

## Distal Humeral Diaphyseal Open Fracture in a Child with Bone Loss

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### ABSTRACT

Distal diaphyseal humerus fracture is less common than supracondylar humeral fracture and its open fracture is even less. This is a case report of open distal humeral diaphyseal fracture on the left arm with bone loss in 10 years old male who sustained the injury from fall, diagnosed as Grade III open unstable distal diaphyseal shaft fracture of left humerus with bone loss without neurovascular deficit. We performed Open Reduction /Internal Fixation (OR/IF) and free bone fragment was flipped and fixed to the bone fragments and maximum possible contact was made and fixed with an external fixator. Range of motion was advised as early as possible. At final follow up the result was excellent as per Flynn's criteria. OR/IF (Open Reduction /Internal Fixation) of this fracture with posterior approach and flipping the bone to get more contact seems good and safe procedure. Further, external fixation provides reasonable fixation in these cases.

**Keywords:** Distal humeral diaphyseal fracture, Open Reduction /Internal Fixation

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### INTRODUCTION

Distal humeral diaphyseal fracture has a lower incidence than supracondylar humerus fracture and few cases have been reported regarding this in English literature.<sup>1-4</sup> Additionally, open fracture with bone loss is reported even less than the distal humeral diaphyseal fracture. The anatomy of distal diaphyseal humerus, triangular shape, and thin periosteum, makes it difficult for closed reduction. Therefore, nonoperative treatment of this fracture is challenging and open reduction and internal fixation is the treatment of choice. In the present case report, we described the mid-term result of such fracture in 10-year male.

### Case presentation

This is a case report of a 10-year male from remote hills of the western part of Nepal, who sustained a fall from a tree and landed on the hard ground. He fell from a height of approximately 10 feet while trying to pick fruits from the tree. He sustained an open injury on the left humerus and a piece of bone was left at the site of injury and came to our OPD being referred from the local hospital after 4 days of trauma with dressing and bandage. He had pain and bleeding from the site of the wound, approximately, three centimeters, with a visible bone fragment kinking the skin at the site of the wound and two smaller wounds. There were no neurological and vascular deficit at the time of presentation. A plain radiograph revealed

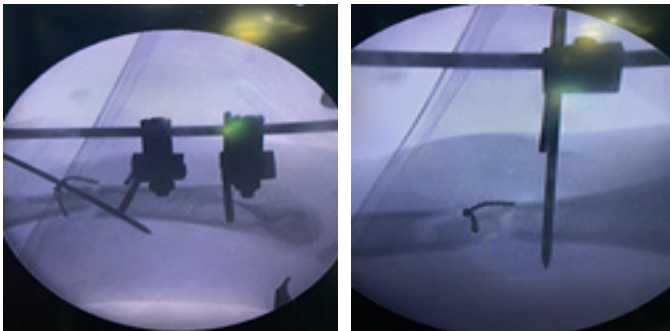
that it was a comminuted fracture with a free bone fragment on the posterior aspect of the shaft of the humerus. Figure 1. It needed urgent surgical treatment as it was a grade III open fracture with bone loss. Informed consent was taken from the patient's parent for surgery and publication of the case.



**Figure 1: Grade III open fracture of distal diaphysis of the humerus with loss of bone**

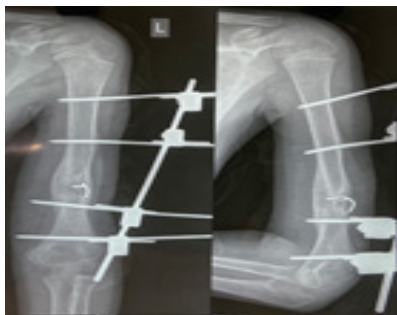
Under general anesthesia, the wound was debrided and washed with five liters of normal saline. Posterior midline incision, approximately 10 centimeters, was given on the posterior aspect of arm with wound at the middle of incision. Fascia and muscles were silted in midline to reach the bone. Free bone piece kinking the skin was removed. Periosteum

were elevated from both sides of bone fragments and bones were exposed proximally and distally. Proximal, distal and free bone piece in the middle were aligned together however, the posterior two-third of the free bone piece of around 4 cm was found to be missing and bone contact was less than 50%. Thus, the free bone fragment was flipped 180 degrees and attached to the proximal fragment with k wire and then fixed with 18-gauge stainless steel wire. Proximal and distal fragments were aligned and fixed provisionally with K-wire. After this, external fixation was added to stabilize the humerus on the lateral aspect of the humerus. (Figure 2) Incised wound was closed with ethilone and open wounds were left in situ without a closure for the drainage. Dressing was done every alternate day till the patient was not discharged.



**Figure 2:** *intraoperative picture of fracture with SS- wires fixing free bone fragment to the proximal bone and provisional fixation and external fixation in situ*

The patient was discharged on the fifth postoperative day on oral antibiotics (cefuroxime) and advised for regular follow-up. However, follow-up could not happen as expected due to COVID-19 lockdowns. Meeting with patient could only happen after 5 months (Figure 3). By that duration, the X-rays showed the features of the union. The functional range of motion was 10 degrees to 120 degrees. Pronation and supination was about 60 degrees each which was excellent according to Flynn's criteria.<sup>5</sup>



**Figure 3:** *Five-month follow-up of the case with evidence of union*



**Figure 4:** *Post removal of implants at five months*

## DISCUSSION

Distal humerus diaphysis is also known as metaphyseal diaphyseal junction, has thinner periosteum compared to the supracondylar humerus and is triangular in shape which makes that region unstable than supracondylar fracture as per Sanders et al.<sup>1</sup> This needs longer immobilization as diaphysis heal slower as compared to metaphysis. Closed reduction and internal fixation are possible which mostly results in cubitus varus deformity and is cosmetically unacceptable as pronounced remodeling does not occur as less than 20% humeral growth contributed to the distal end of the humerus. In this case, we were treating an open fracture in which there was a loss of bone.<sup>6-8</sup> Therefore, open reduction was done and stabilized with an external fixator after thorough debridement.

Distal humerus fracture tends to rotate because of pronation or supination of the forearm as the metaphysis gives origin to wrist extensors; the brachioradialis muscle, pronator teres muscle, and anconeus muscle.<sup>2</sup> Distal humerus fractures are unstable and difficult to reduce as well as difficult maintain anatomical alignment. Thus, the open reduction has been a choice.<sup>1,2</sup> Cross pinning is ideal to achieve rigid fixation but the diaphyseal fractures are proximal to supracondylar region which makes the pinning difficult. In this scenario, intramedullary K-wires are passed through the fracture site from lateral and medial condyles which provides relative stability.<sup>1,4,9,10</sup> Bone healing in children is relatively faster however this requires adequate stabilization with plaster or fixation device. The accurate reduction has an important role in this treatment.

The present case, being open fracture grade III, it needed thorough debridement and washing. Open reduction was the only mechanism to treat the case. Even with 4cm bone loss and lesser contact and unstable nature of the fracture fragments, flipping 180 degrees for the free fragment made maximum possible contact which was additionally stabilized with external fixation. Though the regular follow-ups were lost with the patient, the humerus united. The final outcome was acceptable as the functional range of motion was comparable as per Flynn's criteria.<sup>8</sup>

## CONCLUSION

Distal humerus fracture with bone loss can be treated open reduction and external fixation, though it is tough to maintain the reduction due to loss of bone and deformed bone

architecture.

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