

# Percutaneous Fixation of The Fracture of Surgical Neck of Humerus with Rush Pins: A Simple & Safe Technique

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## Abstract

### Objectives

Fracture of surgical neck of humerus is a common injury seen in the orthopedic practice. Operative fixation is indicated when it is unstable. Multiple 'K' wire fixation is commonly done in this situation. It is a technically demanding procedure and can injure vital structures around the shoulder joint. We are doing an intramedullary fixation of these fractures with Rush pins passed under fluoroscopic control. We are presenting our experience in treating 25 cases with this technique.

### Methods

This study was done in department of orthopedics, Manipal Teaching Hospital, Pokhara, between October 2004 and March 2007. 25 cases [mean age 58 yrs] of fracture of neck of humerus were closely reduced & percutaneously fixed with 2 Rush pins and the inclusion criteria were instability at fracture site with displacement or comminution. After achieving a closed reduction, a stab incision was made over greater tuberosity, lateral to acromion. 2 Rush pins were passed in antegrade manner from the tip of greater tuberosity into the medullary canal of distal fragment under image intensifier. The physiotherapy was started in the first post operative week.

### Results

By 6 weeks, the fracture was united. Patients were able to do at least 60° abduction at shoulder. At 12 weeks all the patients were doing more than 90° abduction with good functional outcome. We have not come across any major complication in mean follow up period of 15 months with this technique.

### Conclusion

Percutaneous fixation of fracture of surgical neck of humerus with Rush pins is a simple and safe procedure with good functional outcome.

## INTRODUCTION

Fracture surgical neck of humerus is usually stable & is mostly treated non-operatively by giving rest and support. With the increase of high velocity trauma, many of these fractures nowadays are presenting as unstable ones. The instability at the fracture site may be due to displacement or comminution. Reduction and operative fixation is indicated in this situation<sup>1,2,3</sup>.

The common method of fixation is to use multiple K wires or Schanz pins, which are passed from lateral, anterior and superior aspect of proximal humerus<sup>1,2,3</sup>. Other methods of fixations like open reduction and T buttress plate fixation (advocated by AO group)<sup>4</sup> and Enders intramedullary

fixation are not very popular. However, all these methods have their lists of complications. We have been doing a Rush pin intramedullary fixation of these fractures in the department of Orthopaedics, MTH & we are presenting our experience of the same.

## MATERIAL AND METHODS

A prospective, non controlled study of Rush pin fixation of fracture of surgical neck of humerus was conducted in the department of Orthopedics, Manipal Teaching Hospital, Pokhara, between October 2004 and March 2007. There were 25 patients of ages ranging from 20 to 72 years (15 males and 10 females). The most common mode of injury was either a fall from a height with an outstretched hand or a

fall on the shoulder.

All the fractures were assessed to be unstable either due to displacement or comminution (10 cases of Neer 2 part type and 15 cases of Neer part 1 with comminution at fracture site)[ Fig.1].

**Figure 1**

Figure 1: Preoperative AP view of a unstable fracture of surgical neck of humerus with comminution.



**PROCEDURE**

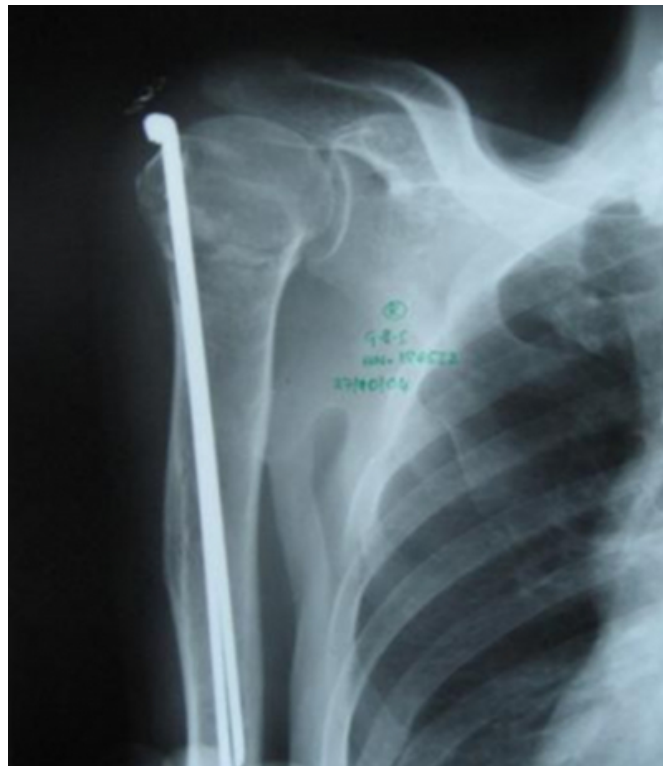
All the patients were operated in supine position with shoulder at the edge of the table. A small pad was placed in the interscapular region. The head end of the table was elevated by 15°. Fluoroscopy was done to check the image quality.

