

A Comparative Analysis Of Surgical Management Of Unstable Fracture Of Distal Radius Using External Fixation And Internal Fixation

Dr.Randhi Rama kartheek¹, Dr.Kotikalapudi Venkata Muralimohan²,
Dr.Vajrapu Naveen kumar³, Dr. Nagireddi ravi shankar⁴, Dr.Rajendra kumar
pudi⁵, Dr.Malla venu⁶, Dr.Bandela Manoranjan⁷, Dr.Challa ravi⁸.

Date of Submission: 13-01-2020

Date of Acceptance: 29-01-2020

I. Introduction:

Fractures of the distal end of radius are the most prevalent fractures presenting to the Orthopaedic outpatient Department and Emergency. It accounts for about One-Sixth of all fractures treated in emergency rooms¹. Fractures of the distal end of radius caused due to falling on an outstretched hand. Unstable comminuted fractures of these typically occur due to high-velocity Injuries. It usually occurs in both younger and elderly populations due to road traffic accidents, fall and its also seen in postmenopausal women. Usually, Uncomplicated fractures of this type can be treated with closed reduction and immobilization in a cast. However, unstable comminuted fractures of radius occur as a treatment challenge. Review of Literature shows a high incidence of unsatisfactory results in the treatment of unstable fractures by the plaster cast method. It causes deformity up to 60% and disappointing results in 32% of patients². Recently, due to the advancement of Surgical techniques, External fixation and internal fixation are widely used as conservative methods fail to maintain anatomical as well as functional stability. External skeletal fixation is minimally invasive procedures. It gets a reduction by ligamentotaxis. Both static, as well as dynamic external fixators, are used, depending on the difficulty in maintaining radial length and alignment.

II. Materials And Methods:-

This was a prospective study conducted in Maharajah's Institute of Medical College, Vizianagaram during the period of June 2017 to December 2019, after taking ethical committee approval. The study consist of 11 cases (group A) of fracture shaft humerus treated with closed intramedullary nailing and 11 cases (group B) treated with dynamic compression plating. Inclusion and exclusion criteria The inclusion criteria were patients more than 15 years of age of either sex. All cases of unstable comminuted distal radius fractures. After taking consent and fit for surgery.

III. Surgical Approach:-

For External fixator:-

The external fixator was applied in the operation theatre under sterile conditions. The pins used for radius were 3.5 mm Schanz type, and for that of metacarpal was 2.5 mm Schanz type. After painting and draping with or without a pneumatic tourniquet, a small incision was made on the dorsolateral aspect of the forearm about 3-5 cm proximal to fracture site. The lateral cutaneous nerve of the forearm was identified, 2.7 mm drill bit was used for predrilling. 3.5 mm Schanz pin (half pin) was inserted. Second pin site was selected beyond mid-forearm proximally, as higher the distance from the first pin in the distal end of radius 3-5 cm proximal to fracture site, more stable is the fixation. Two Schanz pins were passed to the 2nd metacarpal as follows. First, Schanz pin 2.5mm was passed into the base of the second metacarpal to the third metacarpal base. The second Schanz pin of 2.5 mm was passed into the neck of the second metacarpal. Both these pins were passed from the lateral surfaces. The radial pins and metacarpal pins were connected by two external rods. The reduction was achieved under the image intensifier, then control, and a rod to rod clamp or a third external rod were used when necessary to control the angular element of deformity. The best position is the ulnar deviation of the forearm. Postoperatively, the upper limb was elevated for 24 hours with monitoring of neurovascular status. The early motion of digits, elbow, and shoulder was encouraged. The patient was discharged and called for follow up every two weeks till 6 weeks, then every 3 months till one year. During the follow-up period, patients were advised about the exercises of the elbow, digits, and shoulder and about the cleaning of the pin site

with saline and soapy water. Early pin tract infection was treated with antibiotics. Fixator removal was done after clinical and radiological evidence of fracture healing.

