

Results of Open Reduction Internal Fixation versus Conservative Treatment in Cases of Fracture of the Styloid Process of Ulna

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Abstract:

Background: Distal radius fractures constitute about 1/6th of all the fractures that are present. There is an association which is found between fracture of the radius (distal end) and ulna (styloid process). The Ulnar styloid provides support to a very important structure called the Triangular Fibrocartilage complex [TFCC]. According to some surgeons, the fixation of the styloid of the ulna avoids complications (Nonunion, instability). According to other surgeons, there were problems associated with the ulnar styloid fixation like implant prominence and post-surgery scar.

Objective: To evaluate the result of internal fixation versus conservative management for ulnar styloid fracture.

Materials And Methods: A Randomized Controlled Trial of 30 patients was carried out in the Orthopaedics Department, Rajiv Gandhi Government Medical College & Chhatrapati Shivaji Maharaj Hospital. The comparison is between 2 groups. Group A consists of subjects with ulnar styloid fractures with concomitant distal end or shaft radius fractures who are treated with fixation or tension band wiring for ulnar styloid fractures and plating for distal or shaft radius fractures. Group B consists of subjects with ulnar styloid fractures with concomitant distal end or shaft radius fractures who are treated with conservative methods (crepe bandage, wrist support) for ulnar styloid fractures and plating for distal end or shaft radius fractures. Follow-up was taken at 6 weeks, 3 months and after 6 months and results were calculated using Modified Mayo Wrist Score.

Results: The majority of patients were in the age group 26-35 years 11(36.67%). The mean age in Operative Group A and Conservative Group B was 41.37±11.23 years and 42.38±10.76 respectively. The majority of subjects were male in the Operative Group (80%) and male in the Conservative Group (73.33%). It was observed that wrist flexion, extension, radial and ulnar deviation showed statistical significance among the two study groups. It was observed that pain and grip strength scores in the Operative Group and Conservative Group were statistically significant. Modified Mayo Wrist score in the Operative Group and Conservative Group was statistically significant. It was observed that 8 patients (53.33%) had excellent outcomes in Operative Group A as compared to 4 patients (26.67%) who had excellent outcomes in Conservative Group B. Major complication in the Fixation Group was

an infection in one patient and the major complication in Conservative Group was nonunion in two patients.

Conclusion: Internal fixation in the form of tension band wiring in cases of ulnar styloid fractures associated with distal or shaft radius fractures has better results than conservative treatment in cases of ulnar styloid fractures associated with distal or shaft radius fractures. Local and systemic complications are negligible there by reducing hospital stay. Modified Mayo Wrist Score at the end of 6 months is significantly good in subjects who are treated with internal fixation in the form of tension band wiring as compared to subjects who are managed conservatively.

Keywords: Dorsal radioulnar ligament, Palmar radioulnar ligament, Extensor carpi ulnaris, Modified mayo score, Proximal radioulnar joint.

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Introduction

Distal radius fractures constitute about 1/6th of all the fractures that are present [1]. There is an association which is found between fracture of the radius (distal end) and ulna (styloid process). In the biomechanics of the wrist, the ulnar styloid has a very important role to play. The Ulnar styloid provides support to a very important structure called the Triangular Fibrocartilage complex [TFCC] [2]. Human beings can perform numerous tasks, to rotate the forearm and placing the hand in the required position. All these functions can be performed without interfering with the grasping function of the ulna. These functions happen because of the presence of DRUJ (Distal Radioulnar Joint). The distal radioulnar joint is stabilized by different structures consisting of the bones, muscles and ligaments. The structures which stabilize the distal radioulnar joint (DRUJ) are the Extensor carpi ulnaris (ECU) tendon and tendon sheath, Ulnocarpal ligament complex, Triangular fibrocartilage complex, Interosseous membrane and ligament, Pronator quadratus, Joint capsule, Bone [3]. An unstable distal radioulnar joint happens because of Triangular fibrocartilage disruption in the fovea of the distal part of the ulna [4]. The instability of the distal radioulnar joint is mainly associated with fractures of the ulnar styloid [5]. When a study was done by

Zenke et al it was found that ulnar styloid nonunion & ulnar-sided wrist pain was not correlated. It was observed that pain in the wrist and fracture of the styloid of the ulna are not related to each other [6]. In the year 2006, Itadera et al did a study on patients suffering from ulnar styloid fractures. Patients who had an ulnar styloid fracture and underwent surgery achieved a union rate of 91 per cent. On the contrary, the patients who had an ulnar styloid fracture and were managed conservatively had a union rate of 20 to 44 per cent [7,8,9,10]. According to some surgeons, the fixation of the styloid of the ulna avoids complications (Nonunion, instability). According to other surgeons, there were problems associated with the ulnar styloid fixation like implant prominence, increased time of surgery and post-surgery scar [6,8,9,10,11,12]. Hence the present study was conducted to evaluate the result of internal fixation versus conservative management for ulnar styloid fracture.

