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Treatment options for proximal humerus fractures: A prospective study

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Abstract

This prospective study was undertaken to assess type of treatment options for various proximal humerus fracture patterns and thereby select ideal time for rehabilitation. A specific type of fracture would need specific modality of treatment to get maximum benefit. Thirty six patients treated operatively and followed up. Average follow-up was 2.5 years. Patients were followed post-operatively at 2 weeks, 6 weeks, 10 weeks and then at 3-month intervals. Radiographs were assessed for fracture healing, changes in fracture alignment, and loose or broken hardware. The patients were functionally assessed with Neer's point system. No fracture showed X-ray evidence of fracture malalignment. Out of 14 cases treated with cannulated cancellous screw 77% had good to excellent results. All 14 cases of plating had good to excellent results. Half (50%) cases treated with K-wires had poor results. Young patients had excellent end results as compared to old. In patients with early mobilization (with in 2 weeks) post operative results were good to excellent.

Keywords: proximal humerus fractures, Treatment

Introduction

With increasing road traffic accidents and life expectancy fractures of proximal humerus have increased in frequency with female pre dominance in older age groups. Earlier conservative treatment was more commonly followed, as even great degree of malunion and restricted mobility doesn't produce much disability. Moreover because it occurs in osteoporotic and neglected older patients surgical management was avoided.

The proximal part of humerus is divided into 4 parts head, greater tuberosity, lesser tuberosity and proximal shaft. The epiphyseal scar (Codman) formed by fusion of 3 ossification centers (head-6 months, greater tuberosity-3 years and lesser tuberosity-5 years) is a weakened area susceptible to fractures by outside force. The most common mechanism of fracture is by fall on outstretched pronated upper extremity. Other mechanisms being direct blow over greater tuberosity, anterior or posterior dislocations of shoulder and avulsion fractures by external rotators. This prospective study was carried out to assess type of treatment options for various proximal humerus fractures patterns and select ideal time for rehabilitation programme for a specific type of fracture.

Materials and methods

The patients were included with fractures of proximal humerus according to Neer's classification. We had operated 36 patients with fractures of proximal humerus from July 2014 to December 2016. The average age of patients was 44.5 years with male female ratio of 3:1(27/9). Each patient was examined clinically and radiologically with three standard views as scapular AP view, scapular lateral views and trans-axillary views. We followed Neer's classification (1970) ^[1, 2] based on the anatomical relationship of 4 major anatomical segments i.e. articular surface, greater tuberosity, lesser tuberosity and the proximal shaft beginning at the level of the surgical neck (Fig.1). Patients were followed post-operatively at 2 weeks, 6 weeks, and 10 weeks and then at 3-month intervals with radiographs to assess fracture healing characteristics, changes in fracture alignment, and loose or broken hardware. The patients were functionally assessed with Neer's point system.

Surgical technique

While deciding on the methods of treatment parameters like fracture pattern, bone quality and associated injuries are considered. The patient was positioned in a beach chair position. The deltopectoral and deltoid splitting approach 12-15 cm long from anterolateral corner of acromion curving towards the coracoid and ending at deltoid insertion was used. Open reduction and internal fixation by K-wires, cancellous screws and plating was done. Closed reduction and fixation was performed by K-wires, interlocking nail and Rush nail.

Results

Most common mode of injury was road traffic accidents (61.1%) followed by domestic falls (36.1%) and assaults (2.8%) [Table-1].

Dominant right side was involved in 63.3% that further effect outcome in the form of insufficiency in performing daily activity works. Only one patient out of 36 had a distal neurovascular deficit i.e. Axillary nerve palsy, which compromised the end result. About 32% of patients were mobilized in less than 2 weeks time post-operatively while another 60% were mobilized in 2-3 weeks time. Most of the patients (82%) have some physiotherapy for a period of 4 to 8 weeks. During follow-up 10% patients complained slight pain at fracture site. About 60% had normal strength, while another 40 % had fair to good strength of limb. Thirty percent patients had less than normal routine use of their limb. The range of motion was fair to good in 72% patients. Type IIIA (surgical neck) fractures were common in almost all age groups while type IVB (surgical neck with fracture greater tuberosity) was more commonly in younger patients.

The type of fixation used were, K-wire fixation in 5 cases, plating in 14 cases (Fig 2-4), cannulated cancellous screws in 14 cases (Fig 5); Rush nail (Fig 6) interlocking nail (Fig 7) and prosthesis in one case each [Table-2].

In cases treated with cannulated cancellous screws 77% had good to excellent results. All cases (100 %) treated with plating had good to excellent results. Half (50%) cases treated with K-wire had poor results.