FOR PLATING:-

After painting and draping, a longitudinal incision about 7.5 cm long on the radiovolar aspect of the distal forearm was made. The plane between the flexorcarpiradialis and the Palmaris longus was developed. The flexor pollicislongus tendon was retracted towards the radial side, and the median nerve and other tendons were retracted towards the ulnar side. The fibers of the pronator quadratus were separated from their origin over the radius, and the fracture was exposed. The fracture was reduced, and a buttress plate was contoured so that, when it is applied and fixed to the proximal fragment, the distal transverse part will act as a buttress and hold the fractures reduced. A minimum of two screws was inserted in the proximal fragment. Screws were inserted through the distal part of the plate into the Fracture fragments. The reduction of the Fracture and restoration of the articular surface were confirmed by direct observation and by anteroposterior and lateral views in c arm. Pronator quadratus was replaced from its origin on the radius to over the plate ,and the wound was closed. Postoperatively, the upper limb was elevated for 24 hours with monitoring of neurovascular status. The early motion of digits, elbow, and shoulder joints are encouraged. Posterior slab for 3 weeks.

FOLLOW UP:-

Patients were assessed, which included an objective impression of the patient, objective grading of function and deformity, a comparison of final and initial X-ray. Subjective factors such as pain, functional limitations, technical considerations were taken into account. FIG 7:- APPROACH 25 | P a g e Follow up intervals are 6 weeks, 3 months, and 1 year. The objective examination included inspection of the wrist for deformity, tenderness, abnormal mobility of the distal radioulnar joint, measurement of range of movements extending from the shoulder to digits, grip strength, light touch, and pinprick sensitivity.

IV. Results:

Results	IF	EF
Excellent	07	04
Good	06	09
Fair	02	02
Poor	0	0
Total	15	15

The chi-square value was found to be 1.42, and p-value 0.4921, which shows that the method of fixation does not determine the outcome of treatment.

Table : 2 outcome wise Sex Distribution among internal and external fixation:

Results	Male			Female		
	IF	EF	Total	IF	EF	Total
Excellent	4	2	6	3	2	5
Good	3	4	7	3	5	8
Fair	2	0	2	0	2	2
Poor	0	0	0	0	0	0
Total	15			15		

Results were corrected using the chi-square method. The Chi-square value was found to be 0.16, and p-value 0.92, which shows that the sex of the patient doesn't influence the outcome of treatment.

Results	18 – 20			20 – 30			30 – 40		
	IF	EF	Total	IF	EF	Total	IF	EF	Total
Excellent	0	0	0	4	2	06	0	0	0
Good	1	1	2	0	0	0	2	4	6
Fair	0	0	0	0	0	0	0	0	0
Poor	0	0	0	0	0	0	0	0	0
Total	02			06			06		

Results	40 – 50			50 – 60			60 – 70		
	IF	EF	Total	IF	EF	Total	IF	EF	Total
Excellent	2	2	4	0	0	0	1	0	1
Good	1	3	4	0	0	0	2	1	3
Fair	0	0	0	2	2	4	0	0	0
Poor	0	0	0	0	0	0	0	0	0
Total	8			4			4		

This chi-square value was found to be 41.18, and p-value <0.001, which shows that the age of the individual does influence the outcome of the treatment.

Result	Right			Left		
	IF	EF	Total	IF	EF	Total
Excellent	3	2	5	4	2	6
Good	2	4	6	4	5	9
Fair	1	1	2	1	1	2
Poor	0	0	0	0	0	0
Total	13			17		

The chi-square value was found to be 0.16, and p-value 0.9229, which shows that the side involved did not influence the outcome of treatment.

Results	Closed	Open
Excellent	11	0
Good	15	0
Fair	2	2
Poor	0	0
Total	28	2

The chi-square value was found to be 13.93. The P-value <0.001. The result is significant at P < 0.05. It shows the type of fracture is statistically significant in determining the outcome of the patient.

