Original Research Article

Study on functional outcome of distal radius intra-articular fractures managed by ligamentotaxis: a cross sectional study

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ABSTRACT

Background: Fractures of the distal radius continue to be the one of the most common skeletal injuries treated by an orthopaedic surgeon. They are the most common fractures of the upper extremity and account for 15-20% of all fractures. All intra articular fractures need good reduction for better functional outcome. There are multiple treatment methods from casting to arthroscopic surgeries. This study has been undertaken to study the functional outcomes of distal radius intra-articular fractures managed by ligamentotaxis. The objective of the present study was to evaluate the functional outcomes of distal radial intra-articular fractures treated by ligamentotaxis.

Methods: This cross sectional study was conducted in Orthopaedic department of Kilpauk Medical College between April 2017 to April 2019 on 60 patients with fracture of the distal end of radius, with comminuted fracture, who fulfilled the inclusion and exclusion criteria were included in the study. All fractures were managed by ligamentotaxis and were followed regularly and assessed after four months for their functional outcomes.

Results: 80% of the study population were males. Around 67% of the study population had type III or type IV fracture according to Frykman’s classification. 84% of the study population had better prognosis with ligamentotaxis. The difference between mean Mayo wrist score between affected side and normal side was not statistically significant.

Conclusions: Ligamentotaxis, external fixation for comminuted intra articular distal radius fractures is safe and effective treatment. It is also cost effective.

Keywords: Distal radial intra-articular fractures, Ligamentotaxis, Frykman classification

INTRODUCTION

Fractures of the distal radius continue to be the one of the most common skeletal injuries treated by an orthopedic surgeon. In fact, these injuries are the most common fractures of the upper extremity and account for approximately 15-20% of all fractures seen and treated in the emergency rooms. The fracture is mainly due to road traffic accidents and fall from height in young age and fall with outstretched hand in old age with osteoporosis. With increase in longevity and activity in middle age to elderly population, there is an increase of these fractures. Patients with fracture distal end of radius have serious complications more frequently than generally appreciated and failure in management may cause permanent disability. Distal radius fractures disturb the mechanical foundation of the human’s most elegant tool, the hand. Restoration of normal alignment and articular congruity after a displaced fracture can be difficult but is essential for a good functional outcome in terms of early wrist motion, improvement in range of motion and grip strength.
All intra-articular fractures need good reduction for better functional outcome. K-wire fixation with plaster application, open reduction and internal fixation with locking plate, external fixator application (ligamentotaxis) are various described methods for treating these fractures. When there is severe comminution, K-wires and screws cannot help in union of the small fragments and there are high chances of loss of reduction. Also when there is severe soft tissue swelling and in case of open fractures open reduction and internal fixation is not possible. The same ligaments, retinacula, tendons, and periostum that envelop the fracture which are the surgical barriers for open reduction of the fracture fragments, help achieve reduction of the fracture by ligamentotaxis. Management of distal radius fracture has been one of the most debatable topic in orthopaedic surgery. From casting to arthroscopic surgeries all modalities has been tried. This study has been undertaken to study the functional outcomes of distal radius intra-articular fractures managed by ligamentotaxis.

**Objective**

The objective of the present study was to evaluate the functional outcomes of distal radial intra-articular fractures treated by ligamentotaxis.

**METHODS**

This cross sectional study was conducted in Orthopaedic department of Kilpauk Medical College between April 2017 to April 2019. 60 patients with fracture of the distal end of radius, with comminuted fracture, who fulfilled the inclusion and exclusion criteria were included in the study.

**Inclusion criteria**

Mature skeletal fracture (between 20-60 years of age) and closed fractures.

**Exclusion criteria**

Patients with skeletally immature fractures (<20 years of age and >60 years), open fractures, pathological fractures, fractures more than three weeks old and patients having neurovascular injury and medical co-morbidities.

All the cases were immediately classified under Frykman classification and splinted by below elbow slab. The surgery for ligamentosis was performed on next day after pre anaesthetic work-up. Most of the cases underwent external fixator application under general anaesthesia. Few cases were done under supraclavicular or axillary block. The patients were regularly reviewed with weekly radiograph for first three weeks. After six weeks, the external fixator was removed in outpatient department after checking with radiograph for union. Patients were started on intensive physiotherapy for 3 weeks followed by wrist exercises by patient himself for further 6 weeks. All patients were assessed at the end of 4 months by Mayo wrist score and was compared with normal side.

The data was entered in Microsoft excel and was analysed using PSPP software. The socio demographic and other basic parameters were described as percentages. Independent student t-test was used to compare the mean Mayo wrist score between affected arm and the unaffected arm.

