



COMPARATIVE STUDY ON THE FUNCTIONAL OUTCOME OF LIGAMENTOTAXIS IN COMMUNUTED FRACTURES OF THE DISTAL END OF RADIUS AND WITH THAT OF CONSERVATIVE MEANS OF CLOSED REDUCTION AND CASTING

Orthopaedics

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ABSTRACT

Introduction: Comminuted fractures of Lower end of radius most often bring out unsatisfactory outcome if treated by conservative means of closed reduction and casting. This study is to emphasize the far better functional results obtained by treating these fractures by Ligamentotaxis. **Materials and Methods:** This is a prospective Study Conducted in a Government Medical College, and we analyzed the functional outcome of 58 patients with comminuted fracture lower end of radius treated by Ligamentotaxis during the period January 2014 to 2017. Average follow up time was 2 years. Patients with open epiphyseal plate, those with vascular insult and open injuries were excluded from the study. Reduction of the fragments was achieved by the principle of Ligamentotaxis. **Results:** Patients underwent Ligamentotaxis had 88% Excellent or Good results whereas 52% of patients on Conservative care had similar results. When the Conservative methods gave poor results for Severely Comminuted fractures, Ligamentotaxis could bring out excellent re-orientation of fragments back to near normal alignment. **Conclusion:** Ligamentotaxis using a Distractor is a better method to treat Comminuted fractures of lower end of radius. Even though the initial reductions were excellent in a plaster cast, re-displacement rates are very high in a plaster cast. Fractures without intra articular extension always yielded far better results than intra articular fractures. However, badly comminuted and unstable fractures needed either supplementation of bone grafting, or focal pinning to prevent collapse after removal of external fixator.

KEYWORDS

INTRODUCTION:

Distal radial fractures are associated with a colorful history since their first description by Pouteau in 1783 and Abraham Colles in 1814.4 Still they continue to be one of the most common orthopedic injuries treated by Orthopedic Surgeons¹. Among these fractures, the challenging type is comminuted distal radial fractures because, they tend to displace within a plaster cast². It is now clear that preservation of articular congruity is the principal pre requisite for successful recovery following Distal Radial fractures. Wide arrays of techniques from closed manipulation reduction followed by short arm cast, percutaneous pins, pin and plaster, open reduction and internal fixation to complex external fixators were evolved.^[3, 6,7,10,14,21,23].

Closed manipulative reduction and cast immobilization invariably leads to poor functional outcome due to re-displacement of fracture within the cast¹⁵. The purpose of the study is to evaluate the results of ligamentotaxis in comminuted fractures of the distal end of radius and to compare it with the results of closed manipulative reduction and plaster cast immobilization. The study evaluates complications and their management. The study also intends to assess the final outcome of this technique.

MATERIAL AND METHODS :

A prospective study was conducted on ligamentotaxis for comminuted fracture lower end of radius from 2014 to 2017. 50 patients were taken for the study. 25 of these patients were treated by conservative line of management (group II), and 25 by external fixator (group I). Dr. Joshys external stabilization system distractor (20 cm) and AO fixator were used for external fixation. The mechanism of injury in 30 cases was fall from height and in the rest 20 was due to road traffic accident.

Case was selected based on comminution. In 21 of the group I patients, fixator was applied on the first day, and in the rest of the 4 cases, within 3 days as a secondary procedure. In group II there were 6 males and 19 females, where as in group I there were 18 males and 7 females.

20 cm JESS distractor was used in group I. Post operative check x-rays were taken. If reduction was found to be unsatisfactory, distraction was adjusted to get a perfect alignment. The extremity was kept elevated in a sling and antibiotics were prescribed for one week.

In group II, after giving an intravenous sedation, a closed manipulative reduction and short arm slab was given. Re-manipulation was done if the reduction was not satisfactory on check x-rays. If there were no associated injuries, patients were discharged on the next day with a course of oral analgesics and advice regarding active finger

movements.

On the first review after 1 week in the group I patients, check x-ray was taken. The pin track dressings were changed and movements of the extremity assessed. In group II, check x-ray was taken and cast conversion done. Then every 2 weeks patients were reviewed. On the 6th week cast were removed, x-ray taken and mobilization started. In group I patients fixator was removed in the 4th week. Dressings were applied over pin tract and a below elbow cast is applied which was removed after 2 weeks.

The patients were evaluated on 3rd, 6th, 12th and 18th months after surgery for analyzing results. Vander Linden's radiological criteria were used to assess the Anatomical results.²⁴. Functional results were assessed by Gartlands point score system¹².

RESULTS :

Out of 25 patients in group I, 6 were male and 19 were females. Of the 6 male patients, 5 got excellent results and 1 unsatisfactory result. Of the 19 females, 16 got excellent results, and 3 unsatisfactory results. In group II, of the 18 males, 10 had excellent results and 8 had unsatisfactory results. Of the 7 females, 4 had excellent and 3 had poor results. This shows that sex has got no significance in the final result. (p value=0.4321).

12 patients in Gr. I had Rt wrist injured where as 13 had left wrist. Among the 12 10 had good result and 2 had unsatisfactory results. Among the 13 with left sided injury, 10 had good results and 3 had bad results. In Gr. II, 14 had Rt and 11 had Left wrists affected. Among the 14 Rt. sides, 8 had good and 6 had unsatisfactory results. Among the 11 Lft. Sides, 7 had excellent results and 4 had poor results. There was no statistical correlation between side and end results. (p value =0.7832)

Of the 25 patients in Gr. I, 22 had excellent results regarding residual deformity where as in the Gr. II, only 14 had, good or excellent results, which is statistically significant (P value=0.0054). In Gr. I, out of the 25 patients, 18 had good grip strength, where as, only 11 had good or excellent grip strength in Gr. II, which is statistically significant. (p value=0.0046)

Dorsal Angle:

Table shows the dorsal angle in each patient.

