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FUNCTIONAL OUTCOME OF SURGICAL MANAGEMENT OF INTRA-ARTICULAR FRACTURES OF DISTAL END OF THE RADIUS BY INTERNAL FIXATION

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HOW TO CITE THIS ARTICLE:

H. B. Shivakumar, Chanappa T. S, Yatish R, Lohith H. "Functional Outcome of Surgical Management of Intra-Articular Fractures of Distal end of the Radius By Internal Fixation". Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 20, May 19; Page: 5478-5483, DOI: 10.14260/jemds/2014/2616

ABSTRACT: BACKGROUND: Seventy five patients who sustained simple intra articular fractures of distal end of the radius treated by open reduction and internal fixation and closed reduction and k – wire fixation during 2years. To assess the functional outcome of the wrist joint in intra-articular fractures of distal end of radius **AIMS:** To assess the functional outcome of the wrist joint in intra-articular fractures of distal end of radius by opting surgical intervention. **METHODS AND MATERIALS:** A total of 75 cases of intraarticular fractures of distal end of the radius were operated on by open reduction and internal fixation, closed reduction and k – wire fixation, at KIMS hospital. Records of 75 cases were available for study. The mean age of the 54 males and 21 females was 35.4 years (range, 20–72 years) Special care was taken during surgery to achieve articular congruity. The injury was caused by fall in 32patients, RTA in 37 patients and fall from height in 6 patients. All cases were Gartland and Werely type III. All cases were operated on within 7days from the day of injury. **RESULTS:** All patients were assessed clinically and radiographically after a follow-up duration of 6 months. The radiological union was acceptable. Result were evaluated according to modified Green O'Brein Score were excellent in 55 cases (73.3%), good in 13 (17.4%), and fair in 7(9.3%). **CONCLUSION:** Open reduction and internal fixation of intraarticular fractures of distal end of the radius can restore articular congruity and result in good to excellent results. **KEYWORDS:** Intra-Articular, Radius, functional outcome internal fixation, k-wire fixation, articular congruity.

INTRODUCTION: Fractures of the distal end of radius constitute one of the most common skeletal injuries treated by orthopedic surgeons, accounting for one-sixth 14% of the fractures of the 17% extremities of all fractures evaluated in emergency rooms.

Better understandings of the spectrum of distal fractures have led to changing concepts of treatment. Prominent being differentiation of the relatively low-energy metaphyseal injuries, from the more frequently communitied and unstable, and therefore less suitable for more traditional methods of closed reduction and cast immobilization.

Without supplemental skeletal fixation, redisplacement of the fracture commonly to its pre-reduction position is inevitable. Over the past few years the importance of alignment correction preservation of normal radial length and reconstruction of congruity of both the radio-carpal and radio-ulnar joints has been emphasized. The optimal method of obtaining and maintaining an accurate restoration of distal anatomy remains a topic of considerable controversy.¹

Thirty years ago distal radial fractures were considered benign and conservative treatment was the rule. Unaesthetic mal unions were noticed but deemed unimportant. Since then, a growing number of young males, manual workers and sport enthusiasts have suffered high velocity injuries;

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often resulting in complex intra-articular fractures. Pain and disability have resulted from subsequent malunions. Recently surgical treatment has been widely recommended and performed on emergency basis to prevent these sequelae. The aim of the treatment is to obtain a good reduction especially for intra-articular fractures.²

There is evidence to suggest that anatomical articular reduction greatly reduce the incidence of post-traumatic Osteoarthritis.³

The quality of the reduction relates directly to the final outcome.⁴ Treatment of displaced intra-articular fractures of distal radius by open reduction & internal fixation has previously been shown to produce acceptable results.⁵

This study is taken up to analyze the surgical management of fracture using various internal fixation devices.

METHODOLOGY: From November 2008 to November 2013, a total of 75 cases of Intraarticular fractures of distal end of the radius were treated by ORIF with plate and screws and closed reduction and k-wire fixation at Kempegowda Hospital, Bengaluru, India. Records of 75 cases were available for study. The mean age of the 54 males and 21 females was 35.4 years (range, 20–72 years). The mechanism of injury was fall in 32 patients, RTA in 37 patients and fall from height in 6 patients. All cases were Gartland and Werely type III. All cases were operated on within 7 days from the day of injury. Received brachial plexus blocks. General Anesthesia.

PROCEDURE: A pneumatic tourniquet was used in all cases in order to provide bloodless field during surgery. The fracture site was exposed through the distal part of the volar approach. Open reduction of all major fragments was performed, focusing on restoring articular congruity. A Kirschner wire was used to provisionally fix the position of the fragments in few cases along with plate. Definitive fixation was done with a 3.5-mm Ellis plate or LCP under C-ARM guidance. A below-elbow plaster-of-Paris slab was applied for 3–6 weeks and then active movement of wrist was started. Postoperative radiographs were assessed by measuring the radial angulation and palmar tilt, radial length and radial shift in anteroposterior and lateral views, respectively. Patients were followed up initially at 3-week, 6 weeks, 12 weeks and 24 weeks intervals.

RESULTS: All patients were assessed clinically and radiographically after a follow-up duration of 6 months. The radiological union was acceptable. Results were evaluated according to modified Green O'Brien Score were excellent in 55 cases (73.3%), good in 13 (17.4%), and fair in 7 (9.3%) with a p value of <0.001**. No involvement of the median nerve was seen, and no postoperative infection was found in all 75 cases. Statistical analysis was done using Fisher Exact test, Chi-Square Test.

