

Outcome of Fixation of Displaced and Unstable 3-part Greater Tuberosity Fractures of Proximal Humerus by using PHILOS Plate

Outcome of Fractures of Proximal Humerus by using PHILOS Plate

Zulfiqar Ahmed, Muhammad Nasir Ali and Zirwa Nasir

ABSTRACT

Objective: To evaluate the outcome of fixation of displaced and unstable 3-part greater tuberosity fractures of proximal humerus by using PHILOS plate

Study Design: Prospective case series study

Place and Duration of Study: This study was conducted at the Orthopedic Complex, QAMC/B.V. Hospital, Bahawalpur from March 2017 to March 2018.

Materials and Methods: 30 patients (27 males and 3 females), age range 25 to 60 years having closed 3-part greater tuberosity fracture of proximal humerus (according to Neer's classification) were operated by using PHILOS plate and screws. Postoperative follow up evaluation was done for six months by Constant Scoring System for shoulder.

Results: Of the 30 patients operated all fractures healed satisfactorily except 3 patients who developed varus mal-union. Four patients (13.3%) felt mild pain with elevation of arm beyond 90 degrees while sub-acromial impingement was noted in 5(16.6%) patients. Overall functional outcome according to Constant Scoring system at six months follow up was excellent in 18 (60%) patients, good in 6 (20%) patients and moderate in remaining 6 (20%) patients.

Conclusion: The PHILOS plate system is a good option for the treatment of 3-part greater tuberosity fractures of the proximal humerus and especially reliable device in case of the associated osteoporosis and poor bone stock

Key Words: Three-part proximal humerus fracture, PHILOS plate

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INTRODUCTION

The incidence of proximal humerus fractures is about 5 to 7% of all fractures¹. These fractures involve both young and old age people but are more common in elderly². The mode of injury in young people is usually high energy trauma but in old age group these fractures occur mostly due to low energy trauma like fall from standing over the out-stretched hand³. A large number of these fractures (about 80%) are stable with no or minimal displacement and can be managed non-operatively^{4,5} with satisfactory or good outcome.

In case of displaced and unstable fractures surgery usually becomes necessary⁶. Various surgical methods have been described in literature including closed reduction and percutaneous pinning^{7,8,9}, open reduction and internal fixation with K-wires, screws, rush pins,

tension band wiring¹⁰, trans-osseous sutures¹¹, conventional plates^{12,13,14,15}, locking plates^{16,17,18}, intramedullary nails¹⁹ and hemi-arthroplasty^{20,21} as per indications on case to case basis.

Displaced and unstable 2-part surgical neck fractures, 3-part tuberosity and surgical neck fractures or 4-part fractures according to Neer's classification of proximal humerus fractures in patients having additional problem of primary or secondary osteoporosis pose special challenge to the treating surgeon regarding the maintenance of the reduction of the fracture fragments by conventional non-locking or non-angle stable devices resulting in poor prognosis and high rate of post-operative loss of reduction and mal-union or non-union. Internal fixation in these categories of patients with locking plate and screw system devices presents the solution of these problems of loss of reduction, non-union or mal-union. Additional advantage of use of the angle stable locking devices is that the post-operative range of motion exercises can be started early with expedited and better rehabilitation results²². One such implant system is the PHILOS (proximal humerus internal locking system) which works as internal fixator which provides better anchorage of screws in osteoporotic bone^{23,24} and good functional outcome^{25,26}. Our study was aimed to evaluate the outcome of the fracture fixation in the patients having unstable 3-part

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greater tuberosity fracture by use of this (PHILOS) locking device system in terms of fracture union, functional outcome and post-operative complications.

MATERIALS AND METHODS

This was a prospective case series study done at Orthopaedic Complex, Quaid-e-Azam medical college/ Bahawal Victoria Hospital, Bahawalpur from March 2017 to March 2018. 30 patients having 3-part greater tuberosity fracture of proximal humerus based on Neer’s classification were operated by using PHILOS plate application. 27 were males and 3 were females. 12 patients were operated on right side and 18 were operated on left side (Table-1). Age range was 25 to 60 years. All patients having closed fracture with duration history of up to two weeks in the adult, middle and old age group and fit for anesthesia were included in the study while patients having pathological or open fractures or with previous surgery over the shoulder and all paediatric patients with open growth plate or those unfit for anesthesia were excluded. All patients were operated under general anesthesia and in supine or beach-chair position. Delto-pectoral approach was used for all patients. Fracture fragments were provisionally reduced with the help of sutures and ‘K’ wires and pre-contoured PHILOS plate and screws were applied over the proximal fragment. Then the distal fragment was reduced and locking screws were applied over the distal fragment. C-arm image intensifier was used to check the position of plate and screws and any unwanted intra-articular placement of screws. Wound was closed over the drain and dressed. The arm was placed in a sling. Post-operatively the passive movements over the shoulder were started during the first week as tolerated by the patient regarding pain. Stiches were removed at two weeks and active range of motion started at six weeks along with radiological evaluation. Subsequently the patients were followed up at 12 weeks and six months for clinical and radiological evaluation. Clinical evaluation was done according to the Constant Scoring System for shoulder. The Constant scores of 86 to 100 were considered as excellent, 71 to 85 as good, 56 to 70 as moderate while those in zero to 55 range were considered as poor.