Functional Results

With the help of DASH (Disability of Arm, Shoulder, and Hand) method, functional results were as follows :

Excellent (11) - 36.66%

good (15) - 50%

Fair(4) - 13.33%

Poor (0) - 0%

V. Discussion:-

The current study is a prospective, non-randomized study to compare the effects of External fixation and internal fixation in the surgical management of unstable fractures of the distal radius. This study evaluates the functional outcome of patients treated with internal fixation and external fixation using D A S H (Disability of Arm, Shoulder, and Hand) score. 30 patients with comminuted unstable fractures of A distal radius were

employed in the study. 15 patients who underwent external fixation procedures and 15 patients who underwent internal fixation were included in the study. The patient selection was based on factors such as Age, Fracture pattern, bone quality, Type of fracture, affordability of the patient.

Of the patients employed in the study, 50% were males, and 50% were females. In our study, the sex of the patient is not statistically significant ($p = 0.92$) in determining the functional outcome of the patient. Previously Zhuang Cui et al³ has conducted a meta-analysis of unstable distal radius fractures treated with Internal fixation versus External fixation. It included pooled data from ten randomized controlled trials included 738 patients, orthopedic journals. It was discussed that a prospective study of patients age more than 35 years with colles' fracture at six centers in the UK for a period of one year reported that the overall incidence of these fractures is found to be more in females than in males. Therefore, although there may effect modification due to the mean and proportion of women, we could not determine this from available data.

Post-menopausal women are more prone to the distal radius fracture due to osteoporosis. Most of the women in our study sustained an injury due to falls.

In the current study, patients from age groups 18 years to 75 years old were employed. Among which youngest of the study is 18years, and the oldest is 65years. Patients in the age group of 18-20 years were off 6.66%, age group of 20-30 years patients was 20%, in the age group of 30-40 years 20% were employed, 26.6% and 13.33% of patients were on the age group of 40-50 and 50-60 years. In the age group of 60-70 years, 13.33% of patients were included. The majority of patients were of the age group of 40-50 years. Fracture incidence found to be more (or) less equal in younger and older age groups representing bimodal distribution distal radius fractures. More patients in the younger age group reflect the higher incidence of high-velocity injuries, while in elderly people, even low-velocity damages would cause the distal radius fractures. However, the age of the patient is statistically significant ($P < 0.001$) in determining the functional outcome of the patient, which says that the young patient will have a better outcome than the elderly people. This can be due to the remodeling capacity of the young bones and good bone density. The excellent outcome is observed in the people of the age group 20-30 than less than 20 years age group. This may be due to maturity bone. In elderly patients, the bone is osteoporotic, and there will risk of joint stiffness.

In our series, left-sided fractures (17- 56.66%) were common than right-sided fractures (13- 43.33%). Besides, the side of the fracture is not statistically significant ($P = 0.9229$) in determining the outcome of the patient. As the right hand is dominant, hand left will be used to protect themselves while falling. In this study, the mode of Injuries, Road Traffic Accident, and fall were the causes of distal radius fractures. Road Traffic Accident was of major cause found than fall. It is about 18(60%) whereas in fall 12(40%) . However, Jerry Knirk et al¹⁰ found on their series, fall from a height to be the leading cause of fractures. In our study, Mode of Injury is statistically insignificant ($P = 0.2143$) in determining the functional outcome of the patient. the velocity of the injury is proportional to the instability of the fracture. The functional activities or outcomes between the plating group and the external fixation group are not significantly different. Even some advantages in maintaining reduction in imaging examination of plating group were found. Finally, both locking plate and external fixation are feasible to unstable distal radius fracture. The mean length of the operative procedure was 85min for the plating group and 83 min for external fixator. There was a similar study conducted by N.Schmelzer-schmied³⁶ et al⁴., which states that the locking plate has demonstrated the best radiological and functional results, which stated that the ORIF with fixed angled screws was better option than that of external fixation. It has a sample size of 30 with 15 patients with external fixator and 15 patients with external fixator. This study is comparable to our study. In our study, open fractures and closed fractures were included. Surprisingly, the type of fracture was found to be statistically significant ($P < 0.001$ and chi-square value 13.93) in determining the functional outcome of the patient. Probably, the significance of this type of Injury in functional outcome is due to less number of patients included in open fractures type. Additionally, complications such as infections are most common in open fractures than closed type, which delays the healing of fractures and, ultimately, the functional outcome. In the open injury, the hematoma will be disturbed;; it may attribute to the delay of the fracture healing. A maximum number of cases were of frykman's type 6. The cases were selected randomly. There were two instances where type 3 fractures were treated by internal fixation because of inability to achieve the reduction by closed manipulation.

