

# Functional Outcome of PHILOS plating in proximal humerus fracture

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## ABSTRACT

**Background:** Proximal humeral fractures, with the advancement of surgical techniques, are now more often managed operatively to meet the needs of the patient, provide early rehabilitation and better functional outcome. The aim of this study was to assess the functional outcome of operative management of proximal humeral fractures with PHILOS plate fixation.

**Methods:** This was a prospective analytical study of 30 patients with displaced proximal humerus fractures treated by open reduction internal fixation with PHILOS plating in National Trauma Center. Functional outcomes were evaluated based on Constant scoring system and complications were assessed.

**Results:** 16 were 2-part (53.33%), 10 were 3-part (33.33%) while 4 were 4-part (13.33%) fractures as per Neer's classification. Functional outcome based on the Constant scoring system of the patient at 6 month follow-up were assessed. Mean score was 71.8. 10 patients had excellent results (33.3%), 9 had good (30%), 10 had fair (33.3%) and 1 had poor (3.33%) functional result. Minor complications were seen in 7 patients. (23.3%)

**Conclusions:** PHILOS plate provides anatomical reconstruction and stable fixation allowing early mobilization of shoulder after surgery. Majority of patients have a high level of satisfaction and return to their previous level of activity.

**Keywords:** Constant Scoring, Neer's classification, PHILOS plating, Proximal humerus fracture

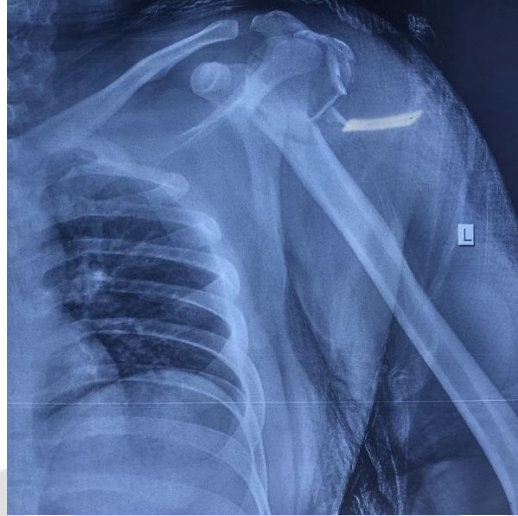
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## INTRODUCTION

Proximal humeral fractures account for 4 to 5% of all fractures.<sup>1</sup> Most are stable and minimally displaced and can be treated non-operatively with good results.<sup>2</sup> Displaced and unstable fractures are difficult to manage and have a high morbidity. The treatment goal is to achieve a painless shoulder with full function. Various methods have been used, including Kirschner wire fixation, suture fixation, external fixation, tension band fixation, Rush pin fixation, intramedullary nailing, locking plate fixation and prosthetic replacement.<sup>3</sup>

Locking plate fixation provides angular and axial stability and minimizes the risks of screw toggle and pull out as well as reduction loss. Divergent or convergent locked screws improve the pull-out resistance of the whole construct.<sup>4</sup> Locking plates fail at a greater load than non-locking plates.<sup>5</sup> PHILOS plates are pre-shaped and pre-contoured locking compression plates, with an aiming device for insertion of the locking screws and positioning of the plate to prevent impingement.

We evaluated treatment outcome of PHILOS plate fixation for displaced proximal humeral fractures in 30 consecutive patients.



**Figure: 1**

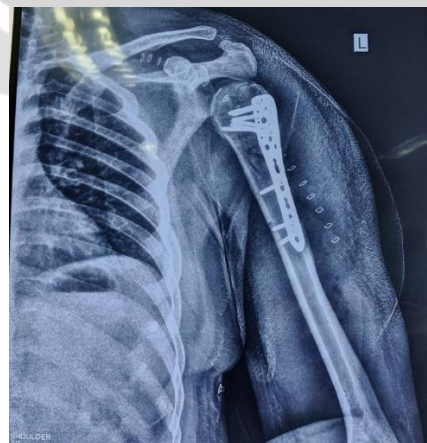
### **METHODS**

This prospective observational study was conducted at National Trauma Center, Kathmandu from July 2023 to June 2024. We reviewed 30 patients with displaced proximal humerus fractures, who underwent open reduction and internal fixation with PHILOS plate. The study was approved by the Institutional Ethical Board.

The patients included in study were skeletally mature with fracture having a displacement of  $> 1$  cm between the major fracture segments or angulation of the articular surface of  $> 45^\circ$  as outlined by Neer. The open fracture, pathological fracture or refracture, failed conservative treatment, previous operative treatment of the proximal part of the humerus, concomitant ipsilateral fracture of the distal part of the humerus or the elbow joint and polytrauma patients were excluded from the study.

The surgery in all cases was performed under general anesthesia with the patient in a 'beach chair' position. A deltopectoral approach was used with minimal soft-tissue dissection to expose the rotator cuff and tuberosity of proximal humerus. The sutures were inserted into Subscapularis, Supraspinatus and Infraspinatus tendon just superficial to tendon's bony insertion to hold the fragments. The fracture was reduced and temporarily fixed with Kirschner wires. The reduction was checked fluoroscopically and then a locking plate was placed about 5 to 8 mm distal to the tip of greater tuberosity and slight posterior to bicipital groove.

