



SINGLE BONE FOREARM RECONSTRUCTION – A SALVAGE SURGERY IN OSTEOMYELITIS OF FOREARM

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INTRODUCTION

The forearm is unique in its anatomy, with the radius and ulna and associated articulations including the humeroulnar joint, the proximal and distal radioulnar joints, the radiocarpal joint, and the interosseous membrane. The relative length of both the radius and ulna is important for proper functioning of the forearm.^[1,2]

The joints are further stabilised by intervening capsule, ligaments, muscles and tendons. The interosseous space between the relatively straight ulna and curved radius is bridged by the interosseous membrane which is of vital importance to forearm rotations and often referred to as a modified joint. The interosseous membrane has both intervening oblique and transverse fibres and is thin distally and thick proximally.

The radius and ulna are rare sites for haematogenous osteomyelitis in children. The infection usually involves the metaphysis and can destroy the whole bone. In infants, the forearm involvement may be a manifestation of a multifocal infection. The acute infection presents with fever, pain, swelling, pseudoparalysis and occasionally, a compartment syndrome.^[3]

The aim of this case report is to evaluate the result of single bone forearm reconstruction in post osteomyelitis unstable forearm.

CASE REPORT

We took a patient 14 year old girl who came at opd of orthopedics department in Kalpana chawala Govt. Medical college with chief complaint of non functional right upper limb, with instability at elbow joint. She had history of infective osteomyelitis of ulna right side, for last 5 years with no active discharge at present. On examination it appeared to be healed osteomyelitis with bone loss and unstable elbow joint, radial head was dislocated and proximally migrated. Patient had range of motion 40° flexion, with no supination or pronation. Muscles around the elbow (triceps, biceps) were wasted. No active discharge was present. There was no neurovascular impairment. Radiological examination of patient was carried out and xray suggested that radial head was dislocated and proximally migrated in arm, most of ulna

was not present, only distal 1/3rd of ulna was present. Patient wanted stable joint and functional range of motion. Blood investigations including white cell count, erythrocyte sedimentation rate and C-reactive protein confirmed the absence of active infection. Taking into account the child's extensive radial loss and the available surgical expertise in our centre, the patient was offered single-bone forearm salvage procedure.

Technique

The patient was operated under general anaesthesia, in a supine position, with the forearm on a radiolucent table. An incision was made over anterior aspect and Henry approach was carried out. Radius was approached, traction was applied and osteotomy site was marked on the radius, radius was osteotomised and proximal radius was removed along with head. Remaining distal part of radius was channeled through interosseous space and taken to ulnar side, proximal end margins were freshened and punctuate bleeding was observed. The proximal ulna and radius were fixed with intra medullary square nail passed from tip of olecranon. Bone grafting was done at fracture site. Distal ulna was left in situ. Following wound closure, a above elbow pop slab was applied. Sutures were removed 15 days post operatively and wound was healed. The square nail was removed on the 12th post-operative week.

4 months post operatively xray suggested bony union, and physiotherapy was started. At 6 months post operative period patient had 70° flexion, full extension and fixed in mid prone position with no supination and pronation.

DISCUSSION

Single-bone forearm was first described by Hey Groves for traumatic radius diaphyseal bone loss in an adult.^[4] The single-bone forearm is based on the fundamental

principle of the “ulna makes the elbow and radius makes the wrist”. To ensure favourable outcome, a normal hand with intact wrist and elbow joints is required pre-operatively.^[5]

The final position of radioulnar fusion should be determined on a case-by-case basis, taking into consideration age, dexterity, occupation, hobbies and patient’s preference. Most authors recommended a position halfway between pronation and supination or in slight pronation.^[5] Unfortunately, single-bone forearm will sacrifice forearm rotation. Therefore, single-bone forearm should only be reserved when bone loss is too extensive for other reconstructive techniques.^[5] We decided to perform single-bone forearm in this patient with square nail using proximal ulna and distal radius and sacrificing the proximal radius with radial head which migrated proximally in arm. We preferred to keep the forearm in mid prone position.

Single-bone forearm is a salvage procedure for cases where the usual reconstruction techniques are not feasible. To date, there is no consensus on the standard indication for this technique and the ideal method for achieving single-bone forearm. Selection of method must be made on an individual basis, depending on the available surgical expertise, amount and area of bone loss, soft tissue condition, patient’s age, compliance, daily activities and personal expectations.

In resource-limited centres, square nail or Kirschner wires can be utilised to achieve single-bone forearm. This method is simple, requires minimal technology and practical for patients with compliance issues. It also negates the need to sacrifice another healthy site for harvesting bone graft, thus avoiding donor site morbidity.



Figure 1: Immediate post operative Antero posterior and lateral radiograph.



Figure 2: Xray image of 2 month follow up.



Figure 3a and b – 4 month post operative xray image showing bony union.



Figure 5 a,b Image of patient showing range of motion extension and flexion.

CONCLUSION

Single – bone forearm reconstruction is a salvage procedure for cases where usual reconstruction techniques are not feasible. Here proximal ulna makes elbow joint and radius makes wrist joint.

Conflict of Interest

The authors declare no conflicts of interest.

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