Closed reduction of the fracture was achieved. A small stab incision was made over greater tuberosity, lateral to acromion and the deltoid muscle was split in the direction of its fibres with the help of artery forceps. The sulcus between the articular surface of humeral head and greater tuberosity was located and Rush pin was passed under fluoroscopic control. It was advanced into the medullary canal of distal

fragment & checked fluoroscopically in two planes. The second Rush pin was also passed parallel to the first one in the similar fashion.[fig2 &3]

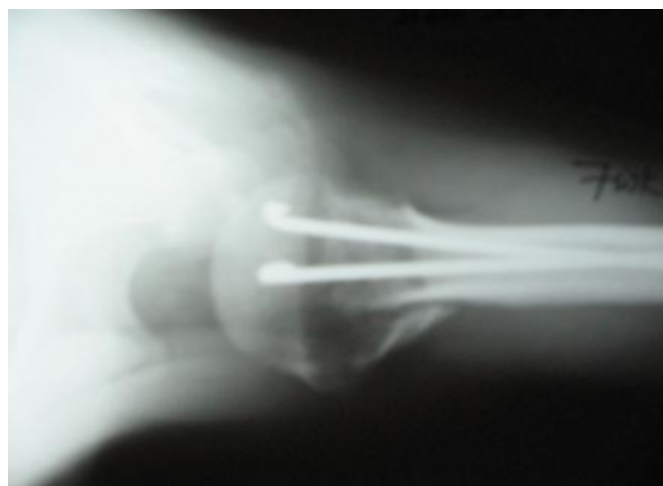
**Figure 2**

Figure 2: Postoperative A-P view



**Figure 3**

Figure 3: Postoperative Axillary view



We have also passed a Rush pin below the tip of the greater tuberosity from the lateral aspect. In these patients, the Rush pin was pre-bent for the ease of passing it into the medullary canal.[Fig.4]

**Figure 4**

Figure 4: Postoperative AP view with prebent Rush pin passed through greater tuberosity.



The hook of the Rush pin was pegged to the cortical surface of greater tuberosity. Full abduction of the shoulder was done intraoperatively to rule out subacromial impingement. Wound was stapled and the arm was immobilized in a sling.

**AFTER TREATMENT**

Physiotherapy was started in the first week as soon as pain subsided. It was in the form of pendulum movements towards abduction. If the greater tuberosity was too osteoporosed or comminuted, adduction and rotations were initially avoided.

**RESULTS**

At 6 weeks

- All patients were able to do the activities of daily living.
- At least 60° abduction was achieved.
- Clinical and radiological evidence of union of

fracture was present.

Rush pins were removed at this time.

All the patients were having pain-free abduction beyond 90° by 12 weeks & were doing ADL with ease.

Functional outcome was considered excellent [15 cases] when the function of both shoulders was comparable and good [10 cases] when the fractured shoulder had regained at least 75 % of the function of the healthy side. The follow up period ranged from 6 to 36 months [mean 20 months].

**COMPLICATIONS**

We have not come across any major complications related to the surgical procedure. In 1 patient, there was backing out of 1 Rush pin. It was thought to be due to comminution at the entry site.