The period of minimum follow up is six months. Another study by Marco Rizzo⁵ did a similar study shows the mean DASH score of the locked volar plate group was 9 compared to 23 for the external fixation group. Radiographically, volar tilt and radial length were significantly better in the patients treated with ORIF. The ORIF group required fewer therapy visits. Whereas in our study the postoperative number of physiotherapy visits of both groups was equal.

Many classifications such as Gartland and Werley, Frykman classification, Melone's classification, OTA / Ao classification, Fernandez classification, Cooney universal classification were proposed for distal radius fractures. In our study, Frykman's grading was employed, which is one of the most standard and recent classifications. Most fractures in the study were of Frykman type 6. Fractures were also distributed in other

groups. There were no type 2 fractures. Similarly, Kapoor et al²¹ conducted a study in the orthopedic department for a period of 5 years; they used Frykman classification for assessment of fractures.

In the surgical procedure, External fixation 13.33% of patients had excellent results, 30% had good results, 6.66% had fair results, and none had poor results. In the Internal fixation group, 23.33% of patients had excellent results, 20% had good

results, 6.66% had fair results, and no one had poor results. Our study showed that the method of fixation is statistically not significant. The chi-square value was found to be 1.42 and the p-value is 0.4921 which shows that the method of fixation has no role in determining the functional outcome of the patient, though the study has certain limitations such as non-randomized, no blinding techniques used, and less number of patients were employed. Similarly, Margalioet al⁶ did a Meta-analysis of distal radius fractures treated with external fixation and internal fixation. 46 articles were included in the study after the calm serenity of internal fixation and external fixation 917 patients were included in the external fixation group, and 603 were included in the internal fixation group. Outcomes were assessed using pooled grip strength, Range of motion, Radiographic assessment, and physician-related issues.

VI. Conclusion:-

The current study shows in surgical treatment of comminuted unstable fractures of distal radius, both external fixation and Internal fixation shows equally good results.

References:-

- [1]. Ark. J. Jupiter, JB. The rationale for the precise management of distal radius fractures. *OrthopClin North Am.* 1993 Apr; 24(2) : 205 – 10.
- [2]. Fernandez, DL., Jupiter, JB. *Fractures of the distal radius. A practical approach to management.* Springer – Verlag. Newyork ; 1995.
- [3]. Zhuang Cui. Internal versus external fixation for unstable distal radius fractures : an up to data meta-analysis. *IntOrthop.* 2011; 35(9) :1333-1341.
- [4]. N. Schmelzer-Schmied,1,2 P. Wieloch,1,2 A. K. Martini,1,2 and W. Daecke1,2,3 Comparison of external fixation, locking and non-locking palmar plating for unstable distal radius fractures in the elderly DOI: 10.1007/s00264-007-0504-9
- [5]. Fractures Marco Rizzo 2007 Oct 17. DOI: 10.1007/s11552-007-9080-0
Comparison of Locked Volar Plating Versus Pinning and External Fixation in the Treatment of Unstable Intraarticular Distal Radius.
- [6]. Margalioet Z, Haase Sc. A Meta-analysis of outcomes of external fixation versus plate osteosynthesis for unstable distal radius fractures. *J hand Surg AM.* 2005; 30 (6) : 1185-99.