DISCUSSION: Fractures of the distal end of radius constitute one of the most common skeletal injuries treated by orthopedic surgeons, accounting for one-sixth 14% of the fractures of the 17% extremities of all fractures evaluated in emergency rooms. Various forms of treatment have been described. They include closed reduction and plaster application, percutaneous pinning, external fixation, ORIF with Kirschner wires, and ORIF with a buttress plate. Closed reduction is usually easy to achieve but difficult to maintain. Fractures of the distal radius have been associated with colorful history since their first description by Pouteau in 1783 and Colles' in 1814. Having been recognized

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for nearly two centuries, fractures of the distal radius recently have become the focus of an intense interest regarding optimal management. Fractures of the distal radius continue to be one of the most common skeletal injuries treated by orthopedic surgeon.

These fractures are frequently articular injuries resulting in disruption of both the radio-carpal and distal radio-ulnar joint. It is remarkable that this common fracture remains one of the most challenging of the fractures to treat. There is no consensus regarding the description of the condition and the appropriate outcome. However, most authors agree that fundamental principle of treatment is the restoration of articular congruity with the goal of restoring functional, painless motion of the wrist and fingers.

Numerous studies have shown that extra-articular fractures as well as impacted stable fractures with minimal shortening can be managed conservatively. However, more often than not, distal radius fractures involve the radiocarpal joint and or the distal radioulnar joint. These require an anatomical reduction of the joint surface to reduce the incidence of post-traumatic arthritis and to guarantee a successful treatment outcome. In contrast, the results of conservative treatment of intra-articular fractures, especially in young individuals have been poor. Thus, intra-articular fractures that cannot be reduced by conservative methods and are comminuted, displaced and unstable, require operative treatment.

The operative method selected to achieve the treatment objectives requires a careful study of the individual fracture pattern, level of activity, quality of bone and general medical condition. The aims of treatment in intra articular fractures of distal end of the radius are to allow early functional recovery of the limb, to improve long term function of the wrist and to prevent cosmetic deformity. There is no doubt; however, that the surgical management effectively maintains the reduced position where as treatment by plaster does not.

Failure to identify the unstable fracture by the degree of displacement, the severity of comminution, in the involvement of the radio carpal or radio ulnar joints, and especially the loss of reduction after a cast is applied will lead to a poor long term result. The present study was undertaken to assess the functional outcome of surgical management of intra articular fractures of distal end of the radius distal by open reduction and internal fixation, closed reduction with 'K' wire fixation. We evaluated our results and compared them with those obtained by various other studies utilizing different modalities of treatment. In our series, we had 73.3% excellent, 17.4% good, and 9.3% fair results with a p value of <0.001**.

Patients who obtained excellent results had no residual deformities or pain. Range of motion was within the normal functional range. They had no arthritic changes or other complications. They were operated within 7 days after injury. Radial length, volar tilt and articular step-off were within acceptable limits. They were cooperative to physiotherapy. Patients with good results had minimal limitation. Rest of their findings was within acceptable parameters. Patients with fair results, Few of their movements were less than that required for normal, but not affecting the normal function. Our series is comparable to those of F. Fitoussl et al⁶, Jesse B. Jupiter et al⁷, John K. Bradway et al,⁸ AK Aggarwal et al,⁹ Marco Rosati et al,¹⁰ A. Sadighi et al.¹¹

In our series, surgical management of intra articular fractures of distal end radius by open reduction and internal fixation and closed reduction and k- wire fixation was done in 30 patients. Distal radial fractures are more common in the 2nd and 3rd decades. Male preponderance is due to their involvement in heavy manual labor and outdoor activities. The mode of injury is either a fall

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60% or road traffic accident 40%. Distal radial fractures which occur due to fall and road traffic accidents (high energy trauma) are mostly intra-articular, displaced and unstable. High velocity injuries are significantly higher in younger age group.

Fractures with extreme comminution are best fixed with internal fixation. Radial length, which is the most important radiological parameter, is best maintained by internal fixation. Outcome of surgery is significantly better in the younger age group compared to older age group with p value is 0.001** Kirschner wires can be used to augment on internal fixator to fix fragments too small for other means of fixation.

Operative treatment for displaced, intra-articular fractures prevents the sequelae of post-traumatic arthritis, pain and stiffness. The patients operated at an earlier date more likely to have an excellent outcome and those operated >5 days had poor surgical outcome. $p=0.646$. Patients with excellent & good outcome had significantly early fracture union. Early fixation and early postoperative mobilization and range of motion exercises, greatly improve the long-term results.

Among the radiological parameters, radial shortening is the most critical followed by joint congruity, radial angulation and dorsal tilt.

Figure 1: Anteroposterior and lateral radiographs of case 1, showing Gartland and Werely type III fracture.

Figure 1

Figure 2: Immediate postoperative radiographs of the same patient, demonstrating the reduction and internal fixation of fractured fragments with plate

Figure 2

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Figure 3: 6 months follow up x ray

CONCLUSION: Open reduction and internal fixation of intraarticular fractures of distal end of the radius can restore articular congruity and result in good to excellent results

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Date of Submission: 18/03/2014.
Date of Peer Review: 19/03/2014.
Date of Acceptance: 22/04/2014.
Date of Publishing: 16/05/2014.