

HUMERAL SHAFT FRACTURE NON-UNION WITH A BONE GAP: A CASE REPORT

Diamond T.E, Echem R.C., Eyimina P.D

Department of Orthopaedic Surgery, University Of Port Harcourt Teaching Hospital, Port Harcourt.

CORRESPONDENCE:

E-mail:teddymond@gmail.com

ABSTRACT:

BACKGROUND:

Fractures of the humeral shaft constitute 1-3% of all fractures. Non-union rates for open humeral fractures after optimal treatment range from 5-15% .Bone gaps commonly occur when high energy weapons are involved in the primary injury, when previous treatment was complicated by bone infections and when bone necrosis follows significant periosteal stripping from previous intervention.

AIM;

We report the management of humeral fracture non-union with a bone gap in a young adult.

CASE SUMMARY:

Mr. A.O, a 23 year old trader presented to us with deformity and abnormal motion across the right arm. He had gunshot injury to the right arm 6 months earlier during an inter-communal clash. Initial treatment was in a private hospital in his community and involved daily wound dressing, antibiotic prophylaxis and pain relief. He subsequently left the hospital 3weeks later (when wound healed) to a traditional bone setter's place.

At presentation to our clinic, he had features of a non-united right humeral shaft fracture with no radial nerve palsy. Plain radiograph showed a non-united fracture of the humeral shaft with a bone gap. There was no evidence of bone infection. He subsequently had open reduction and internal fixation using a narrow dynamic compression plate and screws. A core of 4cm cortico-cancellous bone graft was used to fill the gap. Radiographs by six weeks post-operative review showed good evidence of graft vascularity and bridging callus across fracture site.

CONCLUSION:

Cortico-cancellous bone grafts can be effectively used in the treatment of humeral shaft non-union with bone gap.

Keyword: *humerus, nonunion, bone gap, internal fixation.*

INTRODUCTION

Fractures of the humeral shaft constitute 3-5% of all fractures¹. Non- union rates for humeral shaft fractures regardless of previous treatment range from 5-15%². Bone gaps commonly occur when high energy weapons are involved in the primary injury, when previous treatment was complicated by bone infection and when bone necrosis follows significant periosteal stripping from previous intervention^{3,4}. Eliminating bone and soft tissue infections (if present), restoring healthy soft tissue around the fracture site, obtaining good bone alignment and restoring optimal limb function with

minimal risk of neuro-vascular injuries could pose serious management challenges.

AIM:

We report the management of humeral fracture non-union with a bone gap in a young adult.

CASE SUMMARY:

Mr. S.S, a 23 year old trader presented to us with deformity and abnormal motion across the right arm. He had gunshot injury to the right arm 6 months earlier during an inter-communal clash. Initial treatment was in a private hospital in his

community and involved daily wound dressing, antibiotic prophylaxis and pain relief. He subsequently left the hospital 3 weeks later (when wound healed) to a traditional bone setter's place where he had a traditional fracture-site splintage with periodic release for massage.

At presentation to our clinic, he had features of a non-united right humeral shaft fracture with no radial nerve palsy and no clinical evidence of infection. Plain radiograph showed a non-united fracture of the humeral shaft with a bone gap. There was no evidence of bone infection. He subsequently had open reduction and internal fixation using a narrow dynamic compression plate and screws through the anterior-lateral approach. Fracture site was thoroughly debrided until healthy

bleeding bone edges were obtained. Medullary canals on both ends were re-established and fracture reduced in proper alignment. Fixation with three bicortical purchases on either side of the fracture was obtained. A core of 4cm cortico-cancellous bone graft harvested from the iliac crest was used to fill the gap.

Radial nerve function in the immediate post-operative period was optimal and his wound healed primarily by the second post-operative visit. Radiographs by six weeks post-operative review showed good evidence of graft vascularity and bridging callus across the fracture site. Subsequent radiographs showed progressive evidence of fracture union. Limb function has also remained optimal.



Figure 1: Pre operative radiograph showing humeral fracture with bone gap



Figure 2: Pre operative clinical photograph showing deformity



Figure 3: immediate post operative radiograph lateral view showing implant with bone gap obliterated

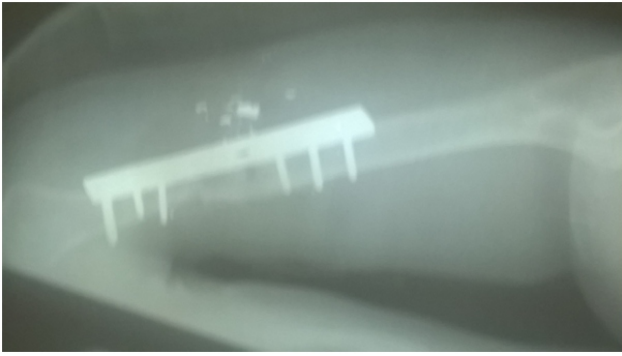


Figure 4: 6 weeks post operative radiograph.

