

# MANAGEMENT OF NON-UNION ULNA IN CHILDREN IN DIFFERENT CLINICAL SCENARIO'S - A SHORT CASE SERIES

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## Abstract

**Background :** Non-union of ulna in children is uncommon, which is usually associated with neglected monteggia fractures, osteomyelitis, open injuries or significant bone or soft tissue loss.

**Objective :** Unusual or difficult management in non-union ulna

**Methodology :** Three paediatric cases of inadequately treated monteggia, post septic sequele which leads onto non-union and multi directional instability of elbow & forearm presenting at Orthopaedics department, Institute of Child Health, Egmore were selected for this study.

**Results :** In all 3 cases our study demonstrates management of non-union in ulna due to different etiology. In one case of fracture non-union ulna with implant insitu and radial head dislocation, we have managed this case in 2 stages because of difficult closure during fixation of ulna. In Stage 1 we have done ulna fixation and in stage 2 plating Shortening of radius Recreating the ulnar angulation with corrective osteotomy ,temporary Radio capitellar k wire .In other two cases of non-union ulna with elbow instability, radial head dislocation we have done single bone forearm to give elbow stability. Functional outcome was assessed and found satisfactory. Safe and salvageable procedure is Single bone forearm in forearm with significant bone loss.

**Conclusion :** We have achieved union of ulna and stable elbow and forearm .In single bone forearm surgery when reconstruction not possible, the disadvantage of restricted supination and pronation movements which can be compensated by shoulder movements. This procedure warrants good range of motion with normal daily activities.

**Keywords :** Post-septic sequele, non-union, osteotomy, instability.

## INTRODUCTION

Forearm fractures are common in children. Most of these fractures can be treated non-surgically with excellent functional outcomes as fracture healing in children is usually uncomplicated with an excellent remodeling potential. There are several factors that may have lead onto the nonunion in our patients.single bone forearm is the option for the children who presented with inadequately treated monteggia, radial head dislocation and with non-union ulna proximal 1/3rd lead onto non-union and multi directional instability of elbow & forearm which may necessitate the need for single bone forearm or other staged procedures. Providing stability to the forearm and minimizing the pain are goals of single bone forearm surgery which offers a stable bony bridge between the wrist and the elbow. We presented three cases of non-union ulna & elbow instability here, The purpose of this study was to report on the management option of single bone forearm in fracture non-union ulna with monteggia variant and in cases with elbow instability in different scenarios when reconstruction not possible.

## METHODOLOGY

Three paediatric cases of non-union presenting at Orthopaedics department, Institute of Child Health, Egmore, Chennai were selected for this study.all patients were followed up to a period of 2 years. The indications for the operation, procedure done, age at that time, and the length of follow up are given in Table 1.

S.no	Presentation	Age during surgery	Procedure done	Follow-up period
1	Fracture non-union ulna with implant insitu and radial head dislocation	8 years	Stage 1 -ulna fixation, stage 2-plating with Shortening of radius Recreating the ulnar angulation with corrective osteotomy temporary Radio capitellar k wire.	24 months
2	Neglected Monteggia fracture	8 years	Single bone forearm	18 months
3	post septic sequele of right ulna with non-union	9 years	Single bone forearm	18 months



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**CASE ILLUSTRATION**

**CASE 1:**

8 years old child presented with fracture non-union ulna with implant insitu and radial head dislocation. On examination there was a Cubitus varus deformity, elbow movements Flexion-0-70°, supination-60°, pronation -30°. We have managed this case in 2 stages because of difficult closure during fixation of ulna.

**PRE OP**



Figure 1: A & B X ray left Elbow at the time of presentation showing fracture non-union ulna with radial head dislocation.



Figure 2: A) Cubitus Varus deformity B) Flexion 0-70° C) Supination 60° D) Pronation 30°

**POST OP**



Figure 3 : Implant exit and Compression plating of ulna done



Figure 4 : 6 Months Post OP X Ray



Figure 5 : Shortening of radius with recreating the ulnar angulation with corrective osteotomy & Radio capitellar k wire fixation done in stage 2



Figure 6 : 8 months follow up X Ray

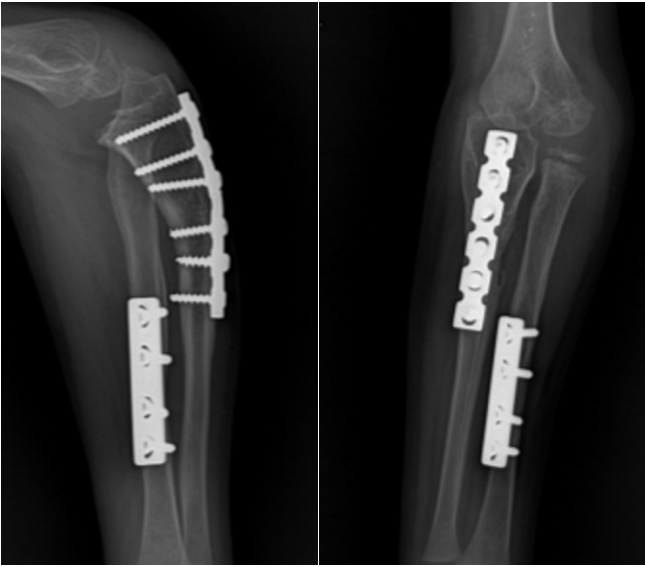


Figure 6 : 12months follow up X Ray



Figure 7 : 2 Year follow-up shows A) No deformity  
B) Flexion 0-140° C) Supination 85° D) Pronation 70°