RESULTS

Post-operatively the patients were followed up for a period of six months. No patient was lost to follow up. Results were evaluated on the basis of functional and radiological outcome as well on post-operative complications. All fractures healed satisfactorily except three patients in which varus mal-union occurred (Table-2). Shoulder range of movements was excellent in 18 (60%) patients, good in 7 (23%) patients and moderate in 5 (16.6%) patients (Table-3). No patients developed post-operative infection, axillary nerve palsy, fixation failure or avascular necrosis of

humeral head. However four (13.3%) patients felt mild pain with elevation (abduction) of arm beyond 90 degree and sub-acromial impingement was reported by 5(16.6%) patients. Overall functional outcome according to Constant Scoring System was excellent in 18(60%) patients, good in 06(20%) patients and moderate in remaining 06(20%) patients (Table-4).

Table No.1: Demographic Data

Total Number of Patients	30
Male	27
Female	03
Right Sided Injury	12
Left Sided Injury	18

Table No.2: Radiological Results

Total Number of Patients	30
Normal Radiological Healing	27
Malunion	03
Non-union	00

Table No.3: Shoulder Range of Movements

Total Number of Patients	30
Excellent	18 (60%)
Good	07 (23.3%)
Moderate	05 (16.6%)

Table No.4: Functional Outcome (According to Constant Score)

Total Number of Patients	30
Excellent	18 (60%)
Good	06 (20%)
Moderate	06 (20%)
Poor	00



Figure No.1: Pre-operative



Figure No.2: Post-operative

DISCUSSION

The unique osteology and muscle attachment over the proximal humerus leads to the specific fracture patterns and demands special considerations for the choice of technique for a particular fracture type. In case of comminution every part of the fracture components has its specific importance regarding the restoration of the pre-injury functional status. Comminuted fractures of the proximal humerus especially when associated with the osteoporosis and poor bone stock remain at risk of re-displacement of fracture fragments, implant loosening and failure of fixation when treated with conventional non-locking technology devices or implants. Worth mentioning in this regard is the AO T-plate and screws which has been associated with high rate of implant loosening, sub-acromial impingement, poor prognosis and patient dis-satisfaction especially in osteoporotic patients^{12,13,14,15}. Among other techniques the minimally invasive methods may lead to increased risk of neurovascular structural damage^{27, 28}, the suture wires may lead to cut through and failure while the blade plate fixation technique has a high risk of perforation through the humeral head into the shoulder joint²⁹. Intramedullary nailing is also not a good choice for the 3-part greater tuberosity fractures due to the fracture over the entry site.

The PHILOS plate system addresses most of the problems associated with the 3-part fractures of the proximal humerus like reduction of the fracture fragments in anatomical position and prevention of the post-operative re-displacement especially in osteoporotic patients due to the special design and locking nature of the screws with provision of the advantage of angular stability.

In a study for fixation of 3-part fractures of proximal humerus with PHILOS plate by Martinez et al³⁰ the Constant Scoring System yielded excellent results in 21% patients, good in 64% patients and moderate in 15% patients along with sub-acromial impingement noted in 03(09%) patients while in another similar study by Vijay Sharma et al³¹ the excellent results were found in 57.1% patients, good in 14.2% patients, moderate in 28.7% patients and sub-acromial impingement reported in 01(0.07%) patient. In our study of the 30 patients the excellent results were noted in 18(60%) patients, good in 06(20%) patients, and moderate in remaining 06(20%)(Table-4). Sub-acromial impingement was noted in 05(16.6%) patients while mild pain reported by 04(13.3%) patients. All fracture united within 12 weeks period. Almost all of the patients were satisfied with the functional outcome.

However our study was limited to one specific fracture type group and further studies are needed for evaluation and comparison of the results of the PHILOS plate system technique in other fracture types like 2-part and especially 4-part fractures according to Neer's

classification of proximal humerus fractures and also other categories like open fractures or associated injuries or co-morbidities.

CONCLUSION

According to the results obtained in our study the PHILOS plate system yielded good to excellent results in most of the patients, so this is a good option for the treatment of 3-part greater tuberosity fractures of the proximal humerus and especially reliable device in case of the associated osteoporosis and poor bone stock.

Author's Contribution:

Concept & Design of Study: Zulfiqar Ahmed
 Drafting: Muhammad Nasir Ali
 Data Analysis: Zirwa Nasir
 Revisiting Critically: Zulfiqar Ahmed, Muhammad Nasir Ali
 Final Approval of version: Zulfiqar Ahmed

Conflict of Interest: The study has no conflict of interest to declare by any author.

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