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# To study of functional outcome and complications of proximal humerus fracture dislocation managed with reduction internal fixation with various methods

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**Abstract**
**Background:** Fracture-dislocation of the humerus refers to the fracture of the proximal part of humerus associated with dislocation of the head from the humero-glenoid joint. It is occurs most commonly in elderly due direct low velocity trauma, while in younger age group, high-velocity trauma is needed.[1] Management of fracture dislocation of proximal humerus needs early reduction and fixation. In or prospective study we have observed the functional outcome and complications of management of displaced proximal humerus fragments with various methods.;
**Methods:** A two-year prospective study was conducted after getting ethical approval at tertiary care centre on cases admitted with proximal humerus fracture dislocation as per the inclusion criteria based on Neer's classification evaluation was done after investigations like xray CT scan and surgery was performed. Postoperative follow-up was done at 1st, 6$^{th}$ month and 1 year and outcome were evaluated for each case based on Neer's shoulder score of constant score.
**Results:** 30 cases were studied which were operated according to neers classification by various methods. Mean age was 42.6 years. Constant Shoulder score was good in maximum patients (46.67%) followed by excellent in 33.67%, three patients (10%) had fair score while it was poor in 2 patients (6.66%).
**Conclusions:** Proximal humerus fracture dislocation can be managed with various methods of treatment. Each method has its own advantage and disadvantages.

**Keywords:** Fracture dislocation proximal humerus, neers classification, constant score, functional outcome

## Introduction
Fracture-dislocation of the humerus refers to the fracture of the proximal part of humerus associated with dislocation of the head from the humero-glenoid joint. It is occurs most commonly in elderly due direct low velocity trauma, while in younger age group, high-velocity trauma is needed [1]. Three-fourth of the proximal humerus fracture occur in the elderly with osteoporosis with incidence three times more in women than in men.[2]. Most of the four-part fractures of the proximal humerus result from a fall on the outstretched arm in elderly people. In younger patients, the displacement is often more severe and these patients frequently have a fracture dislocation.[2] The head fragment is displaced far away from the shaft fragment. Majority cases 80% are aged between 30 to 60 years. Mean age 42.6 $\pm$ 12. 2 years and ranging between 21 to 60 years Management of fracture dislocation of proximal humerus needs early reduction and fixation. Time interval from trauma to surgery has direct relation to the prognosis and outcome. As time lapses, reduction becomes difficult, surgery time increases, more invasive procedure is needed and intra-operative blood loss increases. Devascularisation of the humeral head leads to a high risk of non-union or avascular necrosis [3]. There is no consensus on the best way to treat these injuries. Displaced humerus fragments fractures should be managed with appropriate mode of fixation. Various methods for fixation of proximal humerus fracture dislocation has been prescribed, some of which include:

1. Closed Reduction of dislocation closed internal fixation with percutaneous k wires for minimally displaced or neer 2-part fracture.
2. closed or open reduction of dislocation and internal fixation with cancellous screw fixation for displaced proximal humerus fragment
3. 3 open reductions of dislocation and internal fixation with proximal humerus locking plate (PHILOS) for displaced proximal humerus fracture fragments.

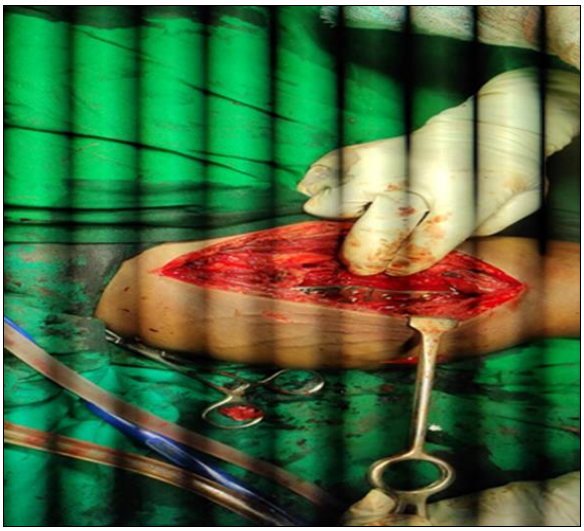
Each modality of treatment has its own advantages and disadvantages
All the operated cases have been evaluated by constant score [7] post operatively and functional outcome is compared

**Methods**
The present prospective study was conducted in the Department of Orthopaedics for a period of two years at tertiary care hospital. The study protocol was presented before the ethical committee and approved. The entire study was conducted as per the guidelines of the committee. The study participants were informed about the study details and informed written consent was obtained from them. The history of injury of the participants, general condition and any associated soft tissue injury were evaluated. The severity of the injury was assessed to assess local injury and axillary nerve was assessed by examining any anaesthetic patch over lateral aspect of the shoulder.

