



Short Term Functional Outcome of Valgus Intertrochanteric Osteotomy in Delayed Presenting Femoral Neck Fractures

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Abstract

Background In the developing world, nonunion of femoral neck fracture is mostly due to neglect by the patient and their attendants in seeking timely interventions. There are various options available to deal with the nonunion femoral neck, each with their own pros and cons.

Materials and Methods We performed valgus intertrochanteric osteotomy in 6 delayed presenting cases of femoral neck fracture at our institution between Jan 2020 to May 2021. All cases were operated over traction table using the subvastus approach. After desired osteotomy was made, the final fixation was made using 135° barrel plate in all the cases. Evaluation was done at subsequent follow ups by serial x-rays to look for union at the osteotomy and fracture site and Harris Hip Score (HHS) .

Results The average age was 45.5 years and average duration of trauma was 4.5 months. The average Pauwel angle was reduced to mean 30° from preoperative mean of 55°. All cases went on to union both at the fracture as well as osteotomy site at an average of 2.5 months. Mean HHS improved from 55 to 85. One patient developed AVN however two others had painless limp.

Conclusion Valgus intertrochanteric osteotomy is a great option to salvage the femoral head. Meticulous preoperative planning is the key to success as the procedure is easy to learn and perform using the simple fixation device like 135° single angle barrel plate.

Keywords: Nonunion femoral neck; 135° single angle barrel plate; Pauwel angle; Valgus intertrochanteric osteotomy

Introduction

Nonunion of the femoral neck still occur with an incidence of approximately 10% to 30%.^[1,2] Factors contributing to nonunion of the femoral neck include impaired vascularity, inaccurate reduction, and loss of fixation. The appropriate treatment depends on several factors, including the physiological age of the patient, the viability of the femoral head, the amount of resorption of the femoral neck, and the duration of the nonunion. Most patients with femoral neck nonunion are older than 60 years of age and may be poor surgical candidates, and osteoporosis decreases

the efficiency of any internal fixation. In general, operations for the nonunion of the femoral neck can be non vascularized and vascularized bone grafts, muscle pedicle graft, valgus intertrochanteric osteotomy, and prosthetic replacement.^[3,4] In general adults younger than 60 years old, non-union in which the femoral head is viable can be treated by valgus intertrochanteric osteotomy.

The concept of valgus intertrochanteric osteotomy was given by Pauwel in 1927, according to his

findings showing that nonunion of femoral neck fracture was due to the high shear forces that increased with the vertical orientation of the fracture.^[5] This technique converts shear forces to compressive forces at the fracture site. It is a type of angulation osteotomy made through or just distal to the lesser trochanter. A serious disadvantage of this procedure, if not done properly, is the production of an extreme valgus position of the femoral head and neck leading to the shortening of the abductor lever arm and abductor lurch.^[6]

In our study, we have reviewed the short-term functional outcome of valgus intertrochanteric osteotomy in 6 delayed presenting cases of femur neck fracture with the nonunion.

Materials And Methods

Between Jan 2020 to May 2021, 6 patients presented to our institute with nonunion of femoral neck. Details of date of injury, mode of injury, preoperative radiographs were obtained. Post valgus intertrochanteric osteotomy we analysed them on the following criteria: Pauwel angle⁵, union at fracture site, union at osteotomy site, avascular necrosis (AVN) changes and Harris hip score (HHS).^[7] Radiographs were taken as AP and Lateral view, and MRI to rule out AVN changes. Inclusion criteria were age <60 years, neck not reabsorbed and no AVN.

Based on preoperative radiographs, Pauwel angle was measured in each case and the wedge angle to be resected was calculated by subtracting the postoperative desired angle of 30° or less from the measured Pauwel angle (Figure 1). After spinal anaesthesia, patient was positioned supine on the traction table. Operative limb prepped and draped

with proper antisepsis. Through lateral incision and subvastus approach a guide wire for the dynamic hip screw was inserted at the base of the greater trochanter at an angle equivalent to barrel plate angle (135°) minus the wedge angle under the guidance of the image intensifier. Thereafter, a Y-osteotomy was made at the level of lesser trochanter as per calculated wedge angle. Osteotomy site was closed by abducting the leg and fixing with 135° barrel plate to the shaft of proximal femur. A 6.5mm cannulated cancellous screw (CCS) was inserted from greater trochanter into the head prior to insertion of lag screw in all the patients to enhance stability (Figure 2).

Postoperatively, knee and ankle mobilisation was started from the next day, and partial weight bearing using crutches from 3rd week. Radiological evaluation was performed every 6 weeks till bony union achieved at both fracture site and the osteotomy site. Clinical outcome was evaluated using the HHS; a score of 90 to 100 was excellent, 80 to 89 as good, 70 to 79 as fair, and <70 as poor.

Results

The average age in our study was 45.5 years (min 36 years and max 52 years). Average duration of trauma 4.5 months (min 1 month and maximum 12 months). Average Pauwel angle was reduced to mean 30° from preoperative mean of 55° (min 45° and max 70°). In all the patients both the fracture site and osteotomy site united at an average 2.5 months. The mean Harris hip score improved from 55 preoperatively to 85. All the patients were followed up to mean 9.6 months (min 3 months and max 16 months). One patient developed AVN of femoral head and is planned to undergo total hip replacement whereas two other patients developed painless limp.

Figure 1 : A 37-year-old male with 3 months old fracture neck femur with the preoperative radiographs showing 60° Pauwel angle

