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RESEARCH ARTICLE

ARTICULAR CONGRUITY AFTER FIXATION OF DISTAL RADIUS FRACTURE BY VOLAR LOCKING PLATE.

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Abstract

Introduction:-

Distal End Radius fracture has been recognized for nearly two centuries. Earlier these fracture occurred more commonly in elderly population and so was not the focus of interest. But due to increase in Road Traffic Accidents young population is more prone to this fracture in recent era. As this fracture causing disruption of wrist anatomy and to get the best functional outcome, these fractures are given utmost important.

Increased awareness of distal radius fractures has led to the emergence of a substantial change in concepts that rational treatment should be incorporated. Prominent among these concepts is that functional recovery closely parallels the accuracy of anatomical restoration.[01] Moreover for the most frequently occurring intra-articular fractures, preservation of distal radial articular contours, that in many cases can be achieved by open reduction of fracture and fixation, is an absolute prerequisite for successful recovery.[03]

Material and Methods:-

Selection of patients:-

40 cases of distal end radius fracture were selected for study. All cases were of closed fracture distal end radius. Fracture patterns were classified on Frykman classification.

Apart from the Frykman classification, radiographic assessment including radial length, radial inclination, volar tilt and intra-articular step off was used.

Technique used:-

Open reduction and internal fixation by locking ellis plate by volar approach.

Post-operative Protocol:-

- Post-operative radiographs taken, limb elevated with below elbow plaster slab.
- Active finger, elbow and shoulder mobilization started as early as possible.
- Plaster slab was removed after 01-02 weeks.
- Crepe bandage was applied and active and passive both wrist mobilizations started as tolerated.

Follow up and Outcome:-

- Follow up taken at 06 week, 12 week and 06 month postoperatively.
- Radiographic assessment including radial length, radialinclination, volar tilt, intra-articular step off used.
- Functional criteria of gartland and werley score and PRWE score used.
- Radiological assessment of Radial inclination , Radial shortening and Palmer tilt evaluated according to Sarmiento's modification of Lind Storm Criteria.

Gartland&Werley criteria:-

Demerit point system used to evaluate end results of healed colles‟ fractures result	Points
Residual deformity	
Prominent Ulnar Styloid	1
Residual Dorsal Tilt	2
Radial Deviation of Hand	2 to 3
Point Range	0 to 3
Subjective evaluation	
Excellent: no pain, disability or limitation of motion	0
Good: Occasional pain, slight limitation of motion, no disability	2
Fair: Occasional pain, some limitation of motion, feeling of weakness in wrist, no particular disability if careful, activities slightly restricted	4
Poor : Pain, limitation of motion, disability, activities more or less markedly restricted	6
Point Range	0 to 6
Objective evaluation	
Loss of Ulnar Deviation	3
Loss of Supination	2
Loss of Palmar Flexion	1
Loss of Radial Deviation	1
Loss of Circumduction	1
Loss of Pronation	2
Pain in Distal Radioulnar Joint	1
Grip Strength – 60% or less of opposite side	1
Point Range	0 to 5
Complications	
Arthritic Change	
Minimum	1
Minimum with Pain	3
Moderate	2

Moderate with pain	4
Severe	3
Severe with pain	5
Nerve Complications (Median)	1 to 3
Point Range	0 to 5
Poor Finger Functions Due to Cast	1 to 2
End result point ranges	
Excellent	0 to 2
Good	3 to 8
Fair	9 to 20
Poor	21 & Above

Results:-

In study 40 patients were selected of close fracture distal and radius with different age groups. They were treated by open reduction and internal fixation of fracture with volar locking plate.

Results according to Frykman Classification:-

- As per Frykmanclassification, out of 40 patients 2.5% patient is classified as type I, 40% patients are classified as type III, and 57.5% patients are classified as type VII.
- In type I all patients have excellent result.
- In type III 87.50% have excellent result and 12.50% have good result.
- In type VII 60.86% have excellent result and 26.08% have good result and 13.04% have fair result.
- Functional Result evaluated according to Gartland and werley score and Patient Rated Wrist Evaluation Score, >90 % patients have found Excellent or Good Results and high levels of satisfaction with activities of daily life .