**Inclusion criteria**
All the cases with proximal humerus fractures above 18 years of age and consenting for the study were included. [Neer's classification: grade 2 to Grade 4].

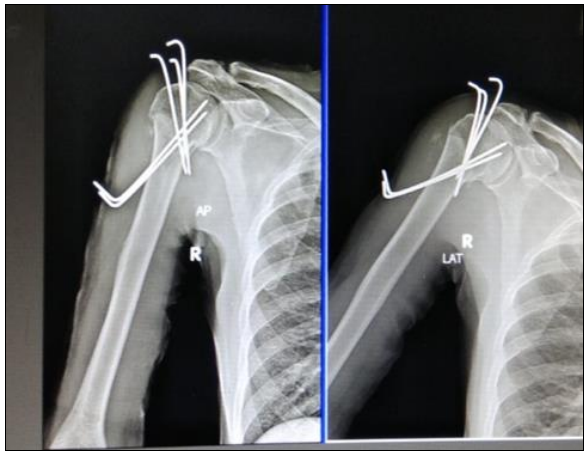
**Exclusion criteria**
Patients with Open fractures

**Procedure**



Intraoperative photo of reduction with PHILOS plate

Postoperative x-ray reduction with PHILOS plate



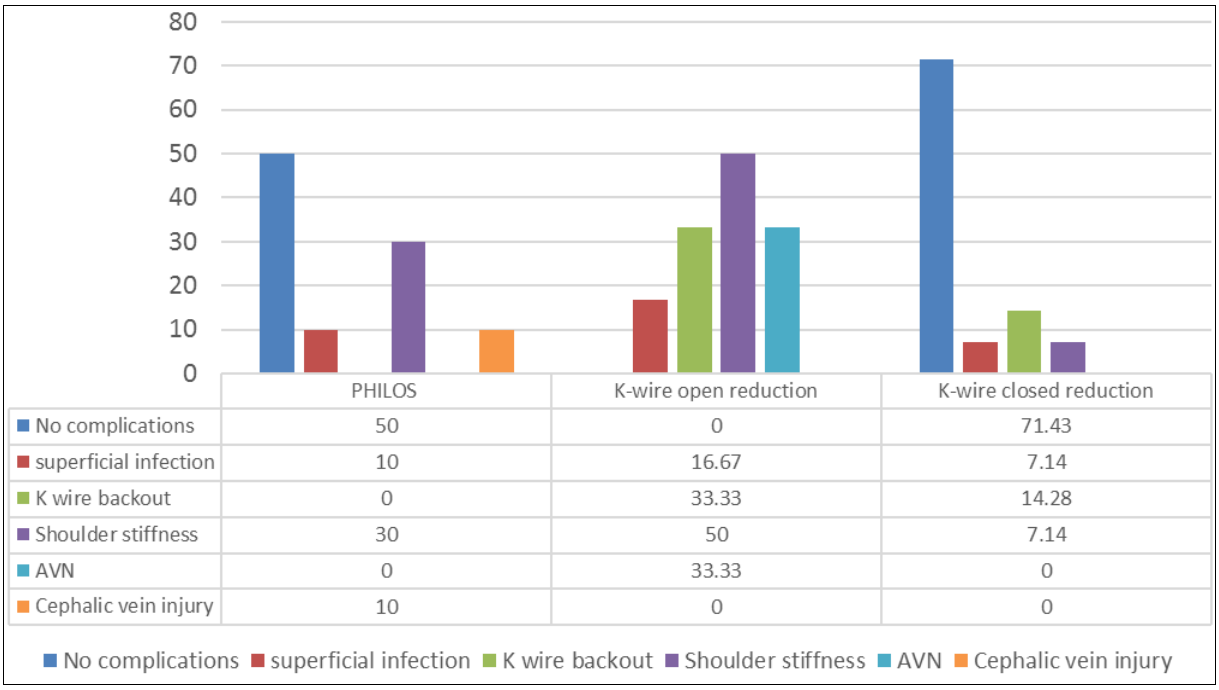

Post op x-ray reduction with k wires

Postoperative care and follow- Appropriate antibiotics and analgesics were given post operation to patients and all patients arm was immobilized with the aid of arm pouch. Immediate post-operative radiographs were taken to determine the bone alignment and maintenance of reduction. Sutures were removed at the 10th post-operative day. For rehabilitation pendulum exercises were recommended immediately depending on pain and passive range of motion were recommended after first post-operative week. Active range of motion was started after 2-4 weeks depending on stability of osteosynthesis and bone quality. At 4th to 6th postoperative week, immobilization was discontinued and active assisted movements were started up to 90-degree abduction and no forced external rotation. At 6th to 8$^{th}$ post-operative