**RESULTS**

There were totally 48 males (80%) and 12 females (20%). Among the study population, 60% of them were in the age group of 30 to 50 years. 36% of males and 75% of females were in the age group of 30-50 years (Table 1).

| Age group (in years) | Male N (%) | Female N (%) | Total N (%) |
|----------------------|------------|--------------|-------------|
| 21-30                | 8 (16.67)  | 1 (8.33)     | 9 (15)      |
| 31-40                | 13 (27.08) | 5 (41.67)    | 18 (30)     |
| 41-50                | 14 (29.17) | 4 (33.33)    | 18 (30)     |
| 51-60                | 13 (27.08) | 2 (16.67)    | 15 (25)     |
| **Total**            | 48 (100)   | 12 (100)     | 60 (100)    |

Table 2 clearly explains that majority of the study population (70 % of males and 50% of females) had type III or type IV fracture. Type III (46% in males and 33% in females) constituted more number of study population compared to all other types. Type I and type II were too rare.

| Frykman’s type | Male N (%) | Female N (%) | Total N (%) |
|----------------|------------|--------------|-------------|
| Type I         | 0          | 1 (8.33)     | 1 (1.67)    |
| Type II        | 0          | 0            | 0           |
| Type III       | 22 (45.83) | 4 (33.33)    | 26 (43.33)  |
| Type IV        | 12 (25)    | 2 (16.67)    | 14 (23.33)  |
| Type V         | 3 (6.25)   | 1 (8.33)     | 4 (6.67)    |
| Type VI        | 5 (10.42)  | 2 (16.67)    | 7 (11.67)   |
| Type VII       | 4 (8.33)   | 1 (8.33)     | 5 (8.33)    |
| Type VIII      | 2 (4.17)   | 1 (8.34)     | 3 (5)       |
| **Total**      | 48 (100)   | 12 (100)     | 60 (100)    |

From Table 3 we can infer that around 83% of study population had good or excellent score after ligamentotaxis. Males had a better recovery 85% compared to females (75%). Table 4 shows that the mean difference of Mayo score between operated side after 4 months of surgery was around 7 compared to the normal side. The results were not statistically significant.
DISCUSSION

Management of distal radial fracture has undergone many modifications and more controversies. There are a wide range of procedures like closed reduction with casting, percutaneous pinning, intrafocal pinning, external fixation with ligamentotaxis, minimal open to open reduction and internal fixation with various modern gadgets. Many researchers still consider external fixation is one of the best available procedures. In our study males comprised of 80% and females comprised of 20%. When classified according to their age group, 56% of males and 75% of females were in the age group of 30-50. Overall 60% of the study population were in the age group of 30-50 years. 15% of study population were below 30 years of age and 25% above 50 years. Similar results were observed in studies done by Anil et al and Supreeth et al. In a study done by Manoj et al in Chennai, the proportion of male and female were more or less equal.

Around 67% of the study population had type III or type IV fracture according to Frykman’s classification. Similar results were observed in studies done by Supreeth et al and Manoj et al. In a study done by Viswanathan et al, majority (66%) of the fractures were between type VI and VIII.

The use of external fixation and pinning has demonstrated successful outcome in multiple studies. Cooney et al demonstrated 90% of study participants had a better function with external fixation. Hutchinson et al in his prospective study on evaluation of external fixation and pins with plaster technique showed that external fixation was better compared to pins with plaster. Kreder et al in their multi center study showed that external fixation group had a better outcome compared to internal fixation.

In our study, around 84% of the study population had better prognosis with ligamentotaxis. Similar results were observed. Many studies reported only between 67-76% better prognosis.

Though the difference in mean Mayo wrist score was 7.2, there is no significant difference between the two means by t-test which implies that functionally there is not much difference after the procedure.

Abdel et al in his study has proved that there is not much significance between outcome in patients who were treated with ligamentotaxis and by open reduction and internal fixation. Many more authors also have clearly demonstrate that ligamentotaxis is no way inferior to other modalities.

CONCLUSION

Though there are studies showing that other procedures are better to ligamentotaxis, external fixation for comminuted intra articular distal radius fractures is safe and effective treatment. It is also cost effective.

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Table 3: Classification of study population according to Mayo wrist score.

| Result   | Male N (%) | Female N (%) | Total N (%) |
|----------|------------|--------------|-------------|
| Excellent| 31 (64.58) | 7 (58.33)    | 38 (63.34)  |
| Good     | 10 (20.83) | 2 (16.67)    | 12 (20)     |
| Satisfactory | 3 (6.25) | 2 (16.67) | 5 (8.33) |
| Poor     | 4 (8.33)   | 1 (8.33)     | 5 (8.33)    |
| Total    | 48 (100)   | 12 (100)     | 60 (100)    |

Table 4: Comparison of mean Mayo score between operated side and normal side.

| Variable                  | Score | P value |
|---------------------------|-------|---------|
| Mean score on operated side | 91.1  |         |
| Mean score on normal side  | 98.3  |         |
| Mean difference            | 7.2   | >0.05   |
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