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Original Research

To assess the outcome of ligamentotaxis of fracture of distal end radius by distractor apparatus

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ABSTRACT:

Background: Distal radius fractures are one of the most common types of fractures, with over 640,000 cases reported during 2001 in the US alone. Hence; the present study was conducted for assessing the outcome of ligamentotaxis of fracture of distal end radius by distractor apparatus. **Materials & methods:** A cohort of twenty patients aged between 20 and 50 years, all presenting with intra- or juxta-articular fractures of the distal radius, was recruited for this study. Each patient underwent a thorough examination focusing on the nature of their injuries, with particular emphasis placed on assessing the circulation and neurological integrity of the affected limb. Comprehensive clinical evaluations were conducted for all participants. Radiographic assessments of both the injured and uninjured sides were performed at the time of injury, utilizing anteroposterior and lateral imaging views. The Gartland and Werley scoring system, which combines subjective and objective assessments, was employed to evaluate outcomes, incorporating factors such as residual deformity (3 points), subjective evaluation (6 points), objective assessment based on range of motion (5 points), and complications including pain (5 points).With excellent being 0 to 2, good 3 to 8, fair 9 to 20, and poor ≥21. **Results:** Mean age of the patients was 45.6 years. Majority proportion of patients were males. Mean duration of surgery was found to be 68.3 minutes. Mean time for complete radiographic union was 14.1 weeks. In 45 percent of the patients and 25 percent of the patients, time for complete radiologic union was between 14 to 17 weeks and 11 to 13 weeks respectively. According to Gartland and Werely score grading, excellent results were obtained in 25 percent of the patients (5 patients), while good results were seen in 65 percent of the patients (13 patients). Fair results were obtained in 10 percent of the patients (2 patients). **Conclusion:** Following near anatomic close reduction and cast immobilization, various factors can cause secondary displacement of the fracture fragments, including shortening, angle of reduction (dorsal angulation), and articular congruence. Treatment of distal end radial by principle of ligamentotaxis is an easy, cost effective, reliable and most suitable line of treatment.

Key words: Radius, Distractor, Apparatus

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INTRODUCTION

Distal radius fractures are one of the most common types of fractures, with over 640,000 cases reported during 2001 in the US alone. For reasons not fully understood, and likely multi-factorial, the incidence of this fracture appears to be on the rise in the US and abroad. Many of the societal effects of these fractures extend beyond the significant medical costs, including decreased school attendance, lost work hours, loss of independence and lasting disability.[1- 3] Fragmented care and coding discrepancies can make accounting for the true number of these fractures difficult, likely underestimating the rates typically quoted in the literature. When analyzing the incidence of distal radius fractures, there are three major populations to consider: children and adolescents, young adults, and the elderly.[4, 5]Management of DRFs is still controversial and may be influenced by the initial fracture classification. Even though numerous classification systems have been proposed e.g., Frykman, Mayo, Melone, and AO, the evaluation and management of these fracture is yet controversial. Older classifications take into consideration several different parameters, such as the length of the radial styloid, dorsal angulation, and comminution of the dorsal cortex, but they overlook comminution of the volar cortex.[6- 8]Hence; the present study was conducted for assessing the outcome of

ligamentotaxis of fracture of distal end radius by distractor apparatus.

MATERIALS & METHODS

The present study was conducted for assessing the outcome of ligamentotaxis of fracture of distal end radius by distractor apparatus.A cohort of twenty patients aged between 20 and 50 years, all presenting with intra- or juxta-articular fractures of the distal radius, was recruited for this study. Each patient underwent a thorough examination focusing on the nature of their injuries, with particular emphasis placed on assessing the circulation and neurological integrity of the affected limb. Comprehensive clinical evaluations were conducted for all participants. Radiographic assessments of both the injured and uninjured sides were performed at the time of injury, utilizing anteroposterior and lateral imaging views. The radiographs were analyzed for indicators such as loss of palmar tilt, presence of dorsal tilt, radial shortening, and loss of radial inclination. Once deemed suitable for surgical intervention, patients underwent surgery under appropriate anesthesia, adhering to strict aseptic protocols, including meticulous cleaning and draping. Fracture stabilization was achieved using a transarticular external fixator device. The choice of implant for osseous fixation, either Schanz pins or Kirschner wires, was determined by the specific fracture type. Traction was applied to the ligaments and soft tissues surrounding the fracture to facilitate reduction, in accordance with the principles of ligamentotaxis, and this reduction was maintained throughout the procedure. A distractor was utilized, as it allows for future adjustments. Post-operatively, patients were encouraged to initiate active movement of adjacent joints as soon as feasible. Discharge from the hospital was contingent upon the patient's local condition, with follow-up appointments scheduled in the outpatient department every three weeks until fracture union was confirmed. The external fixator or distractor was removed once clinical and radiological signs of union were evident. The Gartland and Werley scoring system, which combines subjective and objective assessments, was employed to evaluate outcomes, incorporating factors such as residual deformity (3 points), subjective evaluation (6 points), objective assessment based on range of motion (5 points), and complications including pain (5 points).With excellent being 0 to 2, good 3 to 8, fair 9 to 20, and poor ≥21.All the results were analysed by SPSS software. Chi- square test and one way ANOVA were used for assessment of level of significance. P- value of less than 0.05 was taken as significant.