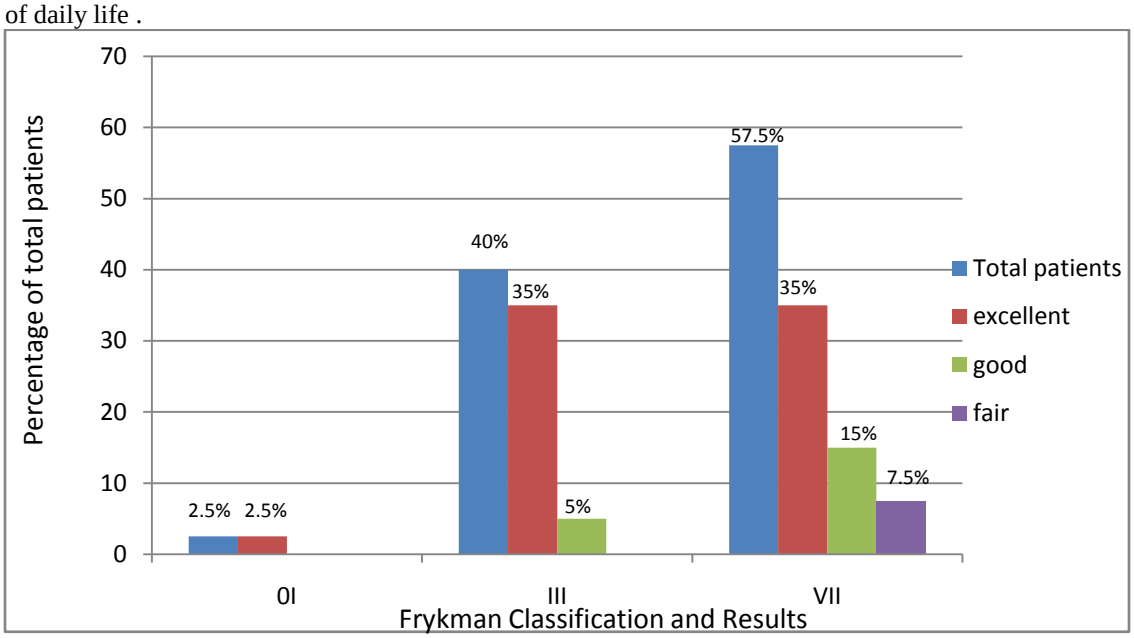

Figure 2:Results according to type of fracture

Discussion:-

Complex articular fractures of the distal radius represent increasing challenge for surgeons and for the design of new surgical implants. The popularity of locked volar plating continues to grow however, previous reports of successful outcome concentrate on radiographic and surgeon orientated measures of success. In my study, patients reported low pain scores and high levels of satisfaction. However further work should address whether locked volar plating produces superior functional outcomes and satisfaction compared with other fixation techniques.

None of our patients suffered any complications like extensor tendon or flexor pollicislongus rupture although we have previously noted these complications among other patients. Both of these complications are well described in literature and we believe care should be taken intra-operatively to ensure that the dorsal cortex is reached but not penetrated by the distal locking screws and the pronator quadratus is laid back over the metalwork, back it into place where possible. Our patients are routinely followed up with physiotherapy and subsequently asked to return to clinic for any further problems. Final radiographic examination confirms that fracture is united and locked volar plate has maintained satisfactory position.

In this study 40 patients of close fracture distal end radius were selected with different age groups with mean age was 39.27 years. Young age group is more affected because they are more prone to trauma with active life and hard work. Male population being more affected than female due to same reason.

As per Frykman classification, out of 40 patients 2.5% patient are classified as type I and have excellent result. 40% patients are classified as type III, 87.50% have excellent result and 12.50% have good result. 57.5% patients are classified as type VII, 60.86% have excellent result and 26.08% have good result and 13.04% have fair result. This shows that volar plate fixation is more consistent with maintaining articular congruity.

Radial inclination, radial length and palmer tilt were evaluated radiologically by Sarmiento's modification of Lind Storm criteria .In study >90 % of patients have excellent or good results for maintaining radial inclination which was necessary for load transmission across radio carpal joint. Loss of radial inclination will increase load across the lunate and pain. If radial inclination is not maintained properly than there may be residual pain because of unequal load distribution across wrist joint.

In study 77.5% patients have excellent or good results for maintaining radial length. Shortening results from extensive comminution and impaction of fractured fragments into the metaphysis. Shortening of radius is more disabling than an angulatory deformity of the distal radius .Radial shortening following distal radial fracture may lead to acquired positive ulnar variance, ulnar impaction syndrome, and instability.Patients will often have significant loss of pronation and supination.
In study 95% patients have excellent or good results for maintaining palmer tilt. Dorsal tilt decreases moment arm of finger extensors, making wrist less efficient.With dorsal tilt deformity, there will be significant transfer of load onto ulna. Normally 82% of compressive load across the wrist is borne by radio-carpal joint and 18% is borne through the ulnocarpaljoint.With 45-deg dorsal angulation deformity,65% of axial load acrosscarpus is directed onto ulna; remaining loads on radius will be concentrated on dorsal aspect of scaphoid fossa.Whenradial shortening occurs with dorsal tilt, there may be dysfunction of the distal R-U joint, manifested by limited rotation of forearm & impingement of ulna on radius. In study 03 patients have deformity in form of residual dorsal tilt and two patients have prominent ulnar styloid with limitation of range of motion.

Functional results are evaluated according to Gartland and Werley score and Patient Rated Wrist Evaluation Score. In study total 92.50 % patients have Excellent or Good results.

At final follow-up overall patients have good range of motions ,grip strength and low pain scores with early return to activities of daily life with volar plate fixation. Anatomical and functional results are good to excellent in >90 % of patients. Complications such as extensor tendon or flexor tendon rupture or dorsal collapse after fixation, reflex sympathetic dystrophy, impingement of tendons or median nerve injury did not seen in any of case in study.

Table 1] Functional Result According to Gartland and werley score and Patient Rated Wrist Evaluation Score:-

Gartland and werley score	PRWE score [Patient Rated Wrist Evaluation Score]	Result	No. of Patients [%]
0-02	0-25	Excellent	29 [72.50]
03-08	26-50	Good	08[20.00]
09-20	51-75	Fair	03[07.50]
>20	76-100	Poor	00

Conclusions:-

Present study suggests that stabilizing the fracture fragments with volar plate and screws in the management of the fractures of distal radius, is an effective method to maintain reduction and prevent collapse of the fracture fragments, even when the fracture is grossly comminuted/intra-articular/unstable and/or the bone is osteoporosed.

Articular congruity well maintained after open reduction and volar fixation of fracture distal end radius, which allows early mobilization and is necessary for preventing arthritis and near normal range of motion of joint at final follow up with good hand grip strength and minimal or no residual pain relative to other modalities of treatment. Locking implants provide added advantages in the treatment of distal radius fractures with metaphyseal comminuted fractures.

The technique emphasizes that open reduction and internal fixation with volar plating has excellent functional outcome with minimal complications proving that it is the excellent modality of treatment for distal radius fractures as compared with other procedures.

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