

SURGICAL TREATMENT OF MALUNITED COLLES' FRACTURE BY CORRECTIVE OSTEOTOMYGopinath K. M¹, Pramod Kumar M², Venkatdeep Mohan³¹Associate Professor, Department of Orthopaedics, Rajarajeswari Medical College & Hospital.²Assistant Professor, Department of Orthopaedics, Rajarajeswari Medical College & Hospital.³Senior Resident, Department of Orthopaedics, Rajarajeswari Medical College & Hospital.**ABSTRACT****BACKGROUND**

Malunion occurs more often after Colles fracture than any other and can result in considerable disability. Multiple techniques for corrective osteotomy have been developed in recent years with objective of restoring the normal anatomy of distal end of radius and also to evaluate the results with respect to pain, restoration of function of wrist and forearm.

MATERIALS AND METHODS

A prospective randomized controlled study was conducted in 20 cases of malunited Colles fracture who underwent Corrective osteotomy with a Dorsal Ellis T plate and bone graft. Post operatively all patients were immobilized on a Sugar-Tong splint and followed up at 4, 6 and 12 weeks.

RESULTS

All measurements of Pain, final range of motion and grip strength significantly improved compared with preoperative measurements. Based on Fernandez et al scoring system we obtained Excellent results in 8 cases, Good in 7 cases, Fair in 3 cases and Poor in 2 cases which was attributed to infection in 1 case and RSD in the other case. Radiologically a mean radial length of 6.14mm (N:10mm), Radial Angle of 21.25° (N:22°) and Volar angle of -3.4° (N: +4°) was achieved.

CONCLUSION

Corrective Osteotomy with Bone graft is a preferred and an Ideal procedure if performed after Proper selection of patients i.e in young adults and extra articular malunions with good range of movements.

KEYWORDS

Malunion, Fracture Radius, Osteotomy, Dorsal T plate. Bone graft, Fernandez.

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INTRODUCTION: Fractures of distal end radius are extremely common in elderly age groups and in adults. In a large majority of cases they are well treated non-operatively perhaps no fracture in the body is as ubiquitous and fraught with potential complications as are the distal radial fractures. Distal radial fractures frequently result in malunions, both from an insufficient reduction and from instability of the reduction which even if good immediately after the treatment may deteriorate afterwards (Castaing 1964).¹

It was Abraham Colles in 1814, a Dublin Surgeon who made the first correct diagnosis of fracture of distal end of radius. He stated the "the limb will at some remote period again enjoy perfect freedom in all its motions and will be completely exempt from pain".² If this statement was true so many studies on malunited Colles would not have been

performed and even we would not have been able to pursue this study. Malunion of distal radius can be caused by numerous factors and ultimately results in a weak, stiff and painful joint. Several biomechanical studies have demonstrated that abnormal wrist contact pressure with extra articular deformity can predispose to arthritis.³ The approaches to malunions of distal radius may be viewed as a hierarchy of surgical options with increasing complexity and potential surgical morbidity. Choice of an appropriate surgical approach requires consideration of the patients' activity level, as well as the anatomic distortion that is present. Osteotomy of distal radius with or without a concomitant distal ulna procedure most nearly recreates the pre-injury situation anatomically and increasingly widespread application. It continues to be a challenging procedure from a technical standpoint. Fernandez recommended corrective osteotomy.^{4,5} The object of present study is to assess the role of corrective osteotomy in malunited Colles fracture and compare the result with the cases which underwent corrective osteotomy procedures in malunited Colles fracture and also to assess the complication, pitfalls and improvement of the wrist function.

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OBJECTIVES OF THE STUDY:

1. To restore the normal anatomy of distal end of radius.
2. To evaluate results with respect to pain, restoration of function of wrist and forearm.

