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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.[1-3] 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.[2] 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.[3] Distal radius fractures disturb the mechanical foundation of the human's most elegant tool, the hand.[4] 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.[5]

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.[2] The same ligaments, retinacula, tendons, and periosteum that envelop the fracture which are the surgical barriers for open reduction of the fracture fragments, help achieve reduction of the fracture by ligamentotaxis.[1] 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.[3] 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.[6] 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.[7-9]

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. 56% of males and 75% of females were in the age group of 30-50 years (Table 1).

Table 1: Distribution of study population according to age and sex.

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.

Table 2: Distribution of study population according to Frykman's classification.

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.

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
Mean score on operated side	91.1
Mean score on normal side	98.3
Mean difference	7.2
P value	>.05

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.[3] 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 yaers. 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.[10,11] In a study done by Manoj et al in Chennai, the proportion of male and female were more or less equal.[12]

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.[11,12] In a study done by Viswanathan et al, majority (66%) of the fractures were between type VI and VIII.[1]

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.[13,14] 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.[15] Kreder et al in their multi center study showed that external fixation group had a better outcome compared to internal fixation.[16]

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.[2,4,11,12]

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.[17] Many more authors also have clearly demonstrate that ligamentotaxis is no way inferior to other modalities.[18-24]

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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REFERENCES

1. Vishwanath C, Harish K, Gunnaiah KG, Ravoof A. Surgical outcome of distal end radius fractures by ligamentotaxis. J Orthop Allied Sci. 2017;5:68-73.
2. Sivaprakash SU, Reddy RM. Functional outcome of comminuted intra-articular distal radius fractures managed by Ligamentotaxis. Int J Orthopaed Sci. 2019;5(1):75-9.
3. Kamal Y, Khan HA, Farooq M, Gani N, Lone AUH, Shah AB, et al. Functional outcome of distal radius fractures managed by Barzullah working classification. Arch Trauma Res. 2015;4(1):e20056.
4. Maruthi CV, Shivanna. Management of fracture of distal radius by external fixator using the principle of ligamentotaxis a prospective study. Indian J Orthopaed Surg. 2015;2(1):19-26.
5. Karmakar T, Dasgupta S, Naiya S, Ghosh A, Sarkar A. Short term evaluation of distal radial intra-articular fractures managed by ligamentotaxis and jess application with or without distal radio-ulnar joint stabilisation in adults. Ann Int Med Den Res. 2017;3(5):28-32.
6. Frykman G. Fracture of the distal radius including sequelae-shoulder hand syndrome disturbance in distal radio or joint and impairment of nerve function: a clinical and impairment of nerve function: a clinical and experimental study. Act Ortho Scand. 1967;108:27-31.
7. Dacombe PJ, Amirfeyz R, Davis T. Patient-reported outcome measures for hand and wrist trauma. Is

there sufficient evidence of reliability, validity, and responsiveness? Hand (NY). 2016;11(1):11-21.
8. Mayo wrist score-Ortho Tool Kit. Available at: https://www.orthotoolkit.com/mayo-wrist/. Accessed on 5 August 2019.
9. Slutsky DJ. Outcomes assessment in wrist surgery. J Wrist Surg. 2013;2(1):1-4.
10. Mishra AK, Sud AD, Prasad M, Kaul R, Singh M. A comparative study of functional outcome of external fixation and volar plating in unstable distal radius fractures. Int J Res Orthop. 2019;5:326-34.
11. Nekkanti S, Kiran RHG, Kanthimathi B, Siddartha A, Kumar RD. A comparative study of distal radius fractures managed by ligamentotaxis versus Buttress plating. J Evol Med Dent Sci. 2015;4(92):15775-81.
12. Reddy PM, Kumar DM, Reddy V. Functional outcome of distal radius fractures managed by ligamentotaxis and/or percutaneous pinning vs open reduction and internal fixation by Buttress Plate. Sch J App Med Sci. 2017;5(10):4244-51.
13. Harley BJ, Scharfenberger A, Beaupre LA, Jomha N, Weber DW. Augmented external fixation versus percutaneous pinning and casting for unstable fractures of the distal radius- a prospective randomized trial. J Hand Surg Am. 2004;29:815-24.
14. Cooney WP, Linscheid RL, Dobyns JH. External pin fixation for unstable colles fracture. J Bone Joint Surg Am. 1979;61:840-5.
15. Hutchinson DT, Strenz GO, Cautilli RA. Pins and plaster vs external fixation in the treatment of unstable distal radial fractures: a randomized prospective study. J Hand Surg Br. 1995;20:365-72.
16. Kreder HJ, Hanel DP, Agel J, McKee M, Schemitsch EH, Trumble TE, et al. Indirect reduction and percutaneous fixation versus open reduction and internal fixation for displaced intra articular fractures of the distal radius: a randomized, controlled trial. J Bone Joint Surg Br. 2005;87:829-36.
17. Abdel-Ghany M, Tohamy TG, Shaaban WM, Atallah AHA, Abdel-Rahman TM. Ligamentotaxis versus open reduction and internal fixation for distal radius intra- articular fractures. Open J Orthopedics. 2017;7:21-31.
18. McQueen MM. Redisplaced unstable fractures of the distal radius: a randomised, prospective study of bridging versus non-bridging external fixation. J Bone Joint Surg. 1998;80:665-9.
19. Lee HD, Monsivais JJ, Pomerance J, Trenholm JA, Zelle AB, Evans JP, et al. Appropriate use criteria for treatment of distal radius fractures. AAOS Evidence-Based Medicine Unit; 2013.
20. Atroshi I, Brogren E, Larsson GU, Kloow J, Hofer M, Berggren AM. Wrist-bridging versus non-bridging external fixation for displaced distal radius fractures: a randomized assessor-blind clinical trial of 38 patients followed for 1 year. Acta Orthopaedica. 2006;77:445-53.
21. Huang TL, Huang CK, Yu JK, Chiu FP, Liu HT, Liu CL, et al. Operative treatment of intra-articular distal radius fractures using the small ao external fixation device. J Chinese Med Assoc. 2005;68:474-8.
22. Grewal R, MacDermid CJ, Pope J, Chesworth BM. Baseline predictors of pain and disability one year following extra-articular distal radius fractures. HAND. 2007;2:104-11.
23. Rozental TD, Blazar PE, Franko OI, Chacko AT, Earp BE, Day CS. Functional outcomes for unstable distal radial fractures treated with open reduction and internal fixation or closed reduction and percutaneous fixation: a prospective randomized trial. JBJS. 2009;91:1837-46.
24. Kasapinov AK, Kamiloski V. Outcome Evaluation in patients with distal radius fracture contributions. Macedon Acad Sci Arts, Section Biol Med Sci. 2011;32:231-46.

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