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### Outcome of Vancouver type B2 periprosthetic fracture in hemiarthroplasty by trochanter hook plate

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#### Abstract

**Background:** Fractures around hip is an increasing burden in elderly causing significant morbidity and mortality. Periprosthetic fractures occurring after hemiarthroplasty of hip is a serious complication. In this study, we have reviewed our experience in the treatment of periprosthetic fractures.

**Method:** In our study 8 patients (6 men and 2 women; mean age:  $65 \pm 8$  years) with periprosthetic fractures treated with ORIF with trochanteric hook plate with proximal unicortical screws in the zone of prosthesis and below by bicortical screws with a minimum follow up of 4 months and maximum up to 1 year was carried out. The average union period was checked after operation with radiologic findings. Radiologic outcomes were evaluated. All cases were assessed postoperatively for functional outcome in terms of range of motion, pain and walking distance.

**Results:** The average time for union was 16 weeks and we have achieved 90% of union and Good range of motion with no pain. There was no case with loss of fixation or loss of reduction requiring revision surgery.

**Conclusion:** We observed good functional outcome in patient treated with Trochanteric hook plate. Reversed trochanteric hook plate is a reliable, effective option for management of Vancouver type B2 periprosthetic femoral fractures.

**Keywords:** Type B2 periprosthetic fracture, hemiarthroplasty and trochanter hook plate

#### 1. Introduction

The Periprosthetic femoral fractures are less common. [1, 2] Periprosthetic fracture after hip hemiarthroplasty is a serious complication. Postoperative periprosthetic fracture, therefore, is a vital injury in most of the patients with osteoporotic bone, poor mobility and associated medical co-morbid conditions. After total hip replacement, the outcome of periprosthetic fracture is well known, whereas a very little is known for periprosthetic fractures that occur around hemiarthroplasty implants performed for hip fracture. [3, 5]

Treatment of periprosthetic fracture is a complex procedure for orthopedic surgeons and a real challenge. Periprosthetic fracture treatment depends on the location and the stability of the fractures, the stability of the femoral stem, the quality of bone, and the medical conditions and functional demands of the patients. To help in the decision-making process, the Vancouver classification was developed as a reliable and valid guideline, as it includes fracture site, implant stability and the surrounding bone quality. [6, 8] According to the Vancouver classification, the periprosthetic fractures are classified in three categories based on fracture location. Type A fractures are located in the proximal femur and are subdivided in AG when involving the greater trochanter and AL for the lesser trochanter. Type B fractures occur around the stem, which is stable for subtype B1, loose with adequate bone stock in subtype B2 and, finally, loose with poor bone stock in subtype B3. All the fractures below the stem are categorized as type C.

The objective of this study was to evaluate the clinical outcome of periprosthetic fractures around hemiarthroplasty stems.

#### 2. Material and Methods

This Prospective study was conducted from March 2017 to March 2019 at Department of

Orthopaedics, Khaja Bandanawaz Institute of Medical Sciences, Kalaburagi who had sustained postoperative periprosthetic fractures around previous hemiarthroplasty of hip were identified and included in our study. Patients whose fractures occurred intra-operatively were excluded from the study. Pre-operative radiological classification of the fracture

was done by operating surgeon. Written informed consent was taken from all the cases before enrollment.

After admission and initial assessment, fractures were classified according to the Vancouver classification, the treatment plan was done according to the location of fracture, the stability of the prosthesis and the surrounding bone stock.

**Table 1:** Vancouver classification of postoperative periprosthetic femoral fracture

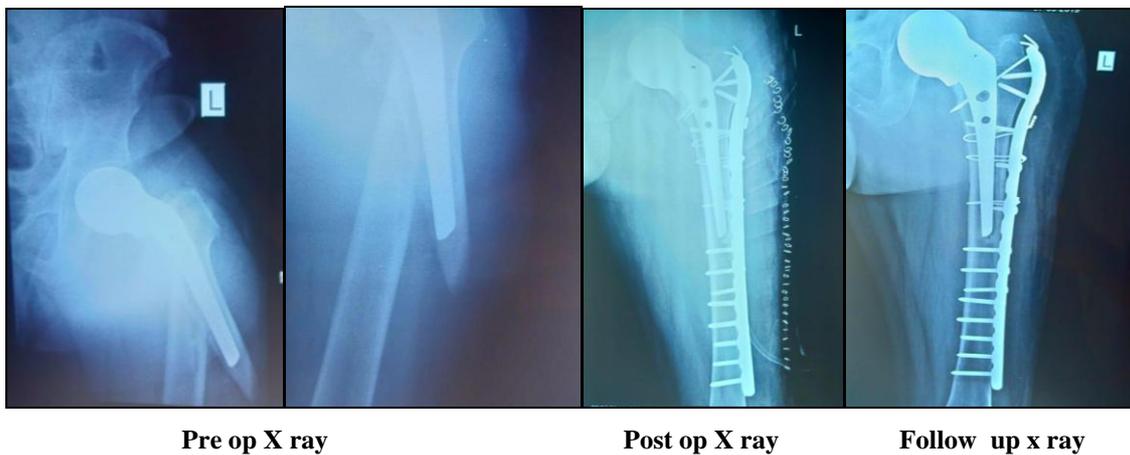
Type	Location
A	Around trochanter
AG	Around greater trochanter
AL	Around lesser trochanter
B	Around or just distal to the stem
B1	Stable fixed stem
B2	Loose stem
B3	Loose stem with poor bone stock
C	Well below the stem

**Table 2:** Showing patient characteristics and fracture characteristics

General characteristics of patients	
Number of patients (N)	8
Mean	65 ± 8 years
Sex(male/female)	6/2
Fracture characteristic	
Affected side(right/left)	3/5
Fracture line(oblique/transverse)	2/6
Union time(average)in weeks	16

We used Titanium trochanteric hook plate for Vancouver type B2 fractures. Surgery was performed in lateral decubitus position on a standard table. An incision was given on the previous scar mark. The femoral component stability was tested by applying traction on the prosthesis, rotational force on the prosthesis. [9] Once the fractures were correctly classified intra-operatively trochanteric hook plate was used for type B2 fractures. The plate selected most frequently had

13-15 holes with the aim to extend the plate from tip of greater trochanter up to lateral condyle femur to prevent stress riser. Reverse contralateral plate allowed the racket shaped portion of the distal femur plate to support the greater trochanter. Position of the plate was checked under image intensifier in both AP and lateral views. Bicortical locking screws were placed into the trochanter and into the femoral shaft distal to the tip of prosthesis.