Table 1: Most common mode of injury was road traffic accidents (61.1%) followed by domestic falls (36.1%) and assaults (2.8%)

Mode of Injury	Number of Patients	Percentage
Road traffic accident	22	61.1
Domestic falls	13	36.1
Assaults	1	2.8
Total	36	100

Table 2: Mode of fixation

Type of Fixation	Number of cases	Percentage
Cannulated cancellous screws	14	38.9
Percutaneous K-wire	5	13.8
Plating	14	38.9
Hemiarthroplasty	1	2.8
Rush/ Interlocking nail	2	5.6
Total	36	100

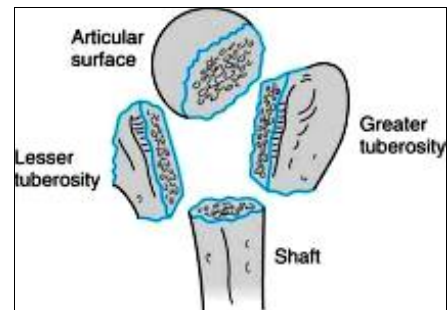


Fig 1: Four segments of the proximal humerus (Codman)

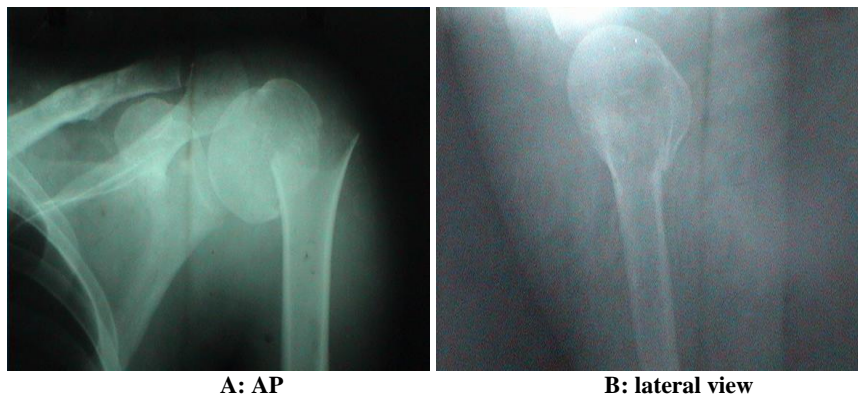


Fig 2: Preoperative radiograph of 2-part surgical neck proximal humerus fracture.

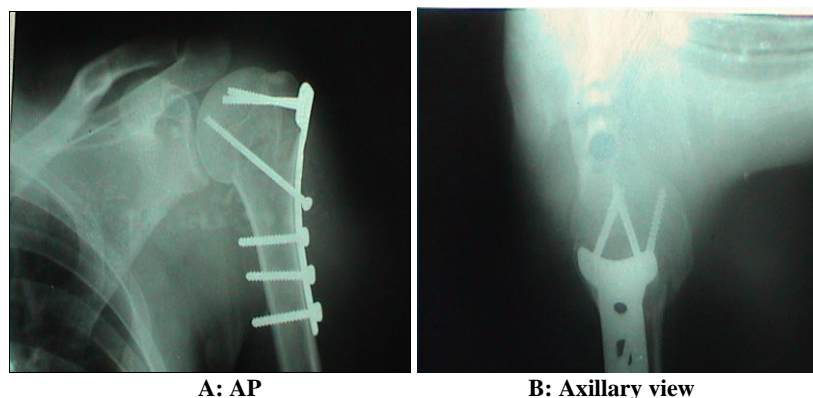


Fig 3: Postoperative radiograph- Fixation with a 4.5 reconstruction plate



A: 2 part proximal humerus fracture



B: Fixation with PHILOS

Fig 4: Preoperative and postoperative view of proximal humerus fracture



A: Comminuted Fracture Dislocation

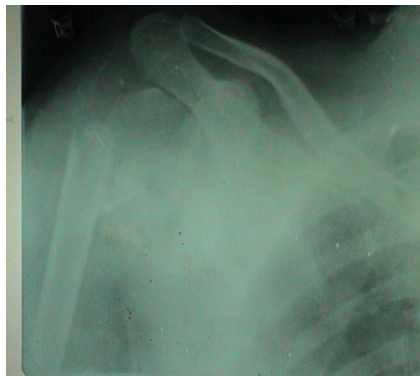


B: Postoperative radiograph



C: Follow-up-2 months

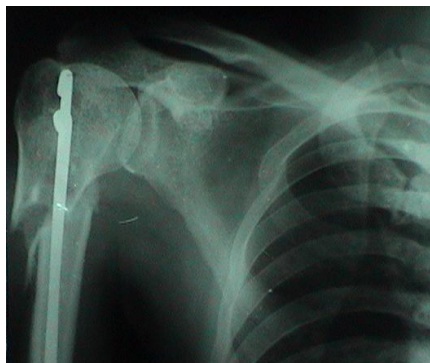
Fig 5: Preoperative and postoperative view of comminuted fracture dislocation of shoulder



