OUT COME OF PLATING, BONE GRAFTING AND SHORTENING OF NON-UNION HUMERAL DIAPHYSEAL FRACTURE

Mohammad Shoaib Khan, Ahmed Sohail Sahibzada, Mohammad Ayaz Khan,

Shahid Sultan, Mohammed Younas, Alam Zeb Khan

Department of Orthopaedics, Ayub Medical College & Hospital Abbottabad

Background: Humeral diaphyseal fracture usually heals with closed methods but when non union develops then it needs surgical intervention in the form of plating and bone grafting, intramedulary nailing (open or closed simple or interlocking nails) and external fixators (circular or one plane fixator). In our unit we treated non union humeral diaphyseal fracture with plating and bone grafting and shortening of fracture ends up to 4 to 5cm when needed. **Methods:** This **s**tudy was conducted at Orthopaedic Department of Ayub Teaching Hospital Abbottabad from January 2002 till December 2003. We included 15 cases with atrophic non-union in 9(60%) and hypertrophic non-union in 6 (40%) patients. All atrophic non-union were treated with plating, bone shortening by transverse osteotomy and bone grafting, while hypertrophic non-union were treated with decortications of non-union ends and fixation with compression plates, with bone grafting in old age. Follow up measures were based on clinical (range of joints motion) and radiological (healing) findings. Follow up was done for upto 6 months. **Results:** Out of 15 patients the age range was 20-80 years, 12(80%) were male and 03(20%) female. Right humerus involved in 5(33.33%) while left humerus in 10(66.66%) patients. In 9(60%) patients with atrophic non union bone shortening by transverse cut osteotomy was done while in remaining patients with hypertrophic non-union plating was done in 2(13.33%) cases and plating with bone grafting in 4(26.66%) patients. Union was achieved in all patients after 16 to 20 weeks of surgery. In one patient (6.66%) of 75 years age with hypertrophic non-union implant was loosened after 03 months of surgery. At that time healing (Union) was evident on X-rays and humeral brace was applied for further 03 months. Two patients(13.33%) got neuropraxia of radial nerve which resolved with in 3 months time. 02 patients (13.33%) developed shoulder stiffness which resolved after exercise. **Conclusion:** In Non Union of Humerus shortening by transverse osteotomy & rigid fixation with plates give excellent results in selected cases.

Key words: non-union, shortening, plating in bone grafting.

INTRODUCTION

Humeral shaft fracture represents 2-7 % of all fractures[1] and mostly heal with close methods without surgical intervention.[2,3] In certain circum-stances this fracture fails to unite within expected period of time (4 -6 months after injury) and then it is called delayed union or non-union.

The causes for this delayed or non-union are initial injury severity, distraction of fracture fragments, soft tissue interposition and inadequate immobilization.[3] Other contributory factors of non-union are obesity, diabetes, poor nutrition, steroid intake, non steroidal anti inflammatory (NSAID), infection and treatment methods.[4]

According to criteria of Weber and Cech[5] non-union of bones is classified according to the viability of fragments ends into Hypertrophic (hyper vascular or viable) and Atrophic (avascular or inert) type, both types have further sub classification.

Non-union of humeral diaphyseal fracture has been reduced due to application of hanging cast by Calwell[6] and functional brace by Sarmiento and associates.[7] The incidence of non-union has dropped to 5% or less in non pathological fractures.[8,9] Humeral diaphyseal non-union has many treatment modalities that is inlay or onlay tibial grafts, circlage wires, Kuntscher nails[10], intramedulary devices[11,] compression plates[9, 12, 13] with or without bone graft[1], dual compression plates, electrical stimulation[13-15] and Ilizarove circular fixator have been used. Intramedulary nailing

(inter locking) has a great success rate of union but with incidence of rotated cuff injury and shoulder stiffness which are not happening with plating and bone grafting procedures in our study. This study was carried out to introduce bone shortening by transverse osteotomy, along with plating and bone grafting in selected non-union cases. Objective of the study was to determine the outcome of plating, bone shortening (by transverse osteotomy) and bone grafting in selected non-union of humeral diaphysis.

MATERIAL AND METHODS

This study was onducted at Ayub Teaching Hospital Abbottabad from January 2002 till December 2003. Inclusion criteria were selected Humeral non-unions in adults of both genders, while exclusion criteria were non-union treated with previous surgical intervention, Proximal and supracondylar humeral non union and infected non-union. Surgical approaches are Anteriolateral approach in mid shaft and Posterior approach in lower third.

During surgery fracture ends were cleaned, medullary canal was opened, fracture site reduced and fixed with compression plates in mid shaft non-union or reconstruction and 1/3rd tubular plates (double plating) in distal 3rd non union.

