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Research Article

Role of proximal femur locking plate fixation in certain unstable trochanteric fractures

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ABSTRACT

Background: Comminution of the lateral trochanteric wall, postero-medial communition, reverse oblique fractures, fractures involving communition of greater trochanter are unstable fractures which had poor results with the regular methods of fixation. Our aim in this study is to evaluate radiological and functional outcome at the end of one year following proximal femur locking plate fixation for certain group of unstable intertrochanteric fractures.
Methods: 20 patients (14 male and 6 female patients) with per trochanteric fractures underwent proximal femur locking plate fixation in Sri Ramachandra Medical College hospital. Intertrochanteric fractures were classified according to Boyd and Griffin. Mean age of the patients was 55.2 years (26-82 years). The Schatzker & Lambert Criteria used to evaluate the functional outcome at the end of one year. Minimum follow up period was six months and maximum follow up was one year.
Results: The functional outcome was assessed by Schatzker and Lambert criteria and was excellent in 8 patients; good in 6, Fair in 4 and Poor in 2.The average time to bear weight fully and walk was 6.5 weeks.
Conclusions: Union was achieved in unstable, comminuted trochanteric fractures without significant complications and neck shaft angle was maintained in majority of the cases following proximal femur locking plate fixation.One of the major drawbacks of using proximal femur locking plate is that weight bearing is to be controlled and done only after radiological evidence of callus formation.

Keywords: Unstable trochanteric fracture, Proximal femur locking plate, Periloc plate

INTRODUCTION

Intertrochanteric and subtrochanteric fractures account for 50% of all fractures of the proximal femur. Early surgical intervention is advocated in majority of these patients to reduce the complications associated with long-term immobilization like deep vein thrombosis, thrombophlebitis, pulmonary embolism, urinary and lung infections, cubitus ulcers. Various extramedullary and intramedullary implants are being used for these fractures. Comminution of the lateral trochanteric wall, postero-medial communition, reverse oblique fractures etc. are unstable fractures which have had poor results with the regular methods of fixation. Proximal femur locking plate is an fixed angle stable construct, with locking cancellous screws at 90, 125 and 130 degrees, which can be used as open reduction internal fixation as well as minimally invasive per cutaneous plate osteoporosis (MIPPO) technique. Our aim in this study is to evaluate radiological and functional outcome at the end

of 1 year following proximal femur locking plate fixation for certain intertrochanteric fractures with communition and subtrochanteric fractures.

The important points of reference on the posterolateral surface of the skull are asterion, inion, apex of the mastoid process & suprameatal crest. The objectives of the present study were to determine the type of asterion depending on the presence or absence of sutural bone, to measure the linear distances of asterion from various bony landmarks, the nearest distance of the same from sigmoid & transverse sinus and also the thickness at the centre of the asterion that may be of importance to anthropologists, anatomists, forensic pathologists & neurosurgeons.

METHODS

In our study 20 patients (14 male and 6 female patients) with per trochanteric fractures underwent proximal femur locking plate fixation in Sri Ramachandra Medical College hospital. 16 Sharma (Figure 1) proximal femur-locking plates and 4 Smith and Nephew plates (Figure 2) PERILOC were used. Intertrochanteric fractures were classified according to Boyd and Griffin. Mean age of the patients was 55.2 years (26-82 years). Immediate post-operative x-rays were taken. Patients were followed up at 6 weeks, 3 months, 6 months and 1 year after the surgery, with clinical and radiographic assessment of the progress of healing and complications. The Schatzker & Lambert Criteria[1] used to evaluate the functional outcome at the end of one year. Minimum follow up period was six months and maximum follow up was one year.