A & B: 2 part fracture



B



C: Fixation with Rush Nail



D: Follow-up

Fig 6: Preoperative and postoperative radiograph of 2-part fracture

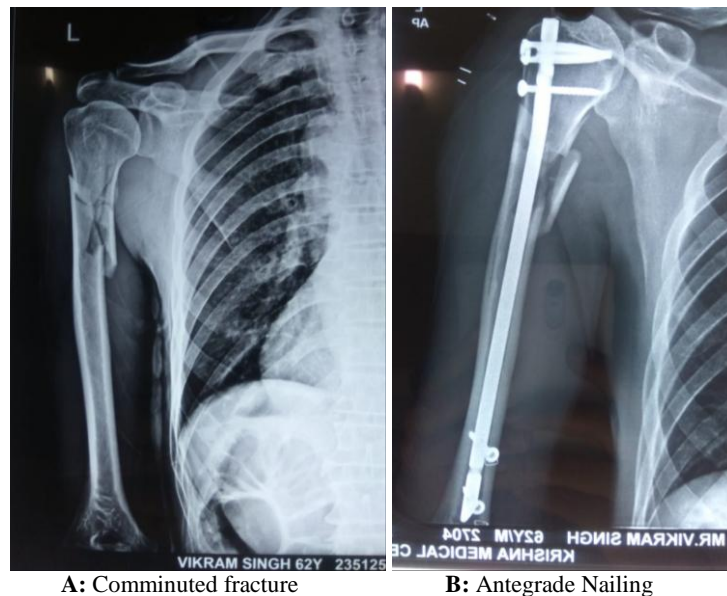


Fig 7: Preoperative and postoperative radiograph of proximal humerus fracture

Discussion

The rotator cuff and shoulder girdle muscles due to their inherent pull create balanced forces on proximal humerus which get disrupted when one or several parts of proximal humerus get fractured. Surgery is performed to preserve articular surface congruency, alignment and vascularity of the humeral head. The basic principle is to achieve an anatomical reduction and restore the medial calcar support [3, 4]. Displaced 3-part proximal humeral fractures quite satisfactorily treated with ORIF and K-wiring in young patients, elderly or infirm with poor bone quality or extensive comminution [5, 6, 7, 8]. Percutaneous fixation is a method of indirect reduction and minimal stable fixation most commonly used to treat 2-part fractures, isolated greater tuberosity fractures or surgical neck fractures [9-11]. Early plating provides advantage of anatomical reconstruction of fracture fragments but the disadvantage of extensive soft tissue dissection and lack of proper holding in osteoporotic bone [12]. The proximal humerus internal locking system (PHILOS) is a better option to deal with the problem of screw loosening and secondary screw displacement. It acts as an internal splint and has superior anchorage, particularly in osteoporotic bone, as compared to conventional plates. Implants providing angular stability have lower risk of screw loosening than conventional plates [13]. Angular stable implants provides proper alignment of injured bone, rigid fixation allowing functional postoperative care, and relatively unaffected natural bone healing [14, 15]. The studies show that there is no difference in the functional outcomes between nailing and plating of 4-part proximal humerus fractures [16]. Cannulated cancellous screws combined with k-wires or Nail is a good implant, as it provides sufficient hold in both young and old patients, with minimal soft tissue dissection, can allow early mobilization of the limb. Depending on the type of treatment, potential complications include shoulder stiffness, necrosis of the humeral head, pain, infection, loss of reposition, and "cutting through of the implant." No matter which type of internal fixation is used, complex proximal humerus fracture fixation is associated with a high complication rate [17]. Whatever fixation method is used, the functional result largely depends upon the quality of the reduction of tuberosity, varus correction and stabilization of the calcar area. Fixations with proximal humerus internal locking system (PHILOS) or with cannulated cancellous

screws give better results than K-wire alone. The advantage of angular stable implants is that it facilitates anatomical reduction with minimal approach and provides stability and early joint motion. Two 7.0mm cannulated cancellous fractures screws vertically aligned along the shaft and into the head fix two parts most often. Till date there have been very few randomized controlled trials (RCTs) of proximal humeral fractures in spite of it being one of the common types of fracture. Non-displaced or mildly displaced fractures can be treated conservatively. In younger population, the aim should be anatomical reduction and the osteosynthetic stabilization of displaced fractures. In elderly patients, primary treatment with prosthesis may also be reasonable, depending on the severity of injury. Young patients with early mobilization (within 2 weeks) had excellent end results. For early mobilization, stability of the fracture should be good i.e. with either plating or cannulated cancellous screws. Surgical treatment of proximal humeral fractures has quadrupled from the 1980s till recent times [18]. Although there are several surgical options currently popular, but no surgical technique has proven to be superior to other.

Declaration

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Conflict of interest: None declared

Ethical approval: Not required

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