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ORIGINAL ARTICLE

Radiological and Functional Outcome of Distal Radius Fracture treated conservatively (MUA Plaster of Paris) vs Percutaneous K-wire fixation

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ABSTRACT

Aim: To compare the radiological and functional result of conservatively treated distant radius fractures (manipulation under anesthesia and plaster of paris) versus percutaneous K- wire fixation
Study design: Retrospective
Duration and place of study: Department of Orthopedic Surgery, The Indus Hospital, Raiwind campus Lahore from July 2018 to August 2020.
Methods: The sample size of 100 patients aged between 18-60 years, closed, isolated distal radius fracture were included, and patients with diabetes mellitus, ischemic heart disease, pathological fractures, chronic renal disease, head injury, chronic liver disease, whose Glasgow coma scale was <14, malignancy were excluded. Patients were randomized as A & B by lottery method. They managed with conservative treatment (manipulation under anesthesia (MUA) and plaster of paris (POP) cast) and K- wire fixation in groups A & B, respectively. Side of the fractured bone, infection, radiological union, and function outcome were recorded.
Results: Amongst the total 100 patients in group-A, 32(63.8%) were males, and 18(36.2%) were females, and 35 (70.2%) were males, and 15 (29.8%) were females in Group-B. in group A patients mean age was 38.86.19 years, while patients mean age of the group B was 39.57.36 years. With the conservative method, 45(95.7%), the union rate was while with the K- wire fixation method, the union rate was 48(96%). In group-A, 35(70%) had excellent, 10 (20%) good, 03 (6%) had an average, and 2(4%) poor and in group-B, 40(80%) had excellent, 04 (08%) good, 04(08%) had an average, and 02 (4%) poor functional outcome.
Conclusion: In terms of clinical and radiological evaluation, fixation of a distal radius fracture with K-wires has a better outcome than conservative treatment (MUA and POP cast) with a low infection rate and better union and result.
Keywords: closed fracture, distal radius, back slab, K-wires

INTRODUCTION

Distal radial fractures represent 17.5% of fractures, the most common pattern of injury in adults[1]. However, The population has a bimodal age distribution, with the highest incidence occurring in patients under the age of 18 and the second highest incidence occurring in patients 50 years or older (especially postmenopausal)[2-5]. In children and teenagers, high-energy trauma is the most common cause of distal radius fractures 6. As a result, in elderly patients who have experienced low-energy trauma, such as osteopenia/osteoporosis, falling from height is the most likely injury mechanism[7,8]. Recent studies indicate a global rise in distal radius fracture incidence, primarily as a result of increased osteoporosis prevalence. Although the population of elders is at the highest risk, distal radius also affects the health and wellbeing of non-elderly adults considerably[9]. However, there is currently no concord concerning the optimal method of treatment[10,11]. Recent studies indicate improvement in the global rate of distal radius operative treatment, despite the higher expense and confined functional outcome[12]. While bone naturally heals, the close reduction can help reduce the infection risk, a rare but viable complication of surgery[13]. At the same time, prolonged immobilization can aggravate stiffness and augment the risk of emerging osteopenia[14].

According to Chung et al close reduction usage decreased substantially from 82% to 70% (2005). However, it continues to be the most frequently used treatment method, afterward percutaneous pinning (15.8%), external fixation (2.8%) and, internal fixation (10.9%)[14]. Additionally, it is hypothesized that the rising trend toward surgical approaches is because of the improvement of surgical techniques that diminish the risk of post-operative complications although better healing time15. My study compares the functional and radiological outcomes of conservative manipulation versus percutaneous K-wires under anesthesia and a POP cast for a distal radius fracture. We intend to define a standard practical method for treating such fractures, which will significantly aid in devThe objective of the study was to compare the radiological and functional result of conservatively treated distant radius fractures (manipulation under anesthesia and plaster of paris) versus percutaneous K- wire fixation

