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APPLICATION OF THE KAPANDJI PINNING METHOD FOR CLOSED REDUCTION OF ADULT DISTAL END RADIUS FRACTURES

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ABSTRACT

Background: Fractures of distal end radius are characterized by varying comminution with angulation of major fragments, articular depression and comminution with volar or dorsal displacement with/without joint involvements. Most frequently involved technique is intrafocal (Kapandji) technique described using two pins for unstable extra-articular fractures in younger adults. It can also be used to include fractures with minimally displaced intra-articular fragments and use of third pin dorsoulnarly

Aim: The present study was aimed to assess the application of the Kapandji pinning method for closed reduction of adult distal end radius fractures.

Methods: The study assessed 80 adults (Male and Female) having distal radius fracture admitted to the Institute within the defined study period. All subjects were assessed at 4 and 6 weeks followed by once at 3 months postoperative and final outcomes were assessed at 6 months. For functional assessment, modified Gartland and Werley demerit point system was used. Results were assessed following Sarmiento's Modification of Lindstrom criteria.

Result: The study results showed that anatomy restoration was excellent, good, and fair in 86.56%, 9.38%, and 4.06% subjects respectively. All 80 subjects were assessed for articular angles. Mean value of radicular inclination, palmar tilt, and radial length was 20.45±1.24, 8.74±0.65, and 10.64±1.14 respectively. The complication seen was pin tract infection in 6 subjects. Full wrist flexion and extension and forearm rotation was seen in all the subjects. ROM was assessed at 2 weeks after immobilization.

Conclusion: The present study concludes that distal end radius fracture is usually seen from low velocity falls as in osteopenic subjects and majority of these fractures are extra-articular displaced fractures typical of Colles' fractures. The use of Kapandji pinning technique for management of these fractures is a highly efficacious approach with the outcomes being similar to the standard methods including percutaneous pinning and closed reduction.

Keywords: Closed reduction, Distal end radius fracture, Kapandji technique, Intrafocal pinning, Percutaneous pinning

INTRODUCTION

Fractures from the distal end radius are usually the results of high-energy trauma or falls on the outstretched hands in younger subjects and from low energy falls from standing or sitting in osteopenic subjects. It can be managed using various conservative and surgical techniques where intrafocal (Kapandji) technique has been explored and discussed extensively in the literature data. It was initially discussed in year 1976 by Aldalbert Kapandji and involve using two pins for unstable extra-articular fractures in younger adults. With time, this technique has been indicated to include fractures with minimally displaced intra-articular fragments and in elderly subjects with the addition of a third dorso-ulnar pin.[1]

The Kapandji technique is aimed to attain adequate bone fusion, start immediate functional rehabilitation, and prevent secondary collapse without needing plaster cast and is a simple surgical method. Previous studies in the literature have reported the efficacy of Kapandji technique of intrafocal pinning in management of distal end radius fractures. These studies have been in line with the use of third dorsal to volar pin in fractures with significant dorsal comminution.[2]

In further years with advances in techniques and technologies, the technique has been refined. In year 1987, Kapandji discussed the use of a third dorsal to volar posteromedial pin for complex fractures involving multiple fragments or articular surface involvement. Also, in 1995, Hoel and Kapandji introduced two additional anterior approaches to the intrafocal pinning technique for management of volar displaced fractures.[3]

These advancements have helped in efficacy and versatility of the Kapandji technique for management of the distal fracture of the radius.[1] Hence, the present study was aimed to assess the application of the Kapandji pinning method for closed reduction of adult distal end radius fractures.

MATERIALS AND METHODS

The present clinical assessment study was aimed to assess the application of the Kapandji pinning method for closed reduction of adult distal end radius fractures. The study was done at Department of Orthopaedics, Saraswati Medical College, Unnao, Uttar Pradesh from May 2021 to September 2023. Verbal and written informed consent were taken from all the subjects before study participation.