**DISCUSSION**

Majority of proximal femoral fracture has no or minimal displacement [Neer part 1]. It is usually seen in elderly person following a low velocity trauma, like falling from standing height. They do well with a conservative treatment like giving support in the form of cuff and collar sling or humeral brace. But with the increase of high velocity trauma, the incidence of a displaced & comminuted proximal humeral fracture has also increased. It may be unstable & may require an operative fixation<sup>1,2,3</sup>. The AO/ASIF advocates an ORIF with a T plate. The AO Manual of Internal Fixation<sup>4</sup> says “stable fixation allowing functional after treatment can only be achieved with a three or four hole T plate.” This may be a more stable construct but it has not been popular because it requires an extensive soft tissue dissection. It has problems like shoulder joint ankylosis, osteonecrosis and injury to muscles & tendons.

Hence, what have gained more popularity amongst orthopedic surgeon are multiple K wire or terminally threaded Schanz pin fixation<sup>5,6,7,8</sup>. Multiple K wires are passed from lateral, anterior and superior aspect of proximal Humerus. But it also has its list of problems. Besides being a technically demanding procedure<sup>5,6</sup> it requires a close monitoring of patients for a period of 4 weeks since secondary displacement & failure of fixation can occur in this period<sup>8</sup>. The surgeon has to be on guard for problems like pin tract infection, pin migration, loosening or bending. The wire end is kept usually outside the skin which causes pain during physiotherapy besides producing an

inconvenience in daily living. The cadaveric study done by Rowles et al, shows that the placement of K wires by the standard operative procedure has a potentiality to damage vital structures like long head of Biceps tendon, axillary nerve, posterior humeral circumflex artery and musculocutaneous nerve.

In our technique, the Rush pin is placed under the skin and inside the medullary canal hence there is no chance of pin tract infection or inconvenience in daily living. The hook of the rush pin is pegged into the cortex of greater tuberosity which reduces the chance of migration and injury to neurovascular structures. There is no possibility of impalement of muscle or tendon. We use two Rush pins to minimize the chance of rotation. Intraoperatively after the placement of Rush pins, the shoulder is abducted to full range to rule out subacromial impingement.

We choose the entry site which is the sulcus between greater tuberosity and articular surface. If an injury to rotator cuff is a matter of concern, the pins can be passed from the lateral surface of greater tuberosity just inferior to its tip. The Rush pins are prebent. This pre-bending helps the surgeon to pass the pin through the lateral cortex towards medullary canal as well as to achieve 3 point contact, which further enhances the stability of fracture fixation.

We have not encountered any major or minor complications in 25 cases operated so far. To the best of our knowledge there is only one publication of similar work. From the series of 700 cases of proximal humeral fractures, Weseley et al<sup>10</sup> published their experience of Rush pin fixation in 16 cases. There was 'minimal postoperative morbidity'. The results were comparable to other methods of treatment. The operations could be performed 'rapidly' and required 'only a short period of immobilization and hospitalization'.

This is yet another advantage of percutaneous fixation of these fractures. We start shoulder physiotherapy from first post operative week, which we believe leads to a better final outcome. In a series of 104 patients, Koval et al<sup>11</sup> concluded that percentage of good and excellent results was significantly greater ( $P < .01$ ) and external rotation was significantly better ( $P < .01$ ) for the patients who had started physiotherapy within two postoperative weeks than those who started later. This has been our observation that percutaneously fixed group of patients started physiotherapy much earlier than conservatively treated group of patients.

Physiotherapy is started in the first post operative week, as soon as the pain is tolerated. We allow pendulum exercises directed towards abductor side, so that there is no chance of implant cutout at greater tuberosity.

Patient's compliance was generally good since the Rush pin is placed intraosseously & the portal of entry is stitched.

It is a simple technique which does not require any specialized instrumentation; all that it needs is a fluoroscope.

## CONCLUSION

Percutaneous fixation of Rush pins in the operative management of fracture surgical neck of humerus is a simple and safe procedure, with no major complication and good functional outcome.

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