Pendulum movements were started from the first post-operative day and the shoulder was mobilized with active assisted exercises and active exercises was started after six weeks of surgery. The patients were in regular follow up at two weeks, 3 months and 6 months. Functional outcome was evaluated according to the Constant–Murley shoulder assessment,<sup>6</sup> the scoring system of which comprises four parts: pain, power, activities of daily living and range of movement.



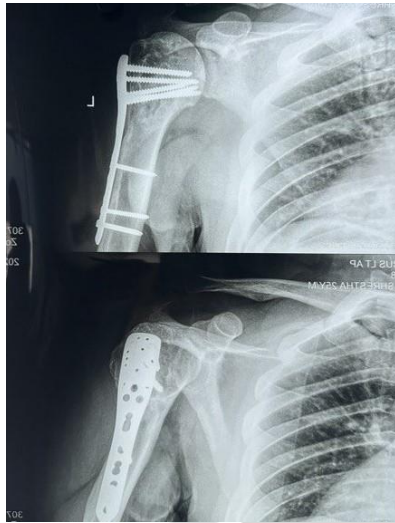
**Figure: 2 (first post op day x-ray)**

## RESULTS

The total numbers of cases in our study were 30. Age range was from 16 to 75 years, with mean age of 49.3 years. 18 were females (60%) while 12 were males (40%) with m:f sex ratio of 2:3. 17 patients had fracture of left side (56.66%) and 13 had right side fracture (43.33%). Out of total cases, 12 cases were due to road traffic accidents (40%) 9 cases were due to fall from height (30%) and 9 cases due to trivial fall(30%). As per Neer's type, 16 were 2 part (53.33%), 10 were 3 part (33.33%) while 4 were 4 part (13.33%) fractures.

As per grading of the constant score to categorize the outcome of patients, 10 patients had excellent results (33.3%), 9 had good (30 %), 10 had fair (33.3%) and 1 had poor (3.33%) result. Mean constant score was 71.8. No intra-operative complication was seen in any of the cases.

Superficial infection was seen in 3 cases and were managed by conservative management. One case of impingement was seen for which implant removal was done and the score improved after the implant removal. Varus malunion was seen in 3 cases.



**Figure: 2 (6 month post -op)**



**Figure : 3 (ROM at 6 month)**



**Figure: 4 (ROM at 6 month)**

## DISCUSSION

The operative treatment of proximal humeral fractures is a challenge for orthopedic surgeons and has been controversial. Most of the un-displaced proximal humerus fracture can be treated conservatively. For displaced proximal humerus fractures, treatment with conventional plates and screws have been reported with high rates of unsatisfactory outcomes and complications.<sup>3</sup> Locking plates are angular stable plates which has advantage of secure fixation in metaphyseal and osteoporotic bones. Locking plates are proven with biomechanical studies that they resist physiological loads more effectively.<sup>7,8</sup> There are many clinical studies which indicate that proximal humerus locking plates have good result in proximal humerus fractures.<sup>9-11</sup>

The average age incidence in present series of 30 patients analyzed, was 49.3 years, which was consistent with the age incidence in studies done by Egol et al, (61 years) and the average age incidence in Gerber et al, study was 44.9 years.<sup>12,13</sup> Further as compared with other studies, present study showed a higher incidence of fractures in female than in male. The gender ration was 2:3. This higher ratio can be explained by a higher incidence of fragility fracture in postmenopausal female.

In our present study, fracture occurred on right side in 13 patients and on left side in 17 patients. Gerber reported, in their series of 34 fractures, 16 were on left side and 18 were on right side.<sup>13</sup> Two-part fracture was observed to be the most common fracture pattern in the present study. Similar observations had also been reported by Björkenheim et al.<sup>14</sup> By contrast, Koukakis et al, and Fankhauser et al had reported a significant higher incidence of three-part fractures in their series.<sup>9,10</sup> Thyagarajan et al in their study on 30 patients reported an average Constant score of 57.5, with mean age of 58 years (range 19-92 years) and fractures were Neer's 2- part, 3-part, and 4-part fractures.<sup>15</sup> Fazal et al evaluated 27 patients with proximal humerus fracture and found mean constant shoulder score to be 70.<sup>16</sup> Mishra et al studied

35 patients and the mean constant shoulder score was 73.6.<sup>17</sup> In our study mean constant score was 71.8 which is comparable with other studies mentioned.

AVN of the humeral head is a known complication of proximal humeral fracture, reported most commonly with four-part fractures. Kilic et al used PHILOS for fixation of proximal humeral fractures and reported AVN in only one of 22 patients in their series.<sup>18</sup> Mishra et al did not observe osteonecrosis in any of their 35 patients.<sup>17</sup> In our study, no case of AVN was observed which may be due to short term follow up as it requires long term follow up for observation.

## CONCLUSION

This study was done to evaluate the functional outcome following surgical management of proximal humerus fracture by PHILOS plate. Adequate surgical skills and surgeon's experiences with the surgical technique are necessary to achieve correct implant fixation and avoid intraoperative errors. Also postoperative physiotherapy plays an important role in rehabilitation of the patient to provide good results. In conclusion, the internal fixation of proximal humeral fractures with the use of PHILOS plates yields reliable results when utilized correctly. With the use of correct surgical technique by a competent surgeon, the anatomic locking compression plate is a suitable option for surgical management of proximal humeral fractures providing a good functional outcome.

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