Surgery was performed with the patient in supine position on a fracture table. Closed reduction was performed in 10 patients under C-arm guidance in antero-posterior and lateral views and secured in traction. Skin incision was made over the trochanteric region through lateral approach. Open reduction was done in 10 cases where closed reduction was not able to achieve. For certain unstable/comminuted fractures, minimally invasive technique was done under C-ARM guidance. Care is taken to avoid varus Malreduction prior to plate fixation, which will lead to implant failure. After fracture reduction, the plate was placed and reduction maintained by K-wires. Cortical screw inserted for plate and bone contact. In patients with Sharma plates, proximally three 5mm non-cannulated locking screws were used. The inferior most locking screw, 135 degree angled, was inserted into the femoral calcar. The other locking screws, angled 95 and 120 degree, are used and finally the cortical screws are inserted. Periloc plate from Smith and Nephew has got six screw holes into the femoral head which can accommodate 4.5 mm, 5.7 mm and 6.5 mm size screws in the same hole which is of great advantage especially when we have thin neck of femur individuals. Artificial Bone grafting substitute was used in one case. After the surgery, drain, if used, was removed after 48hours and all the patients were encouraged to start in-bed mobilization. Non-weight bearing ambulation was started after 2nd post-op day as tolerable. Partial weight bearing was started by 6-8 weeks after signs of callus formation were seen on follow up X ray. Weight bearing was gradually increased up to tolerance level.

RESULTS

Figure 1: Sharma plates.

Among 20 patients treated with proximal femur locking plate, one patient had implant failure due to early weight bearing. In our study, the remaining 19 patients were followed up till 1 year following surgery. 15patients had unstable intertrochanteric fractures and 5 patients had subtrochanteric extension (Figure 3 – 5). There were no surgical site infections and all the patients had healthy surgical scars healed by primary intention. All patients had fracture union. The mean time to union was 14weeks (12-16 weeks) and the mean limb shortenings were 0.5cm (0-1 cm). No patient had medialization of the shaft; varus collapse >10 degree occurred in 2 patients; and implant screw breakage occurred in 2 patients. The functional outcome was assessed by Schatzker and Lambert criteria and was excellent in 8 patients; good in 6, Fair in 4 and Poor in 2.The average time to bear weight fully and walk was 6.5 weeks. Periodical x-rays and clinical examination assessed fracture union.

Figure 2: Periloc plate (Smith and nephew).

DISCUSSION

Intertrochanteric and sub trochanteric fractures in young adults are usually the result of high-energy injury, such as a motor vehicle accident or fall from a height, whereas in the elderly it results from a simple fall. In a case of

polytrauma and severely traumatized patients, the concept of damage control in acute management must be considered and practiced whenever it is appropriate.[2,3] Evans classified intertrochanteric fractures into stable and unstable types. Unstable fractures are those, which are displaced and cannot be reduced, postero-medial cortical communition and reverse oblique fractures.[4] Seinsheimer's classified sub trochanteric fractures and introduced the concept of posteromedial cortical support and the need for its reduction to produce satisfactory results. Integrity of the lateral wall and its significance in the fracture healing and implant failure in comminuted lateral wall has been reported.[5,6] Trochanteric fractures treated conservatively are associated with high mortality associated with prolonged bed rest, especially in the elderly.[7] It is reserved only for cases of anesthesiological contra-indication.

Figure 3: Pre-operative x rays.

Early surgical intervention is advocated in majority of these patients to reduce the complications associated with long-term immobilization like deep vein thrombosis, thrombophlebitis, pulmonary embolism, urinary and lung infections, decubitus ulcers.[6] Achieving stability and early mobilization in patients sustaining per-trochanteric fractures reduces mortality/morbidity of prolonged immobilization. Horowitz (1966) reported in his retrospective analysis mortality rate of 34.6% for the cases treated by traction and only 17.5% for those treated by surgery Evans concluded in his study that operative fixation could produce greater comfort and increased mobility and lowered mortality following intertrochanteric fractures.[4]

External fixation in intertrochanteric fractures can be considered to be a semi-conservative method. It may be a reasonable alternative for patients who are of advanced age, have a poor general condition and cannot tolerate long operations.[8] However Petsatodis et al, reported prolonged union time, increased incidence of varus position of fracture site and inferior functional outcome in unstable fractures.[9] The treatment choices for internal fixation include intramedullary and extra medullary implants. Dynamic hip screw (DHS) fixation is standard implant of choice in these fractures. DHS provides compression along the femoral neck and if the reduced fracture is stable, load sharing between bone and the implant can occur.[10] Although Madsen et al, reported high technical failure rates (34%) when unstable IT fractures treated with DHS alone. According to their study, the failure rates reduced to 9% when unstable fractures were treated with DHS and lateral trochanteric stabilizing plate.[11]. Also rate of mal-union was significantly higher in unstable fractures when compared to stable fractures treated with DHS fixation.[12] Common causes of failure of fixation are instability of fracture, failure of fixation device, and the location of the screw in the femoral head.[13]

Figure 4: Immediate Post op (Mippo technique).