Materials and Methods

A Randomized Controlled Trial of 30 patients was carried out in the Orthopaedics Department, Rajiv Gandhi Government Medical College & Chhatrapati Shivaji Maharaj Hospital from October 2019 to October 2021. All the patients who came to OPD and the

Emergency department diagnosed with a fracture of the ulnar styloid and/or concomitant distal and/or shaft radius fractures were included as the study population. The patients fulfilling the inclusion criteria were treated with Open Reduction and Internal Fixation with Tension Band Wiring after randomization of the patient using SPSS (statistical package for social sciences) version 22.0 software. The comparison is between 2 groups which are Group A consisting of subjects with an ulnar styloid fracture with concomitant distal end or shaft radius fractures who are treated with fixation or tension band wiring for ulnar styloid fractures and plating for distal or shaft radius fractures and Group B consisting of subjects with ulnar styloid fracture with concomitant distal end or shaft radius fractures who are treated with conservative methods (crepe bandage, wrist support) for ulnar styloid fractures and plating for distal end or shaft radius fractures. Follow-up was taken at 6 weeks, 3 months and after 6 months. Patients who had isolated ulnar styloid fracture, ulnar styloid fracture with concomitant distal radius fracture, fracture of ulnar styloid with concomitant shaft radius fracture, and age group more than 18 years were included in the study. Patients who had Grade 3 open fracture, Bilateral fracture, and Ipsilateral limb fracture other than those mentioned above in the inclusion criteria were excluded from the study.

Operative technique

Open Reduction Internal Fixation with Tension Band Wiring Patients were operated under supraclavicular block or general anaesthesia decided and thought appropriate by the anaesthetist. An arm table was used for all the cases. The supine position was given to the patient with the elbow in flexion and the forearm in pronation. The image intensifier was positioned so that simultaneous anterior-posterior and lateral views can be taken. Assessment of the Distal Radioulnar

Joint is done by checking first the normal side and then comparing it with the fractured side. The rotation of the forearm and stability is maintained with the help of the distal radioulnar joint. Therefore it should be assessed first, to make sure that there is no anatomical block to rotate the entire forearm. It is checked by flexion of the elbow by 90 degrees on an arm table. To check for the displacement in the dorsal and volar direction, the forearm should be placed in neutral rotation and the wrist has to be placed in a neutral position too. We have to repeat this method with a deviation of the wrist towards the radius. The process has to be repeated with pronation and supination of the wrist joint. An unstable distal radioulnar joint is there if a palpable clunk is present. Palpable clunk indicates that a fracture which has occurred at the ulnar styloid base would require fixation. A vertical incision of 4 to 5 cm is taken from the ulnar styloid tip and it can be extended proximally on the dorsal and ulnar aspect of the distal ulna. The sensory branch of the ulna is identified and protected. Careful dissection and sub-dissection are done to protect nearby periosteal tissue. Irrigate and clean the fracture site of the hematoma. The fragment is reduced by direct manipulation, aided using a small pointed reduction clamp.

It is important to recognize that the ulnar styloid is occasionally more palmar than it would appear in a radiograph. 2 K wires are used in a retrograde direction from the tip of the ulnar styloid into the opposite cortex. Drill a hole through the ulna from the dorsal to palmar direction approximately proximal to the ulnar styloid. Ulnar nerve (Dorsal branch) to be preserved. Pass a wire through the drill hole using a hypodermic needle as a guide, the wire is passed around the K-wires distally, to create a figure-of-eight loop. Tension band wiring was done using Stainless Steel wire (SS wires) or Ethibond. The wire twist is begun,

ensuring that each end of the wire spirals equally. The wire is tensioned by pulling on the twist until the desired tension is achieved and then twisted to take up the slack created. Cut the twist and bend it towards the bone, so as not to irritate the soft tissues. Using the bending iron for K-wires, K wires have to be bent at 180 degrees and then cut at the ulnar styloid level. They are then impacted into the bone using a small punch, or other appropriate tool. Through the C arm, we have to check that the proximal tip of the wires does not lie in interosseous space [13].