week, full ranges of movements with active exercises were started. Follow ups were done at 6 weeks, 3 months, 6 months and one year and functional outcome was evaluated using Constant and Murley scoring in which

strength measurement was done using a spring balance attached on the forearm distally Strength was measured after 90-degree elevation of arm in the plane of scapula, if pain was involved or if patient was unable to achieve 90 degrees of elevation in the scapula plane the patient was given 0 points. The average strength score was noted in pound (lb). Patients with shoulder stiffness were given physiotherapy for 1-2 weeks on outpatient basis. The patients were examined clinically and radiologically, for range of motion, bone union and complications if any during follow up period.

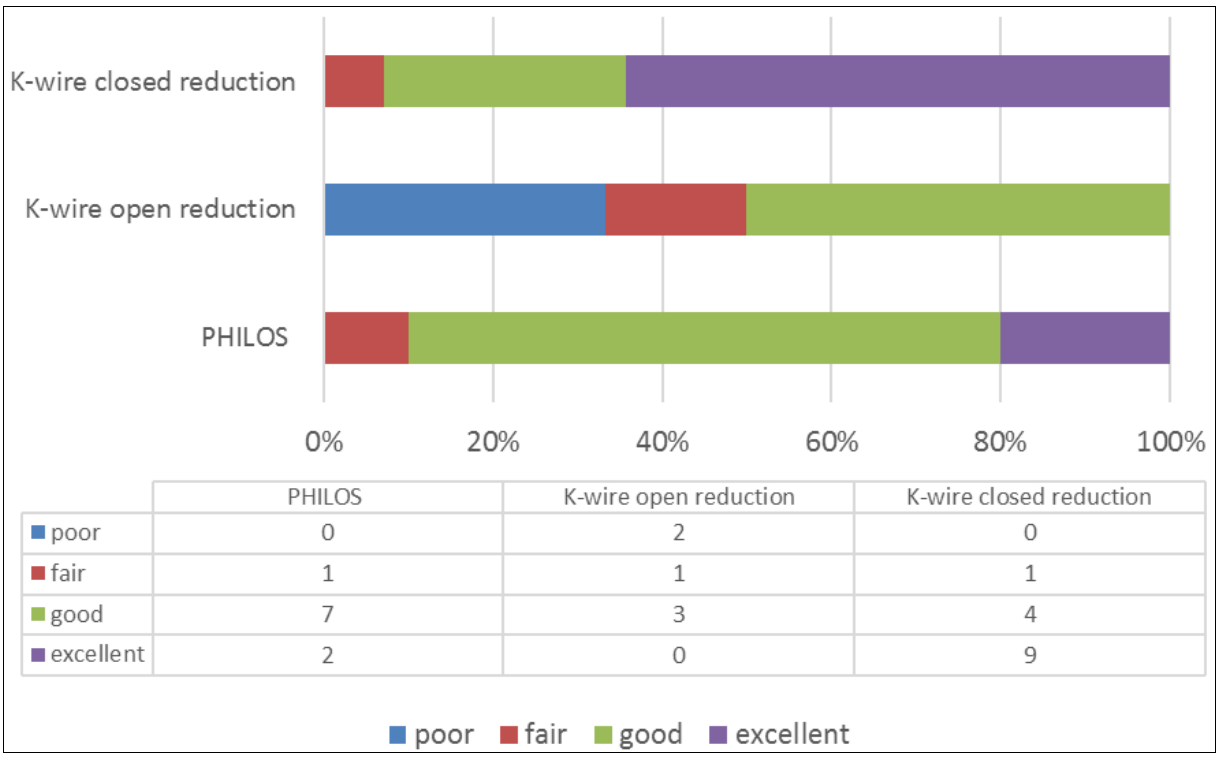
**Results**

Results of our study about functional outcome, complications and radilological outcome have been shown in following graphs




| | PHILOS | K-wire open reduction | K-wire closed reduction |
|---|---|---|---|
| No complications | 50 | 0 | 71.43 |
| superficial infection | 10 | 16.67 | 7.14 |
| K wire backout | 0 | 33.33 | 14.28 |
| Shoulder stiffness | 30 | 50 | 7.14 |
| AVN | 0 | 33.33 | 0 |
| Cephalic vein injury | 10 | 0 | 0 |