The study assessed 80 subjects that were admitted to the Institute for the management of the distal radius fractures within the defined study period. The study assessed subjects with distal end radius fracture assessing both radiological and clinical factors to assess the suitability of the subjects for the surgery.

Functional assessment in the study subjects was done using modified Gartland and Werley demerit point system.[4] The anatomical results were assessed using the criteria of Sarmiento's Modification of Lindstrom.[5] The measurements done included ulnar variance (UV), radial length (RL), volar tilt (VT), and radial tilt (RT). These measurements were assessed at presentation, immediately following pinning, and at follow-up. To establish the normal values, measurements were made from radiographs of opposite wrist were considered. In subjects where radiograph from opposite wrist were not available, normal mean values for RL, VT, and RT considered were 12 mm, 11°, and 23° respectively.

For operative procedures, supraclavicular block anaesthesia was used and subject was placed in supine position with wrist on the arm table. All the procedure were completed under complete draping and following strict aseptic condition. The primary step included reducing the fractured fragments through closed reduction which was achieved using counter-traction and traction technique that diminished impaction and aligned distal fragments. Flexion of distal fragments in anteroposterior direction decrease angulation to a neutral position and corrects mediolateral displacements. Further, position is verified using fluoroscopy to ensure alignment meets acceptable standards. Final corrected position is the one that maintained radial inclination with radial length and is maintained before application of K-wires.

After confirmation of verified position, K wires of size 1.8-2.0 mm were inserted from lateral to medial starting at the base of the radial styloid process. These wires travel the fractures site and hold the opposite cortex ensuring maintenance of reduction and traction. K wires are inserted using power drills and another K wire from sigmoid notch starting from dorsal cortex to palmar cortex and it is ensured if K wire has entered opposite intact volar cortex followed by insertion of K wire from dorsal to volar for maintaining stability. Reduction is assessed under C-arm and K wires were bent around 90 degree using K wire bender and was cut. Good adequate padding and pin site sterile dressings was done and pop was then applied.

Postoperatively, subjects underwent regular follow-up appointments occurring at 2nd and 4th weeks. Also, subjects were clinically assessed for evidence of union, radiological parameters, and wrist movement capabilities. Percutaneous K-wires and plaster of Paris were removed after 6 weeks of immobilization after strict aseptic protocols.[6]

Following removal, subjects began passive and active motion exercises and rehabilitation for restoration of the function of the wrist and physical activity was continued till subjects attained satisfactory hand grip strength and normal activities. Platers were usually removed after 6 weeks and subjects transitioned to splints for added protection as required.[7]

RESULTS

The present clinical assessment study was aimed to assess the application of the Kapandji pinning method for closed reduction of adult distal end radius fractures. The study assessed 80 adults having distal end radius fracture admitted to the Institute within the defined study period. All subjects were assessed at 4 and 6 weeks followed by once at 3 months postoperative and final outcomes were assessed at 6 months. In the study, all fractures showed well healing and anatomy restoration was excellent, good, and fair in 86.56%, 9.38%, and 4.06% subjects respectively. The mean value for radicular

inclination, palmar tilt, and radial length was 20.45±1.24, 8.74±0.65, and 10.64±1.14 respectively. All the parameters showed a statistically significant results with $p<0.05$. The complication seen in study subjects was 6 pin tract infection (Table 1 and 2).

It was seen that on assessing the predominance of the side involved in study subjects, among 80 subjects assessed the right wrist dominant hand injury was reported in 46 study subjects and the remaining 34 subjects had sustained the injury on the left hand which was non-dominant. All the included subjects in the study had the dominance from the right hand only.

