Treatment of proximal humeral fractures – locking plate or an alternative fixation?

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The operative treatment of proximal humeral fractures in elderly patients with osteoporotic bone remains an unsolved problem, principally as regards the stability of the osteosynthesis. A new technique which aims to secure the reduction with locking screws, thus allowing an early mobilisation, has recently been developed. In this article, the advantages and weaknesses of this method are reviewed and compared to conventional methods.

Introduction

The incidence of proximal humeral fractures is increasing in Finland (1). Most of the fractures are only slightly displaced and a good functional result can be achieved with non-operative treatment (2). However, comminuted and displaced fractures are a therapeutic challenge, with a varying prognosis. The optimal treatment of these fractures is still controversial, since many of these are liable to a failure of osteosynthesis (figure 1), avascular necrosis of the humeral head, as well as a non- or mal-union of the fracture (3,4). In order to avoid the common problems associated with this fracture, the AO-ASIF has recently developed a new technique (Philos®) which aims to preserve the biological integrity of the humeral head and to secure an anatomical reduction with multiple locking screws with angular stability (5,6).

Figure 1.

Figure 2.

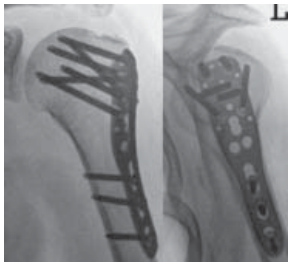


Figure 3.

Operative technique

A beach-chair position and a delto-pectoral approach are most oftenly used. The fragments are reduced indirectly, if possible, with the help of traction sutures placed in the cuffinsertions. When an acceptable reduction has been achieved, the Philos® plate is placed at least 8 mm distal to the upper end of the greater tubercle and fixed to the humeral shaft with cortical screws. An aiming device, which diverges the locking screws in the humeral head, is temporarily attached to the upper part of the plate (figure 2), and the head fragments are secured with Kirschner wires after an image intensifier control. The required lengths of the locking screws are determined with a direct measuring device over the Kirschner wire, and at least six locking screws are inserted in the humeral head (figure 3). A hexagonal screwdriver with a torque limit of 1.5 Newton-meters is used in order to securely lock the screws to the plate.

Advantages and disadvantages

Previous studies have reported acceptable functional results after a conventional ORIF with a buttress-plate and non-locking screws of proximal humeral fractures (7), particularly in young patients (4). However, this method has also been associated with a high complication rate, both in elderly patients with comminuted fractures (8) and in young patients (9), due to a failure in the stability of the osteosynthesis. This technique also requires often an extensive soft tissue dissection, which may compromise the vascular supply of the humeral head and increases the risk of AVN.

Less invasive methods, such as closed reduction and percutaneous pinning, require highly developed skills, a good bone quality, minimal fracture comminution and a co-operative patient (10). In the elderly population with osteoporosis, this method has yielded poor results (11), and is not thus recommended.

There are only a few clinical studies of the use of Philos®-plate in proximal humeral fractures. In our own study (12), the complications and functional outcome were reviewed after a minimum follow-up of one year in 72 patients. The main advantage of this plate was seen in elderly patients, in view of the fact that no failures of internal fixation was observed even in this particular group of patients. Moreover, the patients could reach an activity level enough to ensure their demands for independent daily living. However, as expected, the mean Constant score declined with increasing age.

The outcome for the younger patients in our study was comparable to previous studies with other fixation methods (13), and suggests that the Philos® plate has no additional advantages in younger patients. However, it should be recognised that the T-buttress plate has been associated with frequent hardware-initiated impingement syndrome (11). We did not observe any such symptoms in our patients, but our follow-up may be too short to allow a reliable analysis regarding this complication.

In another study, Koukakis et al. (14) reviewed the outcome in a series of 20 patients with a proximal humeral fracture treated with a Philos® plate, and observed that fracture healing with correct positioning of the fragments was achieved in all cases. AVN and a distal pull-out of the plate occurred each in one patient, thus supporting our finding of a frequently low complication rate associated with this method.

Although most of the displaced proximal humeral fractures may be successfully treated with the Philos® plate, it must be acknowledged that simple fractures at the surgical neck (AO-ASIF A2 and A3) may run with an increased risk of a fatigue failure of the plate at the site of the fracture (figure 4). These types of fractures may be treated in a more safe way with other implants, such as an intramedullary nail (figure 5).

Figure 4.

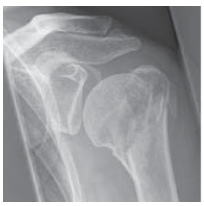
Figure 5.

Conclusions

Although the follow-up times in the previous studies are short, and they are not randomized and controlled, they suggest several benefits associated with the Philos® plate. Most importantly, it is easy to use, it is biological in the sense that the blood circulation of the humeral head is not compromised, the plate does not need to be configured and the angular screw fixation ensures a fixed angle stabilisation. Moreover, complications associated with the plate are few, and the functional outcomes are comparable with the use of the T-buttress plate. Therefore, some of the common complications of the conventional plating can possibly be avoided. Although the Philos® implant is expensive, the number of second or further surgery seems to be minimal.

Treatment guidelines according to Töölö Hospital (AO/ASIF classification)

	***A1*** ***Operative treatment:*** • *Threads, screws, pins*
	***A2*** ***Conservative treatment***
	***A3*** ***Operative treatment:*** • *Proximal IM-nail* • *Philos-plate, particularly in elderly patients* • *T-buttress plate in young patients*

	***B1*** ***Conservative treatment*** ***Operative treatment options:*** • ***Philos-plate, particularly in elderly patients*** • ***T-buttress plate in young patients***
	***B2*** ***Operative treatment*** • ***Philos-plate, particularly in elderly patients*** • ***T-buttress plate in young patients with good bone quality***
	***B3*** ***Same as B2***

	***C1*** ***Conservative treatment if minimally displaced*** ***Operative treatment options:*** • ***Philos-plate, particularly in elderly patients*** • ***T-buttress plate in young patients***
	***C2*** ***Operative treatment:*** • ***Philos-plate, particularly in elderly patients*** • ***T-buttress plate in young patients***
	***C3*** ***Operative treatment:*** • ***Hemiarthroplasty*** • ***Philos-plate, if ORIF indicated due to patient age***

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