **%** | **8.0%** | **4.0%** | | |
| | **Stiffness** | **N** | **2** | **2** | | |
| | | **%** | **8.0%** | **8.0%** | | |
| **Total** | | **N** | **25** | **25** | | |
| | | **%** | **100.0%** | **100.0%** | | |

There was no significant difference between groups regard complication distribution and 32% of Kwire group have complication in form of 4 patients have pin tract infection, 2 patients have malunion and 2 patients had stiffness and 20% of the plate group in form of 2 patients had superficial infection, one patient had malunion and 2 patients had stiffness. (Table 7)

## DISCUSSION

Distal radial fractures are the most common type of fracture that health care providers see. They make up around 17.5% of all fractures, mainly in older persons. Typically, the primary intervention involves closed reduction and stabilization through casting. However, if a satisfactory reduction cannot be attained, a surgical intervention may be contemplated to achieve improved reduction and acceptable radiological characteristics (1).

Because older people are living longer, it is becoming more and more important to treat these fractures correctly. Closed reduction and cast immobilization can be used to treat stable fractures, and this works well in the early stages. For unstable fractures, closed reduction cannot be sustained with external immobilization, necessitating further fixation (2).

Elderly individuals with osteoporotic bone are prone to distal radius fractures that result in displacement. Several studies have examined determinants of instability in conservatively treated distal radius fractures. A prospective study involving 645 conservatively treated Colles' fractures identified age as a significant predictor of displacement (12). In another study examining 60 distal radius fractures in a low-demand elderly cohort treated with anatomic reduction and cast immobilization, no link was identified between fracture classification, initial displacement, and final radiological prognosis (13).

This study compares the functional results of volar locked plate fixation and percutaneous Kirschner's wire fixation for elderly patients with intraarticular distal radial fractures.

Between June 2022 and December 2023, we treated fifty (50) patients with intra-articular distal radius fractures (DRF) class C1–C2 at Badr University Hospital. Of these patients, 25 were treated with K-wire and the remaining 25 were treated with volar locking plates. The patients were all above 60 years of age. Based on the Green O'Brien Scoring method, the follow-up period spanned three to six months.

In our study, the average age of the patients was 65.36 for the plate group and 65.56 for the k wire group. The definition of elderly persons is still up for debate; according to Mandal et al. (14) and Bagheri et al. (15), older people are defined as those who are 60 years of age or older. The Centers for Disease Control and Prevention define elderly persons as those who are 65 years of age or older (16). According to the Chinese Medical Association's Geriatrics Branch's fourth seminar, "the elderly" are defined as those between the ages of 60 and 79. We selected the age of 60 as the watershed for the old based on the findings of the aforementioned investigations.

According to Yigit (17), the average age in his study was 70.4 for the plate group and 70.7 for the k wire group. According to Goehre et al. (18), the average age in the plate group was 71.03 and in the k wire group it was 73.8. According to Zhang et al. (19), the average age in the plate group was 67.97 while in the k wire group it was 70.03.

Male participation in outdoor activities, vehicle riding, and hard manual labor may be the reason for the higher frequency of DRF in this study (60%) among males.

According to the majority of writers, comminuted distal radial fractures were more common in older age groups and in females, according to a review of prior research conducted by Arvind et al. (20). Of the 60 patients in Zhang et al.'s (19) study, 49 (81.6%) were female and 11 (18.3%) were male.

There were three female patients (10%) and 27 male patients (90%) in another study by Meena et al. (21). Another study by Ali et al. (22) involved 43 patients, 36 of whom were male (83.7%) and 7 of whom were female (16.3%).

In our analysis, falls on the ground accounted for 82% of trauma, whereas road traffic accidents (RTA) accounted for 18%. Additionally, 31 cases (62.0%) included the dominant hand, whereas 19 cases (38.0%) involved the non-dominant hand.As a reflex mechanism, the dominant hand was primarily impacted; persons typically used their dominant hand to defend themselves.

The dominant hand was injured in 24 cases (80%) and the non-dominant hand in 6 cases (20%) in the Meena et al. (21) study. The trauma mode was falling on an outstretched hand in 21 cases (70%) and being in a car accident in 9 cases (30%). In the Ali et al. (22) study, 33 patients (76.7%) had injuries to their dominant hand, while 10 instances (23.3%) had injuries to their non-dominant hand. Road traffic accidents accounted for 31 cases (72%), falls from a height for 8 cases (18.6%), and sports-related incidents for 4 cases (9.4%) as the mode of trauma.

The K Wire Group's operation time was considerably less than the Plate Group's, with the two groups' respective times being 22.2±5.60 and 70.80±8.62 minutes.