NEED FOR THE STUDY: Malunion occurs more often after colles fracture³ than after any other and can result in considerable disability. Common misconceptions about distal radius fractures result in under treatment of many fractures particularly in active population. Malunited Colles fracture typically arises from a fall on an outstretched hand resulting in loss of radial inclination, dorsal angulation and radial shortening. Radial shortening causes a positive ulnar variance which causes problems with distal ulna such as, ulnar impaction and disruption of DRUJ. Pain originating from distal radio-ulnar joint may be secondary to arthritis, trauma or degenerative changes in the TFCC. The goals of radial osteotomy are to restore function and improve the appearance of wrist by correcting the deformity at level of old fracture site. The osteotomy should accomplish the reorientation of joint surface to guarantee normal load distribution, re-establish the mechanical balance of midcarpal joint and restore the anatomical relationships of the distal radio-ulnar joint. Because radial shortening is a constant feature of these fractures an opening wedge osteotomy is recommended which permits radial lengthening of 10-12mm and corrects volar tilt in sagittal plane, ulnar tilt in frontal plane and rotational deformity in horizontal plane (Diego L Fernandez).⁴ The bone defect created is replaced with a cortico cancellous bone graft. Henceforth, a careful pre-operative planning with the use of K-wires to mark the angle of deformity guarantees an accurate angular correction and simplifies the procedure.

MATERIALS AND METHODS: A prospective study was conducted in 20 cases of malunited Colles fracture presenting to RRMCH OPD. All cases were selected at random in OPD block.

A detailed history was elicited regarding the mode of injury, duration of presentation and mode of initial treatment

The cases selected on the basis of inclusion criteria were then subjected to a thorough general physical examination and local examination of the affected wrist. Later roentgenograms- postero-anterior, lateral and oblique views of both affected and normal wrists were obtained for comparison. The patients were subjected to preoperative physiotherapy as mentioned earlier. A thorough preoperative evaluation for systemic illness, in the form of routine haematological, urine examination, chest x-ray. ECG, blood sugar levels, blood urea and serum creatinine levels were checked. Medical fitness of the patients for the proposed procedure and anaesthesia was taken. Planning for surgical procedure and technique including proper implant selection, surgical approach and other details of the procedure was made.

All the cases were posted to operation theatre with either general or regional anaesthesia i.e., Brachial block

under tourniquet the proposed surgical procedure performed.

We have performed Fernandez procedure in 14cases and Campbell's procedure in 6 cases.

Campbell's procedure was performed in patients presenting with pain in DRUJ i.e. arthritis, radial shortening exceeding 10mm where even after corrective osteotomy, radial length could not be achieved and in old age, where a subsequent procedure for hardware removal would not be needed.



Fig. 1: Osteotomy Site Opened with K-Wires & Plugged with Bone Graft



Fig. 2: Osteotomy Fixed with Ellis T- Plate

Postoperatively all patients were mobilized on a Sugar-Tong splint upto suture removal. The average duration of hospitalization was 10days. Immediate check x-rays were taken. After suture removal, patients were discharged immobilized on a B/E POP cast for 6weeks.

After 6 weeks B/E POP cast removed, check radiographs were obtained and after confirming radiological union of osteotomy site, physiotherapy was instituted. Serial follow ups were done at 4, 6 and 12 weeks and check x-rays taken accordingly.

The cases were evaluated for any late complications for period of 6months to 24months and final results were evaluated based on Fernandez point score system (1988)⁴ and Sarmiento (1980).⁶

	Extension Mean (SD)	Flexion Mean (SD)	Supination Mean (SD)	Pronation Mean (SD)	Volar Tilt (SD)	Radial Tilt (SD)	Radial Length (SD)
Preoperative	45 ⁰ (16.11 ⁰)	35.1 ⁰ (15.13 ⁰)	63 ⁰ (20.86 ⁰)	50.6 ⁰ (16.33 ⁰)	-24.5 ⁰ (7.67 ⁰)	15.9 ⁰ (5.42 ⁰)	+1mm (4.97 ⁰)
Post-operative	64.45 ⁰ (10.77 ⁰)	58.85 ⁰ (15.42 ⁰)	74.85 ⁰ (13.85 ⁰)	71.35 ⁰ (12.33 ⁰)	-3.45 ⁰ (6.72 ⁰)	21.25 ⁰ (2.48 ⁰)	+6.14mm (4.25 ⁰)

Table 1: Range of Motion Radiographic Evaluation

RESULTS: In the present series results were evaluated clinically by Fernandez et al point score system and radiologically by Sarmiento's as with others in their series.