The study results showed that for the mechanism of the injury in the study subjects, it was noted that predominant and major mechanism of injury in the study subjects was low velocity trauma and majority of the study subjects experienced falls on their outstretched hands. In 80 subjects, 74 subjects sustained injuries resulting from the falls on their outstretched hands, whereas, 6 subjects had the etiology attributed to the road traffic accident. (Table 3)

It was also seen that among the 80 subjects included in the study, 80% (n=64) subjects had extra articular fractures where extra articular metaphyseal fracture with dorsal displacement was seen in 56 subjects and 16 subjects had it with articular involvement (Table 3). All the fractures showed the complete healing in all the subjects at the follow-up. Out of 80, 76 subjects in the study attained full extension and full flexion of the wrist with 04 subjects had loss of 5-10% of wrist flexion and extension at follow up (Table 1 & 2). Complications were shown in Table 4.

DISCUSSION

The present study assessed 80 adults having distal end radius fracture admitted to the Institute within the defined study period.

All subjects were assessed at 4th and 6th weeks followed by once at 03 months postoperative and final outcomes were assessed at 06 months. In the study, all fractures showed well healing and anatomy restoration was excellent, good, and fair in 86.56%, 9.38%, and 4.06% subjects respectively. The mean value for radicular inclination, palmar tilt, and radial length was 20.45±1.24, 8.74±0.65, and 10.64±1.14 respectively. All the parameters showed a statistically significant results with $p<0.05$.

The complication seen in study subjects was 06 pin tract infection. These data were comparable to the previous studies of Sanil N et al[8] and Gehrmann SV et al[9] in 2008 where results similar to the present study were also reported by the authors in their studies.

The study results showed that on assessing the predominance of the side involved in study subjects, among 80 subjects assessed the right wrist dominant hand injury was reported in 46 study subjects and the remaining 34 subjects had sustained the injury on the left hand which was non-dominant. All the included subjects in the study had the dominance from the right hand only. These results were consistent with the findings of Azzopardi T et al[10] in 2005 and Jacob C et al[11] in 2014 where authors also reported right side dominance in subjects with distal radius fracture.

It was seen that for the mechanism of the injury in the study subjects, it was noted that predominant and major mechanism of injury in the study subjects was low velocity trauma and majority of the study subjects experienced falls on their outstretched hands. In 80 subjects, 74 subjects sustained injuries resulting from the falls on their outstretched hands, whereas, 6 subjects had the etiology attributed to the road traffic accident. These findings were in agreement with the results of Uzzaman KS et al[12] in 2008 and Das AK et al[13] in 2011 where mechanism of the injury was falls on their outstretched which was also reported by the authors.

The study results also showed that among the 80 subjects included in the study, 80% (n=64) subjects had extra articular fractures where extra articular metaphyseal fracture with dorsal displacement was seen in 56 subjects and 16 subjects had it with articular involvement. All the fractures showed the complete healing in all the subjects at the follow-up. Also, 76 subjects in the study attained full extension and full flexion of the wrist and only 04 subjects had loss of 5-10% of wrist flexion and extension at follow-up. These results correlated with the findings of Hoel G et al[14] in 1995 and Dang HLN et al[15] in 2022 where authors also reported extra articular metaphyseal fracture with dorsal displacement as common distal radius fracture as seen in the results of the present study.

CONCLUSION

Considering its limitations, the present study concludes that distal radius fracture is usually seen from low velocity falls as in osteopenic subjects and majority of these fractures are extra-articular displaced fractures typical of Colle's fractures. The use of Kapandji pinning technique for management of these fractures is a highly efficacious approach with the outcomes being similar to the standard methods including percutaneous pinning and closed reduction.