In this case scenario, we operated in 2 stages and following issues are solved non-union, radial head dislocation, previous implant and instability. We proceeded with implant exit and compression plating for ulna in first stage. Shortening of radius with Recreating the ulnar angulation with corrective osteotomy & Radio capitellar k wire fixation done in stage 2 and patient followed up for 2 years shows improved range of movements with stable elbow.

**CASE 2:**

8 years old female child presented with deformity & difficulty in doing daily activities .On examination, ROM – flexion 20-80°, supination-70° & pronation-50°, radial head dislocation, shortening, instability .we have done single bone forearm in this case.



Figure 8 : Neglected monteggia fracture right side

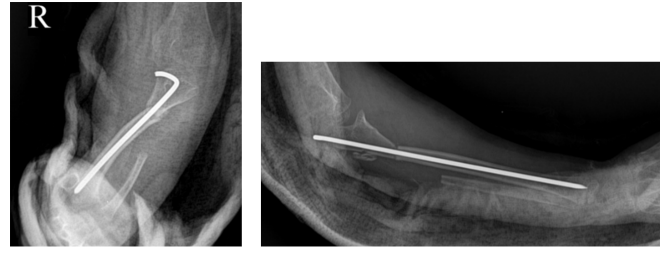


Figure 9 : Proceeded with single bone forearm

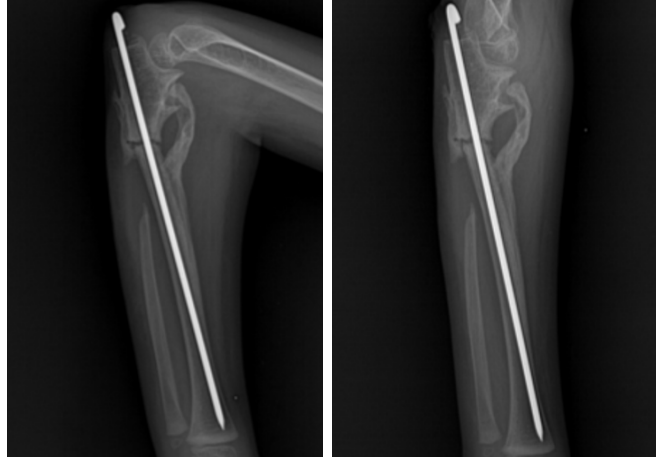


Figure 10 : 3 Months follow up X Ray

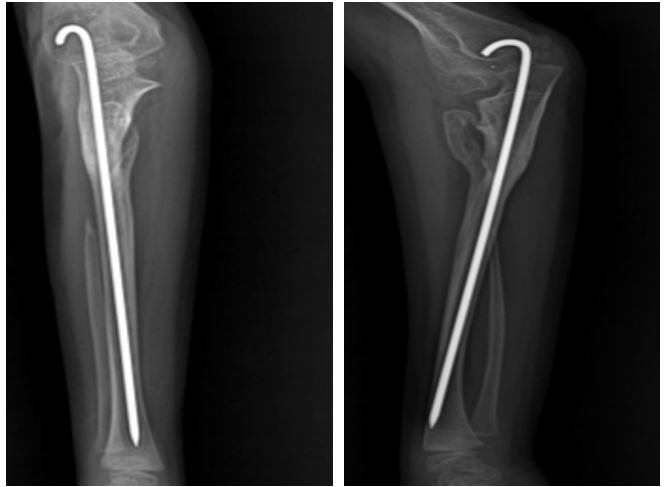


Figure 11 : 6 Months follow up X Ray



Figure 12 : 9 Months follow up X Ray



Figure 12 : Clinical photographs of single bone forearm patient shows stable elbow for activities of day to day life and satisfactory elbow movements (18 months follow up)

The one-bone forearm is a salvage option that restores the upper limb function. It finds its interest when radio-carpal and humero-ulnar joints are intact. Proximal ulna is fixed with remaining part of radius with one intramedullary rush nails cortico-cancellous bone graft incorporated into it, after excision of proximal radius. Union was suspected clinically and radiologically at 9 months follow up. As a result, there was no pain at elbow and forearm. Range of Movements of elbow improved with Flexion of 10-130 degrees, supination fixed in 20 degrees. The girl can do her day to day activities without any limitation.