**Fig 1:** Percentage of complications for each modality




| | PHILOS | K-wire open reduction | K-wire closed reduction |
|---|---|---|---|
| poor | 0 | 2 | 0 |
| fair | 1 | 1 | 1 |
| good | 7 | 3 | 4 |
| excellent | 2 | 0 | 9 |

**Fig 2:** Functional outcome as per constant score

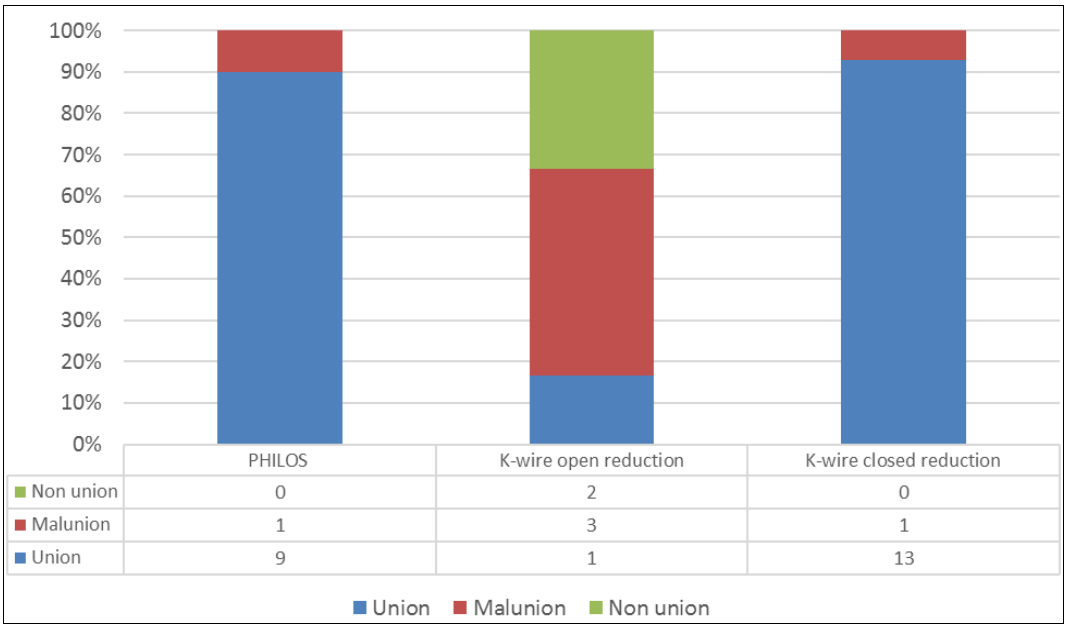



Fig 3: Radiology outcome

**Discussion**

Management of proximal humerus fractures is a challenging task and the choice of surgical management is always a controversy Majority cases 80% had age between 30 to 60 years. Mean age was 42.6 ± 12. 2 years. Ranging between 21 to 60 years.Study by J Dheenadhayalan *et al*. [4] showed that mean age was 53.8 years. 70% were males and 30% were females.

Most common mode of injury was road traffic accident 60% followed by fall 40% Study by Mohamed Nishad *et al*. [5] showed road accidents and domestic falls were observed to be the most common causes of Proximal Humerus Fractures in younger and elderly populations respectively. According to Neer's classification 40% had 2 part fracture, 50% had 3 part fracture and only 10% had 4 part fracture. Study by J Dheenadhayalan *et al*. [4] showed that 52% had 3 part and 48% had four-part fracture. Study by Snehal Hedgire *et al*. [6] showed that 53.3% had 3 part, 36.7% had 2 and 10% had 4-part fracture. Similar findings were seen in present study.