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METHODOLOGY

A retrospective study was done using a probability simple random sampling technique at the Department of Orthopedic Surgery, Indus Hospital, Raiwind campus Lahore from July 2018 to August 2020. Permission was granted from Institutional Ethical Committee. The sample size of 100 patients aged between 12-60 years, closed, isolated distal radius fractures were included. Patients with chronic medical disorders like chronic renal disease, diabetes mellitus, ischemic heart disease, pathological fractures, chronic liver disease, head injury whose Glasgow coma scale was <14, malignancy after ruling out on history and physical examination were excluded. Institutional review board permission from the Indus hospital was obtained. A thorough explanation was given about the nature of the disease, procedure, and complications relating to the procedure, and both of the patients signed a written consent document that stated that they were aware of

the procedure. By using a randomization technique, two groups of patients were composed: group A and B. The lottery method was used for randomization. Patients in group-A were managed with a conservative method using a back slab. Patients in group-B were managed with K- wire fixation. We recorded the side of the fracture, infection, radiological union, and functional outcome. For a minimum of one year, all patients will be followed up. Patients were seen in the out-patient department (OPD) for follow-up in the 2nd, 6th, 12th, 16th, 20th, 24th, 36th, and 48th weeks following treatment. The side of the fracture and the infection were observed clinically. Union and functionality were recorded using DASH scores.

SPSS version 23.0 was used to analyze the data. A quantitative variable, like age, was presented as standard deviation and mean. Qualitative variables such as gender, side of the fracture were presented as percentages and frequencies. Chi-square analysis or the Fisher exact, where required, applied for qualitative variables (gender, presence or absence of infection, and union). P-values of less than 0.05 are recognized as statistically important.

RESULTS

In group-A, out of the total 100 patients, 32(63.8%) were males, and 18(36.2%) were females, and 35(70.2%) were males, and 15(29.8%) were females in Group-B. In group-A, Patients' mean age was 38.8±6.19 years, and in group-B, patients' mean age was 39.5±7.36year. With the conservative technique, the union rate was 45(95.7%), while with the k wire fixation method, 48(96%) was the union rate. In group-A, 35(70%) had excellent, 10(20%) good, 3(6%) had an average, and 2(4%) poor and in group-B, 40(80%) had excellent, 04 (08%) good, 04(08%) had an average, and 2(4%) poor functional outcome.

Table 1: Gender, age, union, infection, and side of the bone in both groups.

Variables	Conservative treatment (n=50)	K wire fixation (n=50)	n
Gender			
Male	32(64%)	35(70%)	67(67%)
Femal	18(36%)	15(30%)	33(33%)
Age of the patient in years (Mean±SD)	38.8±6.19	39.5±7.36	
Side of the bone			
Right	27(54%)	28(56%)	55(55%)
Left	23(46%)	22(44%)	45(45%)
Infection			
Yes	2(4%)	5(10%)	7(7%)
No	48(96%)	45(90%)	93(93%)
Union of the bone			
Yes	47(94%)	48(96%)	95(95%)
No	3(6%)	2(4%)	5(5%)
DASH score			
Excellent	35(70%)	40(80%)	75(75%)
Good	10(20%)	4(8%)	14(14%)
Average	3(6%)	4(8%)	7(7%)
Poor	2(4%)	2(4%)	4(4%)

DASH = disability arm, shoulder, and hand score

Table 2: Chi-square test of both Groups with Union of the bone

Groups	Union of the bone		n
	Yes (n=95)	No (n=05)	
Group- A	47 (94%)	3(6%)	50(100%)
Group-B	48(96%)	2(4%)	50(100%)

P value 0.001

By applying the Chi-Square test, it was concluded that there was a significant difference between both techniques for the shaft of femur fractures union ($p<0.001$) (Table 2).

