

CASE REPORT

PHILOS Plate as a Fixation of Proximal Humeral Fracture: A Revisit

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ABSTRACT

Fracture is common after trauma. Proximal humeral fracture can occur in the elderly after fall and in youngsters after motor vehicle accidents (MVA) and sport injuries. A 37-year-old man was admitted with a fracture of his left proximal humerus following an MVA. He sustained a 3-part fracture and treated surgically using a PHILOS plate. There are few options in managing proximal humerus fracture ranging from conservative to surgical intervention based on its severity. We reminisce the usage of PHILOS plate as a mode of treatment of such fracture.

INTRODUCTION

Proximal humeral fracture involves the proximal third of the humerus. It results from direct injury to the shoulder or arm itself, and axially loaded energy being transmitted on an outstretched hand in a fall. The severity of injury depends on the displacement degree of the fracture of surrounding muscles of the shoulder namely pectoralis major, deltoid, and rotator cuff muscles. It mostly happens in motor vehicle accident (MVA) and sport injury especially among young males but highest among the elderly¹.

Surgical intervention has been recently accepted as the mainstay treatment 3-part fracture of the proximal humerus¹. This issue can be tackled by performing proximal humerus inter-locking osteosynthesis (PHILOS) plate as it offers the best fixation treatment in

proximal humeral fracture than the standard conventional plate or Kirschner wire. This case report herein highlights this current option for proximal humeral fracture treatment.

CASE PRESENTATION

A 37-year-old man presented with painful swelling of the left shoulder following an MVA. Examination revealed a grossly-swollen

left shoulder. There was no visible wound or bruises noted. The left shoulder motion was about 10° – 15° in all planes. The distal pulses were palpable and sensation over the regimental badge area was intact. Plain radiographs showed fracture of the proximal humerus involving the surgical neck and greater tuberosity (Figure 1). He was scheduled for open reduction and internal fixation (ORIF) with PHILOS plate.



Figure 1 AP and lateral views of the left shoulder showing 3-part fracture (white arrows) of the proximal humerus (pre-operative)

He was positioned on a beach chair position with the left arm at the outside edge of the chair for the mobility during reduction and to check the degree of reduction using image intensifier. Prophylactic antibiotic intravenous ceftriaxone was administered after induction of anaesthesia. Through a deltopectoral approach, an incision was made along the deltopectoral groove. Cephalic

vein was identified and retracted laterally. Intermuscular plane was opened up until fracture site identified. Fracture site was then held using Kirschner wire. A 5-hole PHILOS plate was inserted on the anterolateral border and fixed with locking screws. Fixation was then checked by using image intensifier and was acceptable (Figure 2). Wound was washed, irrigated and then closed by layers.



Figure 2 AP and lateral views of the left shoulder shows post open reduction with PHILOS plate in situ (post-operative)

Post-operatively, the patient was able to move his shoulder with minimal pain. Post-operative plain radiographs were acceptable. He was discharged on post-operative day three and an appointment for the next visit in two weeks.

DISCUSSION

The aim of managing any fracture is to stabilize the fracture sites aiming for callus formation. It ranges from conservative management to

surgical interventions based on its severity including fracture of proximal humeral. Charles Neer introduced a classification back in 1970 to describe this fracture². Neer’s classification has described fracture based on the number of displaced segment rather than number of fracture lines which divided the head into the four major segments: articular segment or the anatomical neck, greater tuberosity, lesser tuberosity and shaft or the surgical neck as described in Table 1².

Table 1 Neer’s Classification

Group	Description
Group I	All proximal humeral fractures, regardless the number of lines cleavage, in which no segment is displaced more than 1 cm or angulated more than 45°
Group II	The anatomical-neck fracture, is a displacement of the head segment, with or without hairline tuberosity component
Group III	The surgical neck fracture, is a displacement of the shaft segment with the rotator cuff intact
Group IV	The greater tuberosity displacement, occurs as a two-part and with an unimpacted surgical neck fracture, as a three part lesion
Group V	The lesser tuberosity displacement occurs as two parts and with an unimpacted surgical neck fracture as a three-part lesion. Group IV and V blend as the four parts fracture in which both tuberosities are displaced
Group VI	The fracture dislocation implies damage outside the joint space anteriorly and posteriorly and segment distribution is important in estimating the circulation of the head. The articular surface fractures in which portions of the head are dislocated are the impression fracture and the head-splitting fracture

In this case, our patient sustained 3-part fractures of proximal humerus with fracture lines splitting the surgical neck, greater or lesser tuberosity. The goals in surgical management are to obtain an ideal anatomic reduction and to prevent displacement of the fracture fragments. In 3- and 4-part fractures, closed reduction is incapable to stabilize the proximal humerus because of uncontrollable rotatory displacement and avascular necrosis respectively². The preferred treatment literally is ORIF³. Next, a rehabilitation programme is necessary to obtain the best results functionally³. The invention of PHILOS plate has revolutionized the treatment of proximal humeral fracture. Hence, ORIF of 3- and 4-part fractures of the proximal part of the humerus with this specialized anatomical plate is currently preferred treatment option⁴.

Locking plates are devices to fix a fracture with few threaded screw holes on their surface. These holes allow the screws to thread to the plate, hence function as a fixed-angle device. The plates may have both locking and conventional non-locking screws. The drawback of the conventional plates is that they need a compression of the plate to the bone and rely on friction at the bone-plate interface. The screws however can toggle with increasing axial loading cycles, which reduce the friction force and lead to loosening of the plate. If this circumstance occurs prematurely, fracture instability will occur and lead to implant failure.

In contrast to locking plates, they adhere to the biomechanical principle of external fixators in which they do not require bone-plate friction. They act as internal fixators since the angular-stable articulation between the screws and the plate allows placement of the plate without any contact to the bone⁵. Bone quality especially in osteoporosis and improper application can lead to complication such as screw loosening and ultimately high failure rate⁶. Although locking plate is

better option in treating these fractures, the surgeon who plans to use a locking plate must be well trained and well equipped with high standard surgical skills to perform the operation correctly. These are essentials to avoid intraoperative and post-operative complications. A final image intensifier check with rotation of the humeral head to verify correct screw placement is recommended in all cases.

PHILOS plate is a pre-shaped and pre-contoured plate with an aiming device to guide introduction of the locking screws. It provides a stable fixation with minimal metal work hitch. It allows early range-of-motion exercises to achieve acceptable functional results^{7, 8}. However, the decision to choose should be based on fracture pattern, patient's age, bone quality, functional requirements, and surgeon's preferences. Based on literature, many complications were quoted due to incorrect surgical technique and iatrogenic errors⁹. Knowledge on the anatomy of the shoulder and its blood supply especially posterior humeral circumflex artery is essential. It provides 64% of the blood supply to the head of humerus¹⁰. Protecting this artery during surgical approach and fracture fixation may minimize devascularization of the head of humerus.

CONCLUSION

The principle of fracture management is to stabilize it aiming for callus formation. PHILOS plate offers a better option for proximal humeral fracture. However, a good functional outcome can be obtained by correct surgical technique used by the competent surgeon.

CONFLICT OF INTEREST

The authors declared that there is no conflict of interest in the writing of this article.

CONSENTS

Written informed consent was obtained from the patient to publish the case. A copy of written consent is available for review by the Chief Editor.

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