

ISSN 2395-1354(Print)
e-ISSN 2395-1362(Online)

Indian Journal of Orthopaedics Surgery

IJOS

MANAGEMENT OF BONE DEFECT IN FOREARM BY CREATING ONE BONE FOREARM - A CASE REPORT

Ramesh Krishna K¹, Aradhana T R^{2,*}, Sreekantha K S³, Preetham N⁴

¹Professor, ²Senior Resident, ³Junior Resident, Dept. of Orthopaedics, Victoria Hospital,
Bangalore Medical College & Research Institute, Bangalore.

***Corresponding Author:**

E-mail: aradhana.tr@gmail.com

Abstract: 35 year old, housewife presented with non-union right forearm following crush injury right forearm thirteen months back. Extensor tendons were lost, fixed deformities were present at wrist and x-ray showed non-union with gap of radius more than ulna and wrist arthritis. Radialization of ulna was done creating one bone forearm with bone graft. Three months follow-up showed fracture union in progress, with good cosmetic appearance and some function of the right upper limb. One bone forearm procedure can be considered to treat post traumatic bone loss in forearm when other treatment fails.

Key words: Nonunion, One Bone forearm

35 year old, housewife resident of Nepal presented with deformity of right forearm since eleven months. She had restriction of forearm and wrist movements and loss of hand function. According to her previous medical records there was history of crush injury right forearm thirteen months back which was treated elsewhere with debridement and stabilization with external fixator. Plastic surgery intervention had been done for the post traumatic raw area with flap cover. Removal of fixator was done after two months. On examination (Figures 1e-1d) there was Flap surgery scar of ten centimeters in length occupying two third circumference of right forearm with deformity and abnormal mobility at mid and distal one third junction right forearm. There was loss of continuity in radius and ulna from distal half-length to distal one third junction. Fixed deformities were, wrist fixed

in neutral, fingers fixed in 10°, 20° and 10° at distal interphalangeal joint, proximal interphalangeal joint and metacarpophalangeal joints respectively. Elbow flexion terminally restricted by 20°. There were no wrist movements. 20° free flexion at distal interphalangeal joint and proximal interphalangeal joint and 10° free flexion at metacarpophalangeal joint. On neurological examination sensations were intact but motor system could not be assessed because of extensor tendon loss, wrist fixed deformity and stiffness of fingers. There was three centimetres shortening of right forearm. X-ray (Figures 1e and 1f) showed non-union fracture both bones right forearm with gap of radius more than ulna with sclerosed tapering edges with rounded margins. There was osteopenia in distal fragments and carpal bones and arthritis of the wrist joint. Elbow joint was normal.



Fig 1a-1d: clinical picture of the patient s right forearm showing deformity and non-union. Fig 1e and 1f: x-ray showing non-union fracture both bones right forearm with sclerosed tapering edges, osteopenia in distal fragments and carpal bones arthritis of the wrist joint and normal elbow joint.

Plan of management for non-union of fracture of ulna with gap was freshening of fracture site, stabilisation with locking compression plate or intramedullary nail and cancellous bone grafting. For non-union fracture of radius with gap was freshening of fracture site and free or vascularized fibular graft if intra-operative gap is less than or more than six centimetres respectively and stabilisation with locking Ellis plate. Approach of radius was by Henry's approach and incision over subcutaneous border for ulna. Intra operative findings were distal fragment of ulna was small and osteoporotic (Figure 2a) and there was screw back out hence fixation was unstable and radius non-union gap was six centimetres (more than ulna which was one and half centimetres). So, we carried out radialization of ulna

creating one bone forearm. Proximal ulnar and distal radial fragment were freshened (ends were sclerotic and tapered) and stabilized with locking Ellis plate (Figure 2b and 2c). Transfixation of proximal radial and ulnar fragments was done to prevent impingement. Cancellous bone grafting was done. Post-operative there was flap necrosis over radial side managed conservatively and wound gaping of radial and ulnar incision after suture removal on fourteenth post-op day, managed by secondary suturing after two weeks. Three months follow-up showed fracture union in progress (Figure 2d and 2e), with good cosmetic appearance (Figure 2f) and some function of the right upper limb (Figure 2g and 2h). We have lost the patients follow-up.



