Section: Orthopaedics

Original Research Article

FUNCTIONAL OUTCOME OF SUBTROCHANTERIC FEMORAL FRACTURE FIXATION USING ANGLED BLADE PLATE

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Received : 17/12/2024
Received in revised form : 12/02/2025
Accepted : 28/02/2025

Keywords:
Subtrochanteric femur fracture, Angled Blade Plate.

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DOI: 10.47009/jamp.2025.7.1.210

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (1); 1083-1086

Abstract

Background: Subtrochanteric femur fractures are generally defined as fractures that occur within 5 cm distal to the lesser trochanter of the femur. The bimodal age distribution highlights the importance of considering both high-energy trauma in younger individuals and osteoporosis-related fractures in the elderly. This study is aimed to ascertain the utility and efficacy of angled blade plate for subtrochanteric fracture. **Materials and Methods:** This prospective study was conducted in the Department of Orthopaedics, N.S.C.B. Medical College & Hospital, Jabalpur (M.P.) from 1st September 2022 to 30th June 2024 in 17 diagnosed patients of subtrochanteric fracture satisfying the inclusion-exclusion criteria and was operated by open reduction and internal fixation with angled blade plate. **Result:** In this study of 17 patients, majority were male (64.70 %) with the age group from 25 years to 70 years with mean age of 54 + 14.44 SD years. Two patients were lost to follow up. The union rate was 93% and Average radiological union time was 21 + 2.18 SD weeks and Average clinical union time was 17.14 + 1.87 SD weeks. At the end of 6 months, the follow-up mean HHS was 81.2 + 7.31 and mean VAS score was 1.06. 1 patient (7%) had implant failure and went into non-union, 1 patient (7%) had superficial skin infection managed with appropriate antibiotics. **Conclusion:** The surgical technique for using a 90° angled blade plate is technically demanding, but careful adherence to the principles such as proper patient selection, pre-operative planning, minimal medial soft tissue dissection, proper length and placement of blade into the thick trabecular area of the inferior portion of femoral head near the calcar femorale and insertion of 4 screws distally from fracture site during surgery helps maximize the chances of a successful outcome.

INTRODUCTION

Subtrochanteric femur fractures are fractures that occur within 5 cm distal to the lesser trochanter of the femur. The bimodal age distribution highlights the importance of considering both high-energy trauma in younger individuals and osteoporosis-related fractures in the elderly.[1]

It has been shown that flexion or extension of the hip while in bed can produce forces at the femoral head as large as 2.5 - 3 times body weight, while slow walking can result in hip forces of up to 4.9 times body weight. Thus, fixation systems can be exposed to high stresses, even in relatively immobilized patients. Comminution at the fracture site reduces the potential for compressive load transfer between fracture components, increasing the stress on the implant.[2] These high stresses can reduce implant life and cause mobility of the fracture components hence such fractures are associated with high complication rates, and include non-union and implant failure, which occur regardless of the fixation method, because of the unique anatomical and biomechanical features of the subtrochanteric fracture. A medial buttress is important to minimise implant stress and fatigue failure.[3,4] Treatment options for subtrochanteric fractures typically fall into two main categories: cephalomedullary hip nails and lateral plate-screw systems.

The angled blade plate is considered by some, to be the gold standard in extramedullary fixed-angle proximal femoral plate fixation, but it requires an extensile lateral approach to the femur for insertion.[5]

ISSN (O): 2687-5365; ISSN (P): 2753-6556

The angled blade plate allows for correction in multiple planes (e.g. malrotation, flexion/extension and valgus/varus deformities) while only creating a small footprint, making it the ideal implant for subtrochanteric revision surgery. The angled blade plate, in often compromised bone stock of the femoral neck and head, is superior to multiple locking screws.[6] In this article, we intend to present angled blade plate as a biomechanically sound extramedullary device for fixation of subtrochanteric fractures.

MATERIALS AND METHODS

This prospective study was done in the Department of Orthopaedics of N.S.C.B. Medical College, Jabalpur, (M.P), from 1st September 2022 to 30th June 2024. It included 17 patients with subtrochanteric fracture who underwent open reduction and internal fixation with 90^0 angled blade plate. Out of 17 patients, majority were male (64.70 %) with the age group from 25 years to 70 years with mean age of 54 $\pm$ 14.44 SD years. Two patients were lost to follow up. The commonest mode of injury was by fall (58.82%) and rests were by road traffic accident (41.18%). According to Seinsheimer classification,[7] out of 17 cases, 6 patients (35.29%) had Type 2C fracture, 4 patients (23.52%) had Type 2B fracture, 3 patients (17.64%) had Type 3A fracture, 2 patients (11.76%) had Type 3B fracture, 1patient (5.88%) had Type 2A fracture and 1 patient (5.88%) had Type 5 fracture. Mean time since injury to date of operation was 8.58 $\pm$ 2.29 SD days.