Lateral view

DISCUSSION

Traditionally, closed humeral diaphyseal fractures in adults can be effectively treated by non-operative methods. Open fractures constitute less than 10% of humeral shaft fractures and are commonly associated with high-energy trauma, more severe soft tissue injury, comminuted fracture patterns, and higher incidence of wound and bone infection⁵. Previous visit to traditional bone setters, as is commonly seen in sub-Saharan Africa, poses further challenge to the management of these injuries and limits treatment outcome.

Bone shortening with fracture non-union could create significant functional limitations in the ipsilateral upper limb and raise cosmetic concerns. Ring et al⁶ and Otsuka et al⁷ reported 96% (n=24/25) and 100% (n=25/25) union rates respectively in the treatment of humeral shaft non-union by open reduction and internal fixation with iliac crest bone grafting. Key aspects of the surgical treatment as highlighted by the authors include, thorough debridement of the non-union site to ensure healthy bleeding fractured ends, re-establishment of the medullary canal, adequate deformity correction, stable fixation with compression and bone grafting. These formed the core aspects of treatment for our patient.

Other authors^{8,9} have reported good outcome with the use of demineralised bone matrix and bone morphogenetic proteins (BMP-7 and BMP-2) with respect to bone union but these products are not

commonly available in our region and considerably increase the cost of surgery.

Jupiter¹⁰ also reported good outcome with the use of vascularised fibular graft for patients with bone loss of greater 5-6 centimetre. Ring fixators are more commonly used for lower limb fracture non-unions.

CONCLUSION:

Cortico-cancellous bone grafts from the iliac crest can be effectively used in the treatment of humeral shaft non-union with bone gap.

KEYWORDS: Humerus, non-union , bon- gap, internal fixation.

REFERENCES:

1. Schemitsch EH, Bhandari M. Fractures of the diaphyseal humerus. In: Browner BD, Jupiter JB, Levine AB, Trafton PG, eds. *Skeletal trauma, 3rd Ed. Toronto. WB Saunders;* 2001:1481-1511.
2. Cleveland KB. Delayed union and non-union of fractures. In: Canal ST, Beaty JH eds. *Campbell's operative orthopaedics, 11th Ed. Philadelphia. Elsevier;* 2007: 3529-3565.
3. Foster RJ, Dixon JL, Bach AW et al. Internal fixations of fractures and non-unions of the humeral shaft. *J bone Joint Surg Am* 1985; 67: 857-864.
4. Mast JW, Spiegel PG, Harvey JP et al. Fractures of the humeral shaft. *Clin Orthop Rel Res* 1975; 12: 254-262.
5. Mckee MD. Fractures of the shaft of the humerus. In: Bucholz RW, Heckman JD, Court-Brown CM, eds. *Rockwood and Green's fractures in adults. 6th Ed. Lippincott Williams and Wilkins;* 2006: 1125-1157.
6. Ring d, Jupiter JB, Quintero J, et al. Atrophic non-united diaphyseal fractures of the humerus with a bone defect. *J Bone Joint Surg Br* 2000; 82(6): 867-871.
7. Otsuka NY, Mckee MD, Liewn A, et al. The effect of comorbidity and duration of non-union on the outcome after surgical treatment for non-union of the humerus. *J*

- shoulder Elbow Surg* 1998; 7: 127-133.
8. Tiedeman JJ, Garvin KL, Kile TA, et al. The role of a composite demineralised bone matrix and bone marrow in the treatment of bone defects. *Orthopaedics*; 18: 1153-1158.
 9. Friedlaender GE, Perry CR, Cole JD, et al. Osteogenic protein 1 (Bone morphogenic protein 7) in the treatment of tibial non-unions. *J Bone Joint Surg* 2001; 83: 151-158.
 10. Jupiter JB. Complex non-union of the humeral diaphysis: Treatment with a medial approach, an anterior plate and a vascularised fibular graft. *J Bone Joint Surg Am* 1990; 72: 701-707.