Figure 2a: Distal fragment of ulna was small and osteoporotic.

Figure 2b and 2c: Post-operative X-rays. Figure 2d and 2e: Three months follow-up x rays. Figure 2f, 2g and 2e: clinical photos.

Review of literature: Sir Hey Groves first performed one-bone forearm in 1921¹. It is performed for bone loss due to trauma^{2,3,4}, chronic osteomyelitis^{5,6,7,8}, tumor of radius³, radial club hand⁹ but suitable for instability^{10,11}, excess or segmental bone loss¹² and bone loss of radius (>6cm)⁸. Elbow and wrist movements are spared^{4,5,6,7,9}, forearm is stable^{2,6}, cosmetically good⁵, with normal alignment^{5,6,9}, but rotations are sacrificed^{6,7,8,10,11}, wrist is stable^{5,8}, hand functions are normal^{7,8} and growth is not affected in children^{6,9}. Union rates were good^{5,8}, with less pain^{4,5}, good patient satisfaction⁴, less complications² and

excellent results⁴ in some studies and significant complications in some³. Complications are nonunion, impingement, pain, shortening. Poor results can be due to infection, previous trauma, severe nerve injury and multiple surgery³. This procedure is considered as salvage procedure as last resort when other treatment fails.

Conclusion

One bone forearm procedure can be considered to treat post traumatic bone loss in forearm when other treatment fails.

References:

1. Hey Groves EW. On modern methods of treating fractures. 2nd ed. Bristol: John Wright and Sons Ltd, 1921: 320.
2. Maurice E. Castle. One-Bone Forearm. J Bone Joint Surg Am. 1974; 56(6):1223-1227.
3. Peterson CA, Maki S, Wood MB. Clinical results of the one-bone forearm. J Hand Surg Am. 1995; 20(4):609-18.
4. Sidney M J, Abdo B, Eliseo VD, Randall WC, et al. Complications Following One-Bone Forearm Surgery for Posttraumatic Forearm and Distal Radioulnar Joint Instability. The Journal of Hand Surgery 2013; 38(5): 976-982.
5. Izhar UH. The production of a one-bone forearm as a salvage procedure after haematogenous osteomyelitis - A case report. J Bone and Joint Surg [Br] 1982; 64(4):454-5
6. Kitano K, Tada K. One-Bone Forearm Procedure for Partial Defect of the Ulna. J Pediatric Orthop 1985; 5(3): 261-387.
7. Arai K, Toh S, Yasumura M, Okamoto Y, et al. One-bone forearm formation using vascularized fibula graft for massive bone defect of the forearm with infection: case report. J Reconstr Microsurg. 2001; 17(3):151-5.
8. Jitendra NP, Rajeeb B. Monoaxial distraction of ulna to second metacarpal followed by single bone forearm in massive post infective radial bone loss. Indian Journal of Orthopaedics 2012; 46(6):685-9.
9. Radovan M, Goran T, Marko K, Cedimir V, et al. Forearm Reconstruction after Loss of Radius:Case Report., Srp Arh Celok Lek. 2013; 141(1-2):100-103.
10. Murray RA. The one-bone forearm. A Reconstructive Procedure. J Bone Joint Surg Am, 1955; 37(2):366-370.
11. Jesse BJ, Diego LF, Scott L, Robert WW. Reconstruction of Posttraumatic Disorders of the Forearm. J Bone Joint Surg Am. 2009; 91:2730-2739.
12. Lee SJ, Jazrawi LM, Ong BC, Raskin KB. Long-term follow-up of the one-bone forearm procedure. American Journal of Orthopedics 2000; 29(12):969-972.