Operative Technique

Preoperative planning was done to obtain information regarding (a) The position of the plate (b) The point of entry: It is just below the innominate tubercle of the greater trochanter. The lateral bend of the blade plate should match the trochanteric ridge (c) The length of blade: The tip of the blade should lie in the centre of the femoral neck just below the intersection of the tension and compression trabeculae about 8-10 mm above the calcar. A blade should be long enough, so its tip comes to lie 5-10 mm off the subchondral cortex of the head (d) The length of the plate: The fracture pattern determines the length of the plate and the steps of insertion. Our goal was to insert 4 screws into normal bone distally to the fracture site.

All the patients were treated with open anatomic reduction, minimal soft-tissue stripping of fracture fragments, and internal fixation using a 90^0 angled blade plate. Patients were assessed clinically and radiographically at 1.5 months, 3 months and 6 months to assess the fracture union and the progress of patient recovery using Harris Hip Score and VAS (Visual Analogue Scale) score.

Sitting was allowed from the next post-operative day and isometric quadriceps exercise and ankle pump were started. Partial weight bearing by using a walker with a three-point gait was initiated after 4 weeks. Full weight bearing was initiated along with a walker with a four-point gait after 8 weeks.

RESULTS

The union rate was 93% with average radiological union time of 21 $\pm$ 2.18 SD weeks and average clinical union time of 17.14 $\pm$ 1.87 SD weeks. At the end of 6 months, the follow-up mean HHS was 81.2 $\pm$ 7.31 and mean VAS score was 1.06. 1 patient (7%) had implant failure (plate breakage) and went into non-union, 1patient (7%) had superficial skin infection managed with appropriate antibiotics.

Figure 1: X-ray PBH- AP & Lateral view

Figure 2: Pre-op templating

ISSN (O): 2687-5365; ISSN (P): 2753-6556

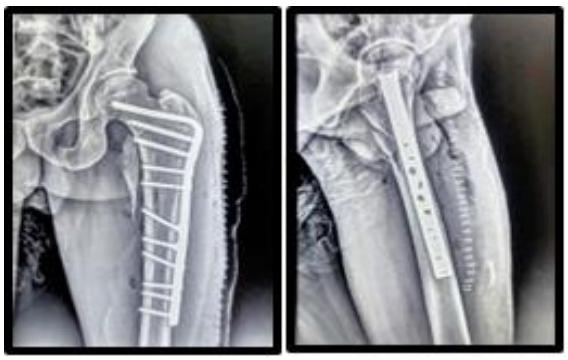

Figure 3: (A&B) Immediate Post Op X-ray Xray

Table 1: Harris HIP score result at 6 months follow up

Harris HIP score	Frequency	Percentage
Excellent	1	7
Good	9	60
Fair	4	26
Poor	1	7
Total	15	100

Table 2: VAS score result at 6 months follow up

Vas score	Frequency	Percentage
None	5	33
Mild	9	60
Moderate	1	7
Severe	0	0
Total	15	100

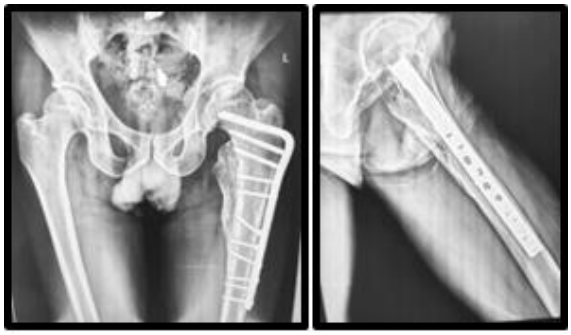

Figure 4: (A&B) Follow up X-ray at 6 months

Figure 5: A Straight leg raise, 5B Squatting

Figure 6: (A & B) showing pre-operative X-ray AP & Lateral view. C & D shows immediate post operative X-rays. E shows follow up 5 months Post-operative X-ray of one patient that landed up in non-union due to implant failure (plate breakage). Most likely cause was early weight bearing and varus malreduction.

DISCUSSION

Myung-Chul Yoo et al,[8] reported in their study that average HHS was 96 ranging from 89 to 100 with average follow up period of 26 months. S. M. Kim et al,[9] compared the two groups (atypical & typical group) using Harris Hip Score which was 83.1 points vs 86.8 points; (p = 0.522) at the time of final follow-up. The mean follow-up of their study was 31.2 months. In the present study, the follow-up mean HHS was 81.2 $\pm$ 7.31 SD. Follow-up period of 6 months in our study was a limitation in this regard and longer follow-up is required for better functional evaluation.

CONCLUSION

The surgical technique for using a 90° angled blade plate is technically demanding but careful adherence to the principles such as proper patient selection, pre-operative planning, minimal medial soft tissue dissection, proper length and placement of blade into the thick trabecular area of the inferior portion of femoral head near the calcar femorale and insertion of 4 screws distally from fracture site during surgery helps maximize the chances of a successful outcome.

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ISSN (O): 2687-5365; ISSN (P): 2753-6556

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ISSN (O): 2687-5365; ISSN (P): 2753-6556