Conservative treatment: The conservative group is managed by Non-steroidal anti-inflammatory drugs, proton

pump inhibitors and calcium supplementation like tablet Diclofenac 75 mg or tablet Tramadol in situations where Diclofenac is contraindicated, tablet Pantoprazole 40 mg, tablet Calcium and Cast (Below elbow) for 42 days.

Follow-up: After a period of 6 weeks, 3 and 6 months till there was some evidence of union. Lifting of heavy weights was started as per the union of fracture assessed based on radiological evaluation of fracture union. Wrist scoring was done as per Modified Mayo wrist scoring on 42 days, 90 days and 180 days. Preoperative, immediate postoperative and post-operative X-rays after 6 months are shown in Figures 1-3.



Figure 1: Preoperative XRay of the Operative Group

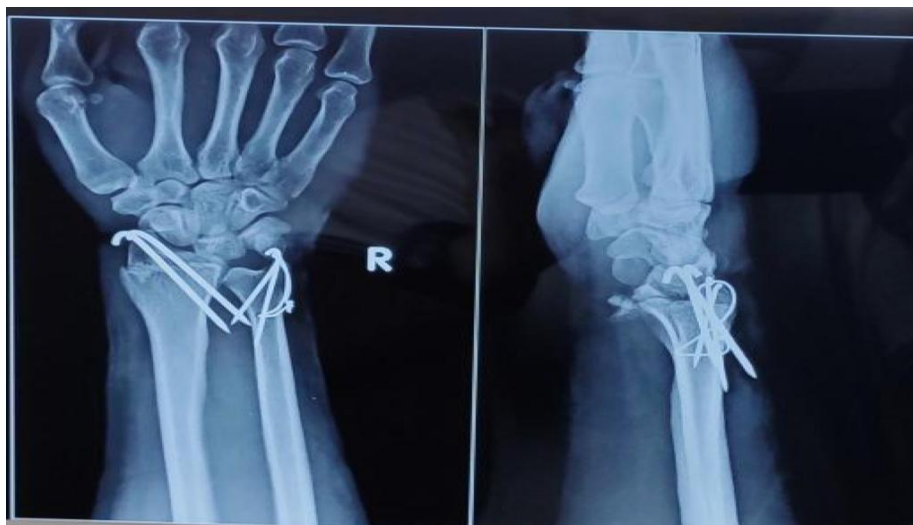


Figure 2: Immediate Post-Operative X Ray of the Operative Group.



Figure 3: Follow up X-Ray after 6 months

Results

Table 1: Distribution of patients according to age:

Age (years)	Operative Group A	Conservative Group B	Total
18-25	04	03	07
26-35	06	05	11
36-50	03	04	07
>50	02	03	05
Total	15	15	30
Mean age (years)	41.37±11.23	42.38±10.76	P=0.72 (NS)

Age among study groups. It was observed that the majority of patients were in the age group 26-35 years that is 11 subjects (36.67%). It was observed that the mean age in Operative Group A and Conservative Group B was 41.37 ± 11.23 and 42.38 ± 10.76 years respectively. There was no statistical significance among both groups. (P value is >0.05).

Table 2: Distribution of patients according to sex:

Sex	Operative(Group A)	Conservative (Group B)	Total
Male	12	11	23
Female	03	04	07
Total	15	15	30

The above table showed the distribution of patients according to sex. It was observed that the majority of patients were male in Operative Group A (80%) and Conservative Group B (73.33%). The p-value is 0.81 which is not statistically significant.

Table 3: Distribution of patients according to Modified Mayo Wrist score (MMWS)

Modified Mayo Wrist Score	Operative Group A	Conservative Group B	P value
Pre-operative	0.00 ±0.00	0.00 ±0.00	P=1.0 (NS)
At 6 weeks	59.34±4.36	48.33 ±12.79	0.03 (S)
3 months	76.91 ±6.53	69.43±9.96	0.02 (S)
At 6 months	91.42 ±7.15	81.18 ±9.41	0.04 (S)

In the table above Modified Mayo Wrist score at different time intervals was described among study groups. It was observed that the Modified Mayo Wrist score in the Operative Group and Conservative Group was statistically significant. Statistical difference was found in the Modified Mayo Wrist score when compared intra-group at 42 days, 90 days and 180 days.