Unicortical locking screws were placed along the length of stem. To improve rotational stability of the proximal fragment cables were applied in the proximal fragment. [10] Average surgical time was 150 minutes (range, 120-180 minutes). Postoperatively, patients were allowed non weight bearing for And 6 months.

6 weeks, partial weight started at 10 weeks; Full weight bearing was allowed once there was evidence of clinical and radiological union. Patients were followed up at 6 weeks, 10 weeks and 16weeks and 6 months. The functional outcome was measured in terms of Harris hip score at 16weeks



Fig 1: Active SLRT

Fig 2: Flexion

Fig 3: Abduction

Clinical Images

### 3. Results

Eight patients of periprosthetic fracture were admitted, all of which underwent operative management. Demographic and fracture characteristics of the patients are described in table 2. Out of the 8 patients classified as Vancouver type B2 radiologically. Trochanteric hook plate was used in 8 fractures found to be in B2 intra-operatively. All fractures were united at an average of 16 weeks. Harris hip score at final follow-up at 6 months was 87. Postoperatively one patient developed superficial wound infection. The infection was successfully treated by irrigation and debridement of wound and intravenous antibiotics.

Table 3: Harris hip score

Harris hip score	No of the patients
Excellent(90-100)	5
Good(80-89)	2
Fair(70-79)	1
Poor(<70)	0

Complications-None observed

### 4. Discussion

The most recommended and commonly method used for treatment of displaced intracapsular hip fractures occurring in elderly is Hemiarthroplasty. [11] Recently, Periprosthetic fracture after hip arthroplasty is a trending problem affecting elderly with an increased evidence that the uncemented Austin Moore prosthesis is associated with a high rate of intraoperative Fracture. [12, 13]

Treatment options include open reduction, and internal fixation of the fracture while leaving the stem in situ, and femoral revision with or without adjunctive internal fixation. [14, 17] It is recommended that Vancouver B2 fractures should be treated with a long femoral stem revision to restore stability of the femoral prosthesis and to obtain sufficient intramedullary fixation of the fractures. This strategy permits early weight bearing and therefore improved mobility compared with treatment with osteosynthesis and protected weight bearing. However, no single surgical recommendation has gained universal acceptance. [18, 20]

Generally, stem revision surgery requires a longer operation time, more blood loss, extensive soft tissue stripping, more loss of bone stock, and increased risk of infection, substantially increasing perioperative morbidity and mortality. In this study, we used ORIF with Trochanteric hook plate to treat Vancouver type B2 Periprosthetic fracture. Several authors have reported that fixation of Periprosthetic Fractures using plates is a reliable treatment option associated with a low rate of complications. [21, 22] One of the challenges for ORIF of Periprosthetic fracture is to achieve sufficient fixation in the proximal fragment around the zone of the

femoral prosthesis. [23] Cables are typically supplemented with screws in the trochanteric region or with unicortical locked screws in the zone of the prosthesis. [24, 26] Relying on unicortical locked screws without cables should be avoided, as these constructs result in inadequate rotational control. [17] In a biomechanical study, only proximal cable fixation was shown to provide significantly less axial stability compared with methods where cables and locked or unlocked screws were used, and proximal unicortical locking screws without cables were associated with a statistically significant difference in load failure compared with the cable group. [25-27] Although anatomical locking compression plates for proximal femoral fracture fixation have been developed, proximal trochanteric fixation is difficult, especially when the fracture line extends proximally as these plates lack in the number of screw options. In contrast to these plates, the racket shaped portion of reverse distal femur locking plate allows the surgeon to put multiple unicortical and bicortical screws in proximal fragment despite the metaphyseal presence of implant. [28]

The bone around the tip of femoral stem is under considerable stress therefore it is important to eliminate the stress riser effect of femoral stem. This can be obtained by sufficient distribution of stress by spanning of femur from greater trochanter to supracondylar region. In our series of patients we have spanned the whole length of femur extending from greater trochanter to supracondylar area of femur. [29] Another concern is screw pullout that occurs due to dynamic loading, especially in patients with osteoporotic bones. In comparison with unicortical screws, bicortical screws provide better rotational stability and are less likely to pull out. It is postulated that they may jeopardize the stability of the stem or the integrity of the cement mantle when aimed proximally. [30] However, most reports suggest that that despite violation of cement mantle with proximal screws, it does not result in premature loosening of the femoral stem. [31, 33]

The proximal femoral fixation can be supplemented with cables to prevent rotation of the fragment. We used cables in the proximal fragment as biomechanically unicortical screws with cables in the proximal portion are reported to provide additional stability in compression, lateral bending and torsion as compared to proximal cables alone. [34]

### 5. Conclusion

We observed good functional outcome in patient treated with Trochanteric hook plate. Reversed trochanteric hook plate is a reliable, effective and relatively cheaper option for management of Vancouver type B2 periprosthetic femoral fractures. The limitation of our study was small sample size. In future, a study with larger sample size will validate these findings.

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