In case of selected cases bone ends were shortened (decortications) up to healthy bone and cancellous graft was added. Follow up was done as first visit after two weeks for stitches removal and wound check followed by monthly visit for 6 months. During follow up clinical (shoulder and elbow motion) and radiological (healing) assessment was done.

During follow up outcome measures followed were graded as excellent, good and poor on the basis of clinical (joint movements and extremity function , any infection or neurological deficit) and radiological (bone healing or any implant loosening) judgement. Excellent meant full shoulder and elbow movements with normal hand function, no infection and no pain and radiological healing within 12 weeks time. Good meant mild limitation of shoulder movement (upto 20 degrees) or radial nerve neuropraxia and radiological healing within 16 weeks. Poor outcome was shoulder stiffness (beyond 30 degree) or elbow stiffness (greater than 30 degree) which needed physiotherapy exercise and delayed healing after 16 weeks or implant failure or permanent neurological (radial nerve) deficit or infection.

RESULTS

Total number of patients was 15. Age varied between 30-80 years, with 12 (80%) males and 3 (20%) females. Site was mid shaft non-union 12 (80%) and Distal 3rd non-union in 3(20%) cases. Causes of initial injury are given in table-1. The gender distribution of these were Road Traffic Accident (RTA) in 8 patients (07 males, 1 female), Fire Arm Injury (FAI) in 02 Patients (both males) and due to falls in 5 patients (03 male, 02 females). Type of Non-Union was Atrophic non-union in 9 (60%) patients, out of whom 7 (77.77%) were male s& 2 (22.23%) females. While hypertrophic non-union was seen in 6 (40%) patients out of whom 5(83.33%) were males and 1 (16.67%) female. Union was achieved in all patients (100%) with in 16 to 20 weeks. After two months two patients were lost to follow up although radiological union was achieved, one more was lost after 3 months.

In the Shoulder movement lack of abduction 20/35 degrees and lack of external rotation 15/20 degrees was observed in two patients. In Elbow movement two patients with distal 3rd injuries had limitation of full extension up to 15 to 20 degree but full flexion and no functional compromise.

One patient (6.66%) of age 75 with atrophic non-union had implant loosening at 3 months. Radiological union however was achieved with supportive brace at 6 months. Two patients (13.33%) got neuropraxia of radial nerve which resolved within 3 months time. The outcome of our study is shown in table-2 and a set of figures for two treated patients.

Table-1: Causes of Initial Injury

Cause	No. of Cases	%

RTA	8	53.33
FAI	2	13.33
FALLS	5	33.33
Total	15	100

Table-2: Outcome

Outcome	No. of Cases	Percentage
Excellent	6	40.00
Good	7	46.66
Poor	2	13.33
Total	15	100

Figure-1: Non union of left humerus in a 65 years old man

Figure-2: Bone shortening, grafting and fixation with plate of the same person (65 years old man)

Figure-3: Functional outcome in non union left humerus of the same person (65 years old man)

Figure-4: Bone shortening, grafting and fixation with double plates in distal non union humerus of a 25 years old male

Figure-5: Functional outcome in distal third non union humerus of the person in Figure 4

DISCUSSION

Plating and bone grafting in non-union of humerus is well known treatment modality and bone grafting at non-union site of long bones is still popular treatment option to get union[16]. It is a fact that success rate of union decreases with number of failed operations[17] so therefore one should adopt the treatment modality with great care. In a study by Wu & shih[11], 35 humeral shaft non-union treated with plates and screws (19 patients) and antigrade interlocking nails (16 patients) resulted in 89.5 % union in 4.5 months and 87.5 % union in 4.4 months respectively. In our study union was achieved in all patients (100% union rate) with in 3 to 6 months compatible with a study[13] by Rosen which has 97 % union rate.

In our study we achieved good union in all selected non-union by transverse osteotomy at non-union ends similar to another study by Barquet[12], on 25 patients treated with decortications at non-union ends and internal fixation with broad DCP and bone grafting in 24 patients and bone cement in 1 patient resulted in union in 24 patients with in 6 months period is compatible to our study.

Although in our study there was a little bit shortening of the extremity but with good functional result i.e. joint movements and hand grip.

CONCLUSION

In Non Union of Humerus shortening by transverse osteotomy and rigid fixation with plates give excellent results in selected cases.

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Address for Correspondence:

Dr. Mohammad Shoaib Khan, Orthopaedics Department, Ayub Medical College and Teaching Hospital, Abbottabad, Pakistan. Tel:0992-381907-14 Ext (3265, 3266), Mobile: 0300-9590730.

Email: drmohammadshoaib@yahoo.com