Figure 5: 1yr Post-operative X rays-excellent result.

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failure of fixation device, and the location of the screw in the femoral head.[13]

Figure 6: Poor result where patient walked immediately and inplant migration due to severe osteoporosis.

Correct placement of locking screws is of utmost importance, especially the screw into the femoral calcar, which along the posterior and inferior locking screws enables an angular stable buttress that increases the stability of the fracture. One of the biggest advantages is its option to use minimally invasive plate osteosynthesis and its improved fixation of osteoporotic bone achieved through screw angulation and locking plate interface[13]. Biological fixation of comminuted sub trochanteric fractures with PFLP provides stable fixation with high union rate and fewer complications. According to Guo-Chun Zha et al. in their study found no cases of cut-out of femoral head screw possible due to the mechanical advantage of three-dimensional and angular stable fixations.[14] In stable fractures treated with DHS, patients can be made to bear weight immediately following surgery. Whereas in cases of patients treated with PFLP can be made to start full weight bearing only after radiological evidence of callus formation, hence it can be a limiting factor.

In this study, we found that PFLP can be used for stable and unstable per trochanteric fractures and had fewer complications even in osteoporotic individuals possibly due the angular stable fixation. There were no cases of peri-operative complications. We found that all patients had fracture union (6-8 weeks). One elderly female patient with intertrochanteric fracture treated with PFLP, started weight bearing early and developed proximal migration of the implant. The other cause of migration could be osteoporosis and poor bone stock. The patient was advised revision procedure but the patient was not willing for any other procedure and was wheelchair bound and was one of the poor results. Another elderly male patient died due to congestive heart failure 5 months following surgery and was not included. The complications associated with these plates, like implant failure, varus collapse is still possible. As it is a rigid implant, it does not allow controlled collapse like DHS fixation.

CONCLUSION

Union was achieved in unstable, comminuted trochanteric fractures without significant complications and neck shaft angle was maintained in majority of the cases following proximal femur locking plate fixation. In patients where Indian Sharma plates were used, Fracture reduction, the placement of 3 proximal locking screws into the neck and head of femur, especially the screw placed into femoral calcar and bone quality determines the outcome of treatment. The alpha screw in Periloc (Smith and Nephew plates) and remaining 4 to 5 screws in to the neck determines the outcome in patients treated with periloc plates with prime consideration to fracture reduction. The Periloc proximal femur locking plates are rigid and stable construct and has given good results for us but we had the opportunity to use it in only 4 patients as the plate is comparatively very expensive. It is found to be more stable and with multiple options of screws, the plate can also be used by MIPPO technique as it has anatomical configuration with side specific and hence comminuted fractures can be treated preserving fracture hematoma. One of the major drawbacks of using proximal femur locking plate is that weight bearing is to be controlled and done only after radiological evidence of callus formation. In our study, proximal femoral locking plate fixation for certain unstable per-trochanteric fixation produced good results. Therefore this device can be a feasible alternative to proximal femur nailing and DHS fixation, in certain difficult unstable trochanteric fractures where greater trochanter is involved along with subtrochanteric extension if done meticulously. The drawbacks of our study are low number of patients and we need to study more number of patients with the PERILOC plates to actually assess the failure and success percentage. Getting the calcar screw in exact place and severity of osteoporosis are key factors to success as in short stature or increased angle of neck,the screw gets placed in undesired position. Hence this plate should be used judiciously with narrow margin of selective indications to obtain reasonable outcome.

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