RESULTS

Mean age of the patients was 45.6 years. Majority proportion of patients were males. Mean duration of surgery was found to be 68.3 minutes. Mean time for complete radiographic union was 14.1 weeks. In 45 percent of the patients and 25 percent of the patients, time for complete radiologic union was between 14 to 17 weeks and 11 to 13 weeks respectively. According to Gartland and Werely score grading, excellent results were obtained in 25 percent of the patients (5 patients), while good results were seen in 65 percent of the patients (13 patients). Fair results were obtained in 10 percent of the patients (2 patients).

Table 1: Duration of surgery

Duration of surgery (Minutes)	Ligamentotaxis
Mean	68.3
SD	13.8

Table 2: Gartland and Werely score grading

Gartland and Werely score grading	Number of patients	Percentage
Excellent	5	25
Good	13	65
Fair	2	10
Poor	0	0
Total	20	100

Table 3: Time for complete radiographic union (weeks)

Time for complete union (weeks)	Number of patients	Percentage
8 to 10 weeks	3	15
11 to 13 weeks	5	25
14 to 17 weeks	9	45
18 to 20 weeks	3	15
Total	20	100
Mean	14.1 weeks	

DISCUSSION

Distal radius fractures represent approximately 16% of all fractures managed by orthopaedic surgeons. They have a bimodal incidence, occurring in children with high energy trauma and in the elderly as a fragility fracture.[7- 9]Hence; the present study was conducted for assessing the outcome of ligamentotaxis of fracture of distal end radius by distractor apparatus.

Mean age of the patients was 45.6 years. Majority proportion of patients were males. Mean duration of surgery was found to be 68.3 minutes. Mean time for complete radiographic union was 14.1 weeks. In 45 percent of the patients and 25 percent of the patients, time for complete radiologic union was between 14 to 17 weeks and 11 to 13 weeks respectively. According to Gartland and Werely score grading, excellent results were obtained in 25 percent of the patients (5 patients), while good results were seen in 65 percent of the patients (13 patients). Fair results were obtained in 10 percent of the patients (2 patients).Chilakamary VK et al studied the management of distal end radius fracture by utilizing the principle of ligamentotaxis where in the reduction obtained by closed means is maintained by external fixator till solid bony union occurs. A total of 26 cases were selected for study by scrutiny of the inclusion and exclusion criteria. Most of our cases were treated with external fixator within 8 hrs of injury. Small A.O external fixator (bridging ex-fix) with 2 pins each in radius and 2nd metacarpal percutaneously was used for all the cases. Selective k wire fixation was done in cases of instability. Fixator was removed after 6 weeks. Guided physiotherapy was ensured in all the cases. Patients were followed up for an average of 9 months. Modified Gartland and Werley scoring system was used to evaluate the overall functional results. Excellent to good results were achieved in 88.45% of our cases while fair result was in 11.54 %. One case had pin loosening and two other cases had malunion. It was concluded that external fixator used for ligamentotaxis is an effective method of treating unstable extraarticular and complex intraarticular fractures of distal radius. The complications like pin tract infection is rare due to the availability of superior antibiotics and sterile surgical technique. complications like wrist and finger stiffness has improved with physiotherapy.[10]

Mann T et al investigated whether applying an internal radiocarpal-spanning plate with the wrist in slight extension affects the biomechanical stability of the construct. An unstable distal radius fracture was simulated in 10 cadaveric specimens and immobilized with a radiocarpal-spanning plate holding the wrist in a neutral position. This construct was then physiologically loaded through the wrist flexor and extensor tendons. The resulting motion at the fracture was captured with a displacement sensor. The plate was then extended using an in situ bending technique, placing the wrist in extension, and the experiment was repeated. No statistically significant difference in the biomechanical stability afforded by the radiocarpal-spanning plate was detected with the wrist in extension compared to that in the traditional neutral position. The radiocarpal-spanning plate fixation was more stable when loaded through the extensor tendons. They concluded that immobilizing a distal radius fracture with an internal radiocarpal-spanning plate that holds the wrist in extension does not compromise biomechanical stability.[11]Dahl J et al conducted study where twelve fresh frozen cadaver arms were randomized to fixation with a dorsal radiocarpal spanning plate using one of two techniques: (1) index finger metacarpal fixation (index group) or (2) middle finger metacarpal fixation (middle group). Cadaveric dissection and relevant anatomic relationships were assessed in relation to the plate. Superficial branches of the radial sensory nerve were in contact with the index group plate in all specimens, while no contact occurred in the middle group specimens. No extensor digitorum comminus (EDC) middle extensor tendons contacted the plate in the index group; an average of 10 cm of plate contact was seen in the middle group. The extensor pollicis longus (EPL) tendon contacted the plate in both the index and middle groups for an average distance of 12.4 and 25.5 mm, respectively. One complication [EPL and extensor indicis proprius (EIP) entrapment] was observed in the middle finger metacarpal group. They concluded that mounting the dorsal bridge plate to the index finger metacarpal places the superficial branches of the radial sensory nerve at risk during dissection, while mounting the plate to the middle finger metacarpal leads to a greater degree of tendon-plate contact.[12]

CONCLUSION

Following near anatomic close reduction and cast immobilization, various factors can cause secondary displacement of the fracture fragments, including shortening, angle of reduction (dorsal angulation), and articular congruence. Treatment of distal end radial by principle of ligamentotaxis is an easy, cost effective, reliable and most suitable line of treatment.

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