Angle	Group II			Group I		
	Post Red		12 wks	Post Red		12 wks
	No.	%	No. %	No.	%	No. %

-6 to -10	5	20								
0 to -5	5	20	1	4		2	8	1	4	
1 to 5	8	32	4	16	no	6	24	6	24	no
6 to 10	6	24	9	36	marked	12	48	11	44	marked
10 to 14	1	4	8	32	change	5	20	6	24	change
>15	-	-	3	12	-	-	-	1	4	

From this table it is clear that though initial correction was better in group II displacement in the cast was marked. The average dorsal angle in group II is 2.66 and in group I 8.32.

Radial angle: The values in two groups are given in table.

	Group II						Group I			
Angle	Post Red		6wks		12 wks		Post Red		K. 6 wks	
in degrees	No.	%	No.	%	No.	%	No.	%	No.	%
> 20	10	40	1	4	no		12	48	10	40
15-19	11	44	4	16	change		10	40	10	40
10-40	3	12	14	56	> 5°		2	8	3	12
5-9	1	4	6	24			1	4	2	8

Intra articular was seen in 16 cases (64%) in group I and 10 cases (40%) in group II. They were again sub classified by Melones classifications. Of the 16 cases in Gr.I, 14 had excellent or good results. Of the 10 cases in Gr.II, only 6 had good or excellent results. (p value=0.0062)

Movements of Joints : In group I 88% of patients showed good or excellent movements of wrist and forearm. In group II 48 % of the patients showed good or excellent movement of wrist and forearm. Palmer flexion is most affected followed by limitations of dorsiflexion and supination.

Pin loosening: In group II three patients had pin each loosened but the fixator was stable it was noticed on removal.

Pin tract infection: In group I seven patients had mild pin tract infection which was completely controlled by short course oral Cefuroxime and proper pin tract care.

Malunion / Nonunion: No nonunion was observed. In four cases of group I and six Cases of group II had some tenderness over the fracture site they were treated by additional two weeks of cast.

Sudeks osteodystrophy : No case of Sudeks osteodystrophy was noticed in either group in this study.

Neuro vascular complications: In group I two cases had median nerve affection and two patients had numbness over the radial nerve superficial branch distribution. In group II no median nerve affection was seen but three patients had numbness along the radial nerve distribution and two had neuralgia along the radial nerve distribution.

Post traumatic osteoarthritis : No severe cases of osteoarthritis was noticed in the group I patients and two patients in group II had moderate osteoarthritic changes. But mild moderate articular incongruity was noticed in six of group I and fifteen of group II patients.

Result based on treatment: When both group I and group II are compared group I had 52% good or excellent results and group II had 88% of good or excellent results. From this it is clear that group II patients received a better treatment than group I. When the statistical formula is used $t=2.02$ which shows that P value is 0.0053 and hence it is statistically significant.

Complications:

Finger stiffness, inferior-radio ulnar instability, pin loosening, pin tract infections, mal union/ non union, Sudeks osteodystrophy, neurovascular complications (median nerve involvement) and post traumatic osteoarthritis were the complications seen with this study.

DISCUSSION :

In the study, most of the cases were in the younger age group. As stated by Melone, there is an increased frequency for the comminuted fractures of lower end of radius in younger age groups in recent years due to increased incidence of Road Traffic Accidents²². Almost all authors got a female preponderance. In the study, Group I had high incidence in young Males since the females were reluctant to Surgery. There is a Right sided predominance in this study. It is observed that

the right hand is affected in almost all series because it is the dominant hand²⁰. In this study, 96% of patients in Group I had no or mild deformity at the end of follow up, whereas only 52% in GroupII had no or mild deformity. The treatment with external fixator is better to maintain the reduction and to prevent the recurrence of deformity. It reduces the rate of malunion, which is evident by radiological analysis. Other than fracture of lower end of ulna no other skeletal injuries were noted in the same upper limb in the present series, but according to Belcorn and other authors, fracture Scaphoid is a common association¹¹. 48% of GroupII patients got good or excellent grip strength, whereas it was 60% in Group I. Stiffness of joints was more in conservatively treated patients. Intra articular fractures carried poorer results. Post traumatic Osteo Arthrosis was assessed according to Kirk Jupiter Scale¹⁶. In Group II, 32% and in GroupI 4% of Osteoarthritis was noted. Pin track infection was noted in 7 patients (28%), which responded to a short course of oral antibiotics. Pin loosening was found in 3 patients (12%). Frame pin junction loosening was noted in 4(16%).

Difficulties met with during these procedures were:

- patient motivation is essential
- non-threaded wire had less purchase than threaded
- readjustment was difficult with a static fixator

CONCLUSION:

Comminuted fracture lower end of radius is seen in middle aged, commonly with slight female preponderance. The common causes are fall from height and road traffic accidents. Conservative management with a plaster slab after closed manipulative reduction often gives unsatisfactory results due to re-displacements, whereas, Ligamentotaxis using a distractor is a better treatment option. Anatomical restoration of the joint is a must for the excellent functional result. Commonest complication is Malunion which in later age may lead to arthritic change. Intraarticular fractures give poorer results compared to non articular fractures. Chance of collapse after removal of external fixator is there. So additional bone grafting or focal pinning may be needed. Early active exercise can avoid stiffness of joints.

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