The median skin-to-skin operation time in the Goehre et al. (18) investigation was 60 (range 31–130) minutes for the plate fixation group and 23 (range 10–55) minutes for the K-wire fixation group. There was a significant difference ($p < 0.01$) in the operation times for the two surgical procedures. According to Zhang et al. (19), the K wire group's operating time was notably less than the Plate Group's, which was 30.73 and 60.4 minutes, respectively.

The Plate group in our study had a noticeably lengthier hospital stay. The average length of stay in the hospital was 1.6±0.55 days for the K wire group and 2.52±0.77 days for the plate group. Additionally, Zhang et al. (19) found that the plate group had a considerably longer hospital stay than the K wire group, with the mean hospitalization length in the plate group being 9.37 days and the K wire group's being 5.77 days.

Except for flexion, extension, supination, and pronation post, there were no significant differences between the groups in our study. In terms of the contralateral side and fracture side post differences, the fracture side post was significantly lower in both groups in every way.

Range of motion was measured at 6 and 12 months in the Yigit (17) investigation. At no time point did the ROM degrees of the two groups differ significantly between six months and a year. Regarding ROM at three, six, and twelve months, there was no discernible difference between the groups in the Goehre et al. (18) investigation.

In order to evaluate the healing outcome of a distal radius fracture, Graham (23) proposed evaluation criteria based on three radiographic measurements: volar tilt (usually around 11°), radial inclination (usually around 23°), and radial height (usually between 11 and 12 mm). One of the most commonly used standards for treating patients with distal radius fractures nowadays is Graham's criteria. Due to the limited association between radiographic and functional results in older patients, these radiographic criteria did not necessarily correlate with subjective functional outcomes (24). Except for radial inclination post, there was no significant difference between the groups in our study. In terms of change assessment, both groups showed significant increases in all parameters, with the exception of articular step off, which considerably decreased in both groups.

Both groups in the Yigit (17) study had similar degrees of initial fracture displacement and intra-articular (AO type C1) radius distal fracture types. There was no significant difference between the two groups in terms of radial inclination ($p = 0.975$), volar tilt ($p = 0.661$), or radial height ($p = 0.346$) when comparing VLP to CRPP postoperative images taken a year later. Zhang et al. (19) also found no significant difference between the two groups in terms of radial inclination, volar tilt, and radial height.

In our study, the average age of the K-wire group is 65.56, the male incidence rate is 60.0%, K-wire removal occurs in 4-6 weak individuals, and all patients have a 3-month functional outcome follow-up. The three-month Green O' Brien scoring method yielded a score of 73.20.

in contrast to prior K-wire studies. The mean age of the 70-year-old female incident in Wong (25) was 62%, and the Green O' Brien Scoring system was used for the 12-month follow-up (82.2).

The average age in the Volar Plate group is 65.36, with a high incidence of 60% in males. After two weak points, the sutures are removed, and all patients have a three-month functional outcome follow-up. The three-month Green O' Brien scoring method yielded an 80.40 score.

Overall, seven patients (14%), twenty patients (40%), eighteen patients (36%), and five patients (10%) had excellent functional end results, which were assessed using the Green O'Brien scoring method. 54% of the findings are satisfactory (good and outstanding), whereas 46% are unsatisfactory (fair and bad).

There was a statistically significant difference in the three-month follow-up scores between K.W. and Plate in this investigation, with Plate fixation showing better function outcomes than K.W. fixation. For group (A) treated by percutaneous pinning, the satisfying outcomes (excellent & good) make up 40% and the unsatisfactory results (bad & fair) make up 60%. For group (B) treated with self-locked plates and screws, the satisfying outcomes (excellent & good) make up 68% of the total, whereas the unsatisfactory results (bad & fair) make up 32%. Regarding the distribution of overall result categories between groups, there was no discernible variation.

In their Comparison of Modified K-wire Fixation with Open Reduction and Internal Fixation (ORIF) for Unstable Colles Fracture in Elderly Patients, Zhang et al. (19) found no significant difference between the two groups after 3 months postoperatively ($p > 0.05$). For group (A) treated by percutaneous pinning, the satisfying outcomes (excellent & good) make up 73.3% of the total, whereas the unsatisfactory results (bad & fair) make up 26.6%. For group (B) treated with self-locked plates and screws, the satisfying results (excellent & good) make up 86.6% of the total, whereas the unsatisfactory outcomes (bad & fair) make up 13.3%. Additionally, there was no discernible variation in the distribution of overall result categories across the groups.