DISCUSSION

One of the most prevalent fractures in older patients is distal radius fracture, which accounts for about 17% of skeletal fractures[16,17]. Numerous studies have demonstrated that distal radius anatomic repair is important for appropriate functional outcomes[18-20]. There is a direct link between functional and anatomical outcomes[21–23]. However, this is not the case with elderly patients who function normally regardless of the defect[24]. Numerous factors influence the method selection process. Typically, anatomical restoration can be accomplished through closed or open surgery. Should we have treated the distal radius fracture via the conversational or surgical method of treatment? There is a considerable debate with advancements in knowledge and science of the functional anatomy of the wrist and hand, orthopedic surgeons are able to treat fractures more precisely, including closed reduction, and external fixation, open reduction, and internal fixation closed reduction and percutaneous pinning and, closed and casting reduction.

This paper is intended to compare conservative functionality and radiology (POP and MUA cast) with the percutaneous K-wire fixation surgical method. This simplifies the selection process for the public. I discussed various studies that demonstrated which method is often more advantageous than the other.

According to Li J et al., medicating distal radius fractures with closed restoration and plaster immobilization is an unsatisfactory method. These approaches generate a Colle's fracture malunion. Malunion of fracture results in a painfully malformed, stiffened, and weak wrist. Patients had deprived functional and radiological results and encountered significant difficulties performing daily activities[25]. In 2018, a study was conducted on the follow-up following distal radius conservational treatment with the goal of identifying early functional and radiological loss associated with this method. The patient presented with pain in the wrist, shoulder, and elbow on each visit, as documented in this study. They demonstrated decreased functional outcomes[26].

Okamura A, et al., Li J, et al., and JL Kirk et al. studied Non-surgical therapy of distal radius fractures. All claimed that these were not suitable treatment options for distal radius fractures. They resulted in suboptimal radiographic and functional outcomes[18,25,26]. In 2000, In the United Kingdom, Walton et al. conducted a study in which they used intramedullary and intrafocal insertion of K-wires to treat 103 patients with unstable distal radius fractures. The radiological and functional scores were determined using a modified Lidstrom scoring system. It established that K-wire fixation is an effective and safe technique used for distal radius fractures[27].

Kurup et al. in the United Kingdom conducted a radiological study on 56 patients treated with percutaneous K-wire fixation. The result revealed that distal radius fractures would not experience considerable loss of fracture position restoration following pin removal using the K-wire method of fixation. Variables such as sex, AO type, fracture type, age, and period of wire fixation did not affect the treatment quality[28].

In 2005, an analysis was carried in Pakistan on the customized Kapandji wiring method in destabilizing distal radius fractures. Kapandji wiring is a foremost treatment decision for distal radius fractures, according to this study. K-

wire is the next option for the insecure distal radius fracture, which initially reduces with plaster but becomes insecure in casting plaster. The Kapandji technique has numerous advantages, including ease of use, superior functional outcomes across a range of motions, increased fracture fragment stability, reduce days of disability, and early rehabilitation. These factors contribute to the fact that K-wire fixation is a more effective treatment option for an insecure Colles fracture[29].

Kurup et al., Walton et al and Hashmi et al submitted that fixing the percutaneous K wire in the distal radius procedure led to favorable functional and radiological results[27–29].

Scheck M[40] stated in his longitudinal study that Kirschner cast and wires fixation have become an effective method for distal radius fracture restoration. On the basis of the result this research, 75% of patients had satisfactory anatomical outcomes, while 25% had unsatisfactory outcomes. Additionally, they demonstrated favorable functional outcomes and lacked significant deformity. The patient resumed their normal activities. Only a few patients demonstrated grip loss. One of the comparative cohort's studies found that after a twelve-month record check, patients treated with surgical and non-surgical methods had nearly identical ranges of pain intensity, motion, and DASH and PRWE scores. Patients with the surgical technique demonstrated improved handgrip during that time period. In an incidental clinical trial, the radiological and functional results of casting with percutaneous K-wire fixation in the treatment of distal radial fractures were compared. For both groups, thirty patients were elected.