Table 4: Distribution of patients according to MMWS score

Modified Mayo Wrist Score	Operative Group A	Conservative Group B
Excellent	08	04
Good	06	09
Fair	01	02
Poor	00	00
Total	15	15

In the table above functional outcome by Modified Mayo Wrist Score was described among study groups. It was observed that 4 (26.67%) patients had excellent outcomes in Conservative Group B as compared to 8 (53.33%) patients in Operative Group A. There was a statistical difference in the two study groups related to functional outcomes. ($P < 0.05$).

Table 5: Distribution of patients according to complications:

Complications	Operative Group A	Conservative Group B	Total (n=30) (%)
Malunion	00	00	00
Nonunion	00	02	02
Deformity	00	00	00
Infection	01	00	01

In the table above complications were described among study groups. It was observed that major complication in Operative Group was Infection in one patient (6.66%) and Nonunion in two patients (13.33%) in Conservative group.

Discussion

Comparison based on age

There were a total of 30 subjects with each group having 15 subjects. The operative group consisted of maximum patients in 26-35 years i.e. 40% followed by 18-25 years, 36-50 years and greater than 50 years consisting of 26.66%, 20% and 13.33% respectively. The least number of patients are in the age group of greater than 50 years. In the conservative group, the highest number of patients were in 26-35 years i.e. 33.33% followed by 36-50 years, 18-25 years and greater than 50 years consisting of 26.66%, 20% and 20% respectively. The lowest number of patients in the conservative group is in the

age groups of 18-25 years and greater than 50 years. The mean age group in the operative group (Group A) is 41.37 ± 11.23 years and the mean age group in the conservative group (Group B) is 42.38 ± 10.76 years.

Both groups have no statistical significance. Cristian Robles et al in their study between the operative and conservative treatment of ulnar styloid fractures observed mean ages of 49 and 50 years in two groups with no statistical significance [14].

Comparison based on sex

Out of the 15 patients, in the operative group, 12 were males i.e. 80% and 3 were females i.e. 20% and among 15 subjects of the conservative group 11 were males i.e. 73.33% and 4 were females i.e. 26.66%. Majority of the patients in both the groups that is Group A (Operative group) and Group B (conservative group) were males. The p-value is 0.81, hence both the

groups have no statistical significance. CristianRobles et al in their study between the operative and conservative treatment of ulnar styloid fractures concluded that the results were not statistically significant[14].

Comparison based on Modified Mayo Wrist Score

In our study, the Modified Mayo Wrist Score System at different time intervals was described among study groups. It was observed that the Modified Mayo Wrist score in the Operative Group and Conservative group was statistically significant. It was observed that among 15 subjects in the operative group, 8 subjects (53.33%) revealed excellent outcomes, 6 patients (40%) showed good outcomes and 01 patient (0.06%) had fair results and 0% had poor results. Similarly in the conservative group, 4 patients (26.66%) had excellent results, 9 patients (60%) had good results, 2 patients (13.33%) had fair results and 0% of patients had poor results. There was a statistical difference in the two study groups related to functional outcomes. ($P < 0.05$). In a study by Kim et al on 138 subjects, it was found that 76 patients had an ulnar styloid fracture. They did not show any statistical significance in terms of the Modified Mayo Wrist Score the p-value being $p = 0.68$ after 19 months (12-36 months) [10]. Wijffels et al observed that the Modified Mayo Wrist score (p-value is 0.45) after 30 months. Hence statistical significance does not exist [15].

Comparison based on complications

Among 15 subjects who were operated only 1 patient had an infection whereas there were no cases of malunion or nonunion in the operative group. Similarly out of 15 patients in the conservative group there were 2 cases of nonunion. Therefore, the results were not statistically significant. Wijffels M et al in their study observed that there were no complications after the operation (Tendon tear, Infection,

failure of implant). ($p = 0.147$) [15]. Sour et al in their study evaluated that in patients with distal end radius fractures in whom ulnar styloid fracture was not treated they had complications such as loss of reduction, implant loosening, infection and rupture of extensor pollicis longus tendon [11].

Conclusions

From our study, we can safely conclude that internal fixation in the form of tension band wiring in cases of ulnar styloid fractures associated with distal or shaft radius fractures has better results than conservative treatment in cases of ulnar styloid fractures associated with distal or shaft radius fractures.

We can safely consider it as a viable option in the treatment of ulnar styloid fractures. So this surgery can give predictable outcomes in trained hands. The pain score, grip strength, and range of motion are better in subjects who have undergone internal fixation as compared to conservative management. Also, local and systemic complications are negligible thereby reducing hospital stay.

Modified Mayo Wrist Score at the end of 6 months is significantly good in subjects who are treated with internal fixation in the form of tension band wiring as compared to subjects who are managed conservatively.

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