In our current study out of 30 cases evaluated 10 cases (33.33%) were operated with open reduction and internal fixation with PHILOS PLATE,6 cases (20%) were operated with open reduction and k wire fixation, and 14 cases (46,66%) were operated with closed reduction and percutaneous k wire fixation

In our short term prospective observational study we have assessed the radiological and functional outcome of proximal humerus fracture dislocation managed with reduction and internal fixation with K wire and PHILOS plate in a tertiary care hospital using the Constant shoulder score [7]. We have also assessed the complications associated with each modality of treatment.

The findings of the study has been discussed as below:

- Majority cases (80%) were aged between 30 to 60 years with mean age 42.6 years.
- Of the enrolled 30 patients in the study, 70% were males and 30% were females
- Right side was most commonly involved in 83.3% patients while 16.7% patients had affected left side.
- Most common mode of injury was road traffic accident (60%) followed by fall (40%).
- According to Neer's classification, 40% had 2 part, 50% had 3 part fracture and only 10% had 4 part fracture
- All (12) patients with Neer's two-part fracture were managed with closed reduction and k-wire fixation. Out of 15 patients with three parts fracture 7 were managed with open reduction and PHILOS plating, 6 were managed with open reduction and k wire fixation while 2 were managed with closed reduction and k wire fixation. All Neer's four-part fracture patients (3) were managed with PHILOS plating.
- Mean operative time is more for open reduction and internal fixation with PHILOS (116.11min) while it is less for open reduction and k wire fixation (62.5 min). Least time is required for closed reduction and k wire fixation (32.92min).
- Mean intra-operative blood loss is observed more in patients managed with open reduction and PHILOS plate fixation (127.77ml), while lesser blood loss was noted in open reduction and k wire fixation (71.66ml). Least mean intra-operative blood loss (22.85ml) was observed in patients managed with closed reduction and k wire fixation.
- Radiological outcome of maximum patient (76.67%) was union while 5 patients (16.67%) had malunion and 2 patients (6.67%) went into non-union. Union rate in PHILOS was observed to be 90% while Mal-union was 10%. In patient managed with open reduction and k-wire fixation, Union rate was 16.67%, malunion was 50% and non-union was observed in 33.33% cases. Patients managed with closed reduction and k wire fixation; union rate was 92.86% while malunion was 7.14%.
- Constant Shoulder score was good in maximum patients (46.67%) followed by excellent in 33.67%, three patients (10%) had fair score while it was poor in 2 patients (6.66%).
- Range of motion (ROM) of affected shoulder at 6 months follow up was observed to be full in maximum patients (53.33%). Terminal restriction of shoulder ROM was observed in 36.67% while three patients (10%) had gross restriction of shoulder ROM.
- Out of 10 patients managed with PHILOS plating, 40% had full range of motion at shoulder while 60% had terminal restriction of shoulder ROM. In group managed with open reduction and K wire fixation 3 patient (50%) had gross restriction of ROM, 33.33% cases had terminal

restriction of ROM and 16.67% had full ROM. In group managed with closed reduction and K wire fixation 11 patients (78.57%) had full ROM and 21.43% cases had terminal restriction of ROM.

- In our current study, in PHILOS group 50% patients were found to have no complications,10% patients developed superficial infection, 30% patients were found to have shoulder stiffness, in 10% patients cephalic vein injury was occurred. In open reduction and k wire fixation group, 50% patients were found to have shoulder stiffness while 33.33% patients were having k wire backout and avascular necrosis was found in 33.33% cases, while 16.67% patients was having superficial infection. Complication rate was less with closed reduction k wire fixation 71.43% patients were having no complications while, superficial infection was found in 7.14% patients, k wire backout was occurred in 14.28% patients.

## Conclusion

In our study we conclude that Proximal humerus fracture dislocation needs early intervention. Prognosis and outcome of management depends on the time interval from trauma to the surgery. Early intervention leads to better outcome. Neer's 2 parts fracture can be managed better with close reduction and k wire fixation as it has following advantage low complication rate, early mobilization, less operative time and intraoperative blood loss, ease of implant removal. Open reduction and K wire fixation has poor outcome in terms of radiological union and functional outcome for management of neer's 3 parts and 4 parts fracture, as It does not provide stable and rigid fixation, It involves more soft tissue injury. Open reduction and internal fixation with PHILOS plating has better radiological and functional outcome for management of 3 and 4 parts fracture as compared to k. wire fixation owing to anatomical reduction and stable fixation, Early mobilization. PHILOS plating has more chances of soft tissue injury and more operative time and intraoperative blood loss hence, more chances of infection.

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## Author's Contribution

Not available

## Conflict of Interest

Not available

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Not available

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