Treatments had no effect on the quality of life or functional outcomes, according to this study. Both treatments have comparable outcomes in terms of complications, wellbeing, and healing rate. Additionally, the study demonstrated that K-wire was appreciably superior in terms of radiological outcomes (radial length, radial inclination, and dorsal angulation). Whereas both treatments had a low complication rate and a high rate of healing[32].

In Pakistan, post-operative reduction in the displacement of non-physical distal radius fractures in children treated with percutaneous Kirschner wire fixation was investigated against a conservative approach. The study found that the conservational technique had a 50% higher loss of restoration than Kirschner cable fixation. In comparison to conservative treatment, K-Wire fixation is the most appropriate method for treating distal radius fractures in children[33].

A study by France comparing kapandii fixation and trans-styloid found that in conditions of dorsal, radial tilt, and volar showed the same results by Kapandji fixation and the trans-styloid method. The fixation of K-wire showed better clinical results but was short-lived. However, additional pain was observed later. Radial nerve and RSD lesions were more often observed following Kapandji fixation, and wire removal must be done with extreme caution[35].

Another study compared therapeutic approaches for elderly patients. Some were treated with surgery, while others received conservative treatment. In the early years, surgical patients showed improved functional outcomes, such as wrist extension and grip strength, than patients without surgery. In later years, there are no variances in functional outcomes measured by disability scores for the hand, arm, shoulder, as well as pain scores. Better radiographic results were shown in surgical treatment patients. Complications in both treatments were the same[32].

In the United Kingdom, a randomized controlled trial comparing K-wire fixation to volar locking plates for distal radius fractures came to a conclusion that better surgical methods were developed in addition to the conservative method to provide a better functional outcome and speed recovery as science progressed. Although modern locking plate fixation achieves better functional results, it has been reported to be more expensive than traditional wire fixation. Kirschner-wire fixation was established to be a more cost-effective and simpler locking plate fixation method in this study. However, both procedures have the same functional and radiographic results[31].

The treatment of elderly patients with distal radius fractures was the focus of a study. According to this research, elderly patients have a higher risk of surgical complications, which has resulted in the restriction of these treatments. Different factors such as age, bone mineral density, and grasping forces all influence the treatment choice. Thus, closed reduction and casting were rarely used to treat unstable distal radius fractures to avoid surgical risks and complications[27].

The radiological and functional outcomes of percutaneous K wire fixation and shedding in extra-articular distal radius fractures were compared to closed reduction and casting in a prospective study. A total of sixty patients with extra joint fractures were included in this study. Closed reduction and the application of gypsum under the elbows are less effective than open reduction and the utilization of gypsum under the elbows. The results of this study indicated that percutaneous K wires and closed reduction with the application of gypsum under the elbows resulted in superior radiological performance. Each approach yielded the same functional outcome[40].

An experimental study was conducted on thirty-two patients with extra-articular distal radius fractures, ranging in age from eighteen to seventy years, by Das AK et al. from India. To treat the fracture, two to three K-wires were used in a closed reduction and percutaneous pinning. According to the findings, percutaneous pinning combined with neutral wrist immobilization leads to a better functional outcome. Since it avoids wrist and hand stiffness, it is the simplest, most efficient, and best method of restoration[42]..

The objective of this prospective clinical research is to compare the complication rate associated with non-surgical and surgical methods. They chose 256 patients with distal radius fractures for this research. They demonstrated that surgical treatment had superior radiological outcomes to non-surgical treatment. On the other side, pin tract infection has a higher complication rate[45].

From the studies mentioned above, it is concluded that Radiological outcomes, such as ulnar dispersion, palmar inclination, and radial inclination, were significantly improved with percutaneous K-string fixation of distal radius fractures. However, no noticeable difference in functional outcomes was observed between these treatments, including radial deviation, DASH scores, extension, complication rate, grip strength, flexion, and ulnar deviation.

CONCLUSION

The result of distal radius fracture fixation with K-wires is preferable to conservative treatment in union and functional outcome. The infection rate was low with the K- wire.

Conflict of interest: Nil

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