**CASE 3 :**

9 years old child a case of post septic sequele of right ulna Presented with complaints of deformity & difficulty in doing daily activities. On examination Multidirectional instability in elbow, Deformity, Shortening, Radial head dislocation, ROM-Flexion-0- 90 o, Restricted supination & pronation. We have done single bone forearm for give elbow stability.

**PRE OP :**

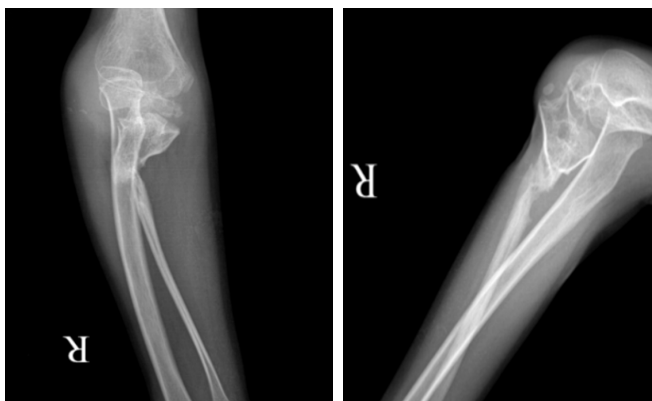


Figure 13 : Radiographs showing post septic sequele of ulna.

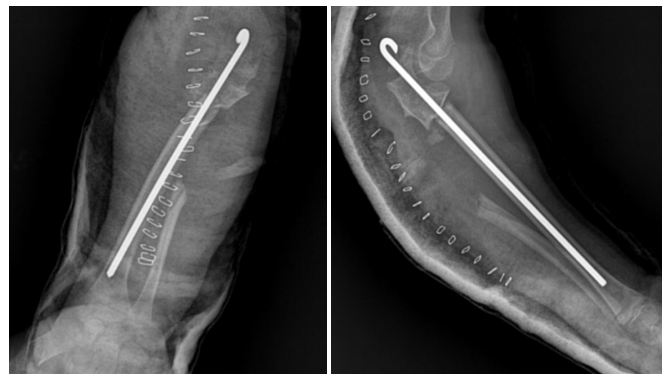


Figure 14 : Immediate post-operative radiographs showing single bone forearm fixed with rush nail



Figure 15 : 6 Months follow up X Ray



Figure 16 : 10 Months post op X Ray



Figure 17 : 12 Months post op X Ray



Figure 18 : Clinical images of the patient after single bone forearm procedure with satisfactory range of movement with stable elbow

## RESULTS

In the first case scenario, we operated in 2 stages and proceeded with implant exit and compression plating for ulna in first stage. Shortening of radius with Recreating the ulnar angulation with corrective osteotomy & Radio capitellar k wire fixation done in stage 2 and patient followed up for 2 years shows improved satisfactory range of movements with stable elbow. In other two case scenarios where reconstruction is not possible we proceeded to eliminate forearm instability by creation of a radio ulnar synostosis, or "1-bone forearm." Shoulder movements compensate for loss of forearm rotations with improved grip strength, shoulder

Figure 6 : 12months follow up X Ray

and wrist movements. The requirement for radio-ulnar transposition is intact radio-carpal and humero-ulnar joints.

## DISCUSSION

Elbow and wrist is connected by forearm and helps in pronation and supination which is associated with human embryology in brain growth and differentiation of prehensile thumb. Activities of daily living (ADL) depends on these vital movements, so the normal anatomy should be restored as close as possible. Proximally, through radio-humeral and radio ulnar joints and distally through distal radio-ulnar and radio-carpal joints radius and ulna are complexly joined, that provide ideal biomechanics for wrist and elbow movements including pronation and supination at the forearm. Due to relative growth discrepancy and deficiency of radius or ulna segment causes deformity particularly in children. Dislocation of radio-capitellar joint with Varus deformity is due to partial absence of ulna. Partial absence of radius causes dislocation of distal radio-ulnar joint and manus valgus deformity. Inadequately treated Monteggia fractures lead onto non-union and multi directional instability of elbow & forearm which may necessitate the need for single bone forearm or other staged procedures. Various factors including age of onset, cause, preliminary treatment plays a major role in extent of deformities. The operation of radio-ulnar transposition was given by Hey Grooves in 1921. Greenwood (1932), Watson Jones (1934), Vitale (1952) 1,2 reviewed some cases showing improved functional and cosmetic outcomes and need not worry on the growth discrepancy after continuity is established with axial growth producing adequate functional and cosmetic results.<sup>3</sup>

## CONCLUSION

In this study, three patients of non-union ulna were studied. Among them two patients were suffering from neglected Monteggia fracture and one was having chronic osteomyelitis. one case reconstruction done using compression plating and Shortening of radius with recreating the ulnar angulation with corrective osteotomy & Radio capitellar k wire fixation. In other two cases single bone forearm reconstruction was done. The stability of forearm and range of movements are adequate and without visible deformity in all three different case scenarios. In conclusion, elbow & forearm instability is an extremely complex problem that must be recognized and addressed acutely to optimize good results.

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