REFERENCES

1. Peyroux LM, Dunaud JL, Caron M, Slamia IB, Kharrat M. The Kapandji technique and its evolution in the treatment of fractures of the distal end of the radius. Report on a series of 159 cases. Ann Chir Main. 1987;6:109–22
2. Rayhack J. The history and evolution of percutaneous pinning of displaced distal radius fractures. Orthop Clin North Am. 1993;24:287–300.
3. Merchan EC, Breton AF, Galindo E, Painado JF, Beltran J. Plaster cast versus Clyburn external fixation for fractures of the distal radius in patients under 45 years of age. Orthop Rev. 1992;21:1203–9.
4. Strohm PC, Muller CA, Boll T, Pfister U. Two procedures for Kirschner wireosteosynthesis of distal radial fractures. A randomized trial. J Bone Joint Surg Am. 2004;86:2621–8.
5. Walton NP, Brammar TJ, Hutichson J, Raj D, Coleman NP. Treatment of unstable distal radial fractures by intrafocal, intramedullary Kwires. Injury. 2001;32:383–9.
6. Depalma AF. Comminuted fractures of the distal end of the radius treated by ulnarpinning. J Bone Joint Surg Am. 1952;24:651–62.
7. Trumble TE, Schmitt SR, Vedder NB. Factors affecting functional outcome ofdisplaced intra-articular distal radius fractures. J Hand Surg Am. 1994;19:325–40.
8. Sanil N, Sajan A. The Kapandji pinning: Technique of closed reduction for distal end radius fracture in adults. Indian J Orthop Surg 2022;10:149-153.
9. Gehrmann SV, Windolf J, Kaufmann RA. Distal Radius FractureManagement in Elderly Patients: A Literature Review. J Hand Surg Am. 2008;33:421–9.
10. Azzopardi T, Ehrendorfer S, Coulton T, Abela M. Unstable extraarticular fractures of the distal radius: a prospective, randomised study of immobilisation in a cast versus supplementary percutaneous pinning. J Bone Joint Surg Br. 2005;87:837–40.
11. Jacob C, Anoop R, Philip NT. Functional and Radiological Outcomes of Distal Radius Fractures Treated with Closed Reduction and Percutaneous Five Pin Technique – A Prospective Cohort Study. Int J Recent Trends in Sci Technol. 2014;10:430–3.
12. Uzzaman KS, Awal KA, Alam MK. Closed Reduction and Percutaneous Kirschner Wire Fixation Combined with Plaster Cast versus Conventional Plaster Cast immobilization in the Treatment of Colles' Fracture – A Prospective Randomized Comparative Study. J Dhaka Med Coll. 2008;17:98–105.
13. Das AK, Sundaram N. Percutaneous pinning for non comminuted extra articular fractures of distal radius. Indian J Orthop. 2011;45:422–6.
14. Hoel G, Kapandji AI. Osteosynthesis using intra-focal pins of anteriorly dislocated fractures of the inferior radial epiphysis. Ann Chir Main Memb Super. 1995;14:156–7.
15. Dang HLN, Nguyen BL, Le HP, Nguyen TT & Le NTN. Experience of Kapandji technique in treating Colles' fracture in central region of Vietnam. SICOT-J. 2022;8:41.

S. No	Point system	Score	N%
1.	Poor	21 and more	0
2.	Fair	9-20	4.06%
3.	Good	3-8	9.38%,
4.	Excellent	0-2	87.56%,

Table 1: Demerit point system results in study subjects using Gartland and Werley

S. No	Scores	Loss of radial deviation (°)		Radial Shortening (mm)		Loss of palmar Tilt (°)		Residual deformity	
1.	Poor	>14	0	12	0	15	0	Severe	0
2.	Fair	10 - 14	4	7-11	0	11-14	6	Moderate	3
3.	Good	5 - 9	4	3-6	6	1-10	8	Slight	12
4.	Excellent	<5	12	<3	74	0	66	Insignificant	65

Table 2: Results of Sarmiento's modification of lindstorm criteria in study subjects

S. No	Fracture pattern	Number	Percentage (%)
1.	Intraarticular fractures	16	20

2.	**Extraarticular fractures**	64	80

Table 3: Articular surface involvement in study subjects

S. No	Complication	Number	Percentage (%)
1.	**Pin tract infection**	6	7.5

Table 4: Complication seen in study subjects