When comparing the clinical results of self-locked plate fixation and percutaneous pinning for intra-articular distal radial fractures, Jupiter (26) found no appreciable variations between the two methods.

In his retrospective and observational cohort study comparing the outcomes of elderly women's radius distal AO type C1 fractures using two different techniques, Yigit (17) found no significant difference between the PRWE scores of the two groups at any time point between six months and a year ($p = 0.23$ and $p = 0.80$).

According to Goehre et al. (18), patients treated with palmar fixed-angle plate fixation and K-wire fixation for distal radius fractures (A2, A3, and C1) in patients over 65 years of age had similar functional outcomes one year later. Both approaches produced functional results that were almost equal after a year. Additionally, this conclusion is in line with previous writers' findings (27).

Low bone quality in older people increases the likelihood of malunion. Two patients in the current study who received percutaneous pinning experienced malunion as a result of their casts being removed before six weeks (a mistaken management strategy); one patient in the plate group experienced malunion as a result of heavy manual labor one week after the slap was removed.

Porgue et al. (28) documented malunion in the distal radius, and Huard et al. (29) evaluated the outcomes of treating 38 patients with a distal radius fracture using K-wires or a volar non-locking plate in patients older than 70. In order to treat distal radial fractures in 89 senior individuals, Voigt (30) compared the outcomes of a VLP and a CRPP.Loss of decrease was shown to occur often in both experiments. In the Yigit (17) trial, two patients experienced a malunion (a loss of reduction) in the VLPs group while four patients experienced a malunion in the K wires group.

The possibility of infection is the primary drawback of internal fixation and open reduction. Out of 36 individuals, Rozental (31) reported two cases of infection. In 6.7% of cases, Lucas (32) reported infection. In the current study, four cases in group (A) treated by percutaneous pinning had pin tract infections that were resolved by antibiotics and dressing, whereas two cases of superficial infection in group (B) treated by self-locked plates were resolved by continuous dressing and broad spectrum antibiotics.

Prophylactic wide spectrum antibiotics, sterilized surgical technique, and patient awareness of operative instructions appeared to be the key to preventing infection.

Regarding the distribution of complications in our study, there were no appreciable differences between the groups. Furthermore, according to Yigit (17), there was no discernible difference in the complications between the two groups (VLP group 6 (%15) and CRPP group 6 (%17). In their investigation, Zhang et al. (19) discovered no discernible difference in the distribution of complications between the groups.

Elderly patients with intra-articular distal radius fractures can be treated using either technique (17, 19). The patient, the kind of fracture, and the surgeon's experience all play a role in surgical planning. Volar locked plate fixation is the best course of action if early functional postoperative care is crucial since it allows patients to resume daily activities earlier (18, 30, 33). Other than that, K-wire fixation is a good minimally invasive substitute that has faster recovery times, shorter hospital stays, and comparable clinical outcomes. Elderly patients are more receptive to this. (17, 30, 34).

Our study had certain limitations. 50 patients is still a small sample size. There is a limited follow-up period in this study. Furthermore, in the studies included in this investigation, the incidence of posttraumatic arthritis would not have been identified at the short-term follow-ups. In long-term follow-up, it is possible to observe how the beginning of posttraumatic arthritis affects wrist functioning.

## CONCLUSION

Both closed reduction and internal fixation with K. wires and open reduction and internal fixation with volar locked plates and screws are appropriate for the treatment of elderly patients with intra-articular distal radius fractures because they offer rigid fixation and anatomical reduction that is adequate to enable early mobilization of the nearby joints, thereby assisting in the achievement of satisfactory functional results. The patient, the kind

of fracture, and the surgeon's experience all play a role in surgical planning. There was no discernible variation in the distribution of overall result categories across groups, despite the fact that K. wires produced less desirable results than plates and screws; this could be because there were less cases. Volar locked plate fixation is the best course of action if early functional postoperative care is crucial since it allows patients to resume daily activities sooner. Other than that, K-wire fixation is a good minimally invasive substitute that has faster recovery times, shorter hospital stays, and comparable clinical outcomes. Elderly patients are more receptive to this.

**RECOMMENDATIONS**

K-wire has the following benefits: minimally invasive, safe, easy, quick near anatomical reduction achievement, minimal blood loss, shorter operation time, shorter hospital stay, and non-significant difference in terms of overall result categories distribution between groups using two techniques. Based on this study, we recommend its use in the management of elderly patients with simple intra-articular distal radius fractures (C1-C2). However, because volar locked plates are more stable and have a lower failure rate of reduction and mal-united, we advise their use in the treatment of intra-articular distal radius fractures in older patients who require an earlier resumption to activities of daily living.

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