Fernandez has analyzed with respect to pain, flexion-extension arc, rotation of forearm and grip strength. He has allocated 4 points for each. The radiological criteria for evaluation consisted of

- 1. Radial Length:** average radial length in affected wrist was +6.14mm while in normal wrist was +10mm.
- 2. Radial Angle:** average radial angle in affected wrist was 21.25⁰ while in normal wrist it was 22⁰.
- 3. Volar/Dorsal Angle:** average volar angle in affected wrist was -3.4⁰ while in normal wrist it was +4⁰. The healed wrist values are compared with normal wrist. The idea of evaluating radiologically in present series is to know whether anatomy of distal radius is restored as the objective of this study was to achieve restoration of normal anatomy of distal radius.

The results in our series are being compared with other series published by Fernandez (1982),⁷ Ekenstam et al (1985)⁸ and Watson et al (1988).⁹

	Excellent	Good	Fair	Poor	No. of Cases
Fernandez et al ⁷	5	5	1	1	12
Ekenstam et al ⁸	17	19	2	1	39
Watson et al ⁹	8	3	3	1	15
Present series	8	7	3	2	20

Table 2

In majority of cases (75%) we had excellent results to good results because all fracture malunions were extra articular. The poor result in one case was due to improper patient selection that had reflex sympathetic dystrophy, retraction and fibrosis of capsular and ligamentous structures of both radio carpal and radio-ulnar joint. In another patient even though good correction was obtained preoperatively, later patient was totally non cooperative and non-compliant for physiotherapy and developed stiffness of wrist and decreased range of motion.

Radiologically we analyzed the result according to Sarmiento's criteria and we had 3 Excellent 8 Good, 7 Fair and 2 poor results.

We have obtained clinically a good range of movement though a residual dorsal tilt of 3.4⁰ persisted in the present study.

DISCUSSION: Many studies have demonstrated that corrective osteotomy which restores anatomical configuration can effect an improvement in wrist function, forearm rotation, grip strength and pain.¹⁰ Usually an opening wedge osteotomy using dorsal plates and bone grafting has been performed for malunited Colles' fractures.⁷ The only disadvantage with use of dorsal plate is painful hardware and tendon rupture/irritation.^{11,12,13,14} Moreover, a dorsal approach is easier than a volar approach and the reduction of dorsal cortex is much simpler and advantage of direct vision. The present study showed that a corrective osteotomy using a dorsal T plate with bone grafting could effectively produce a significant improvement in wrist function in patients treated for extra articular distal radius malunion. In anatomical results, a mean radial length of 6.14mm (normal 10mm), radial angle of 21.25⁰ (normal 22⁰) and volar angle of -3.4⁰ (normal +4⁰) was achieved which signifies that near normal anatomy could be restored in majority of our cases. No significant complications were encountered except for infection (1case), attrition tendinitis (2 cases) and sympathetic dystrophy (1case). According to Fernandez et al point score system,⁴ our clinical results were excellent (8), good (7), fair (3) and poor (2). In majority of cases (75%), results were excellent to good because they were extra articular malunions. We therefore conclude that in malunited Colles' fracture, corrective osteotomy with bone graft is the preferred and easily performed procedure with predictably good results. Improvement of pain, range of motion, deformity and grip strength are regularly obtained. Corrective osteotomy is an ideal procedure, if performed after proper selection of patients i.e. in young adults and extra articular malunions with good range of movement.



Fig. 3 & 4: Cosmetic Deformity: Pre-Operative & Post-Operative



Fig. 5: Preoperative Dorsiflexion



Fig. 6: Postoperative Dorsiflexion (Improved)



Fig. 7: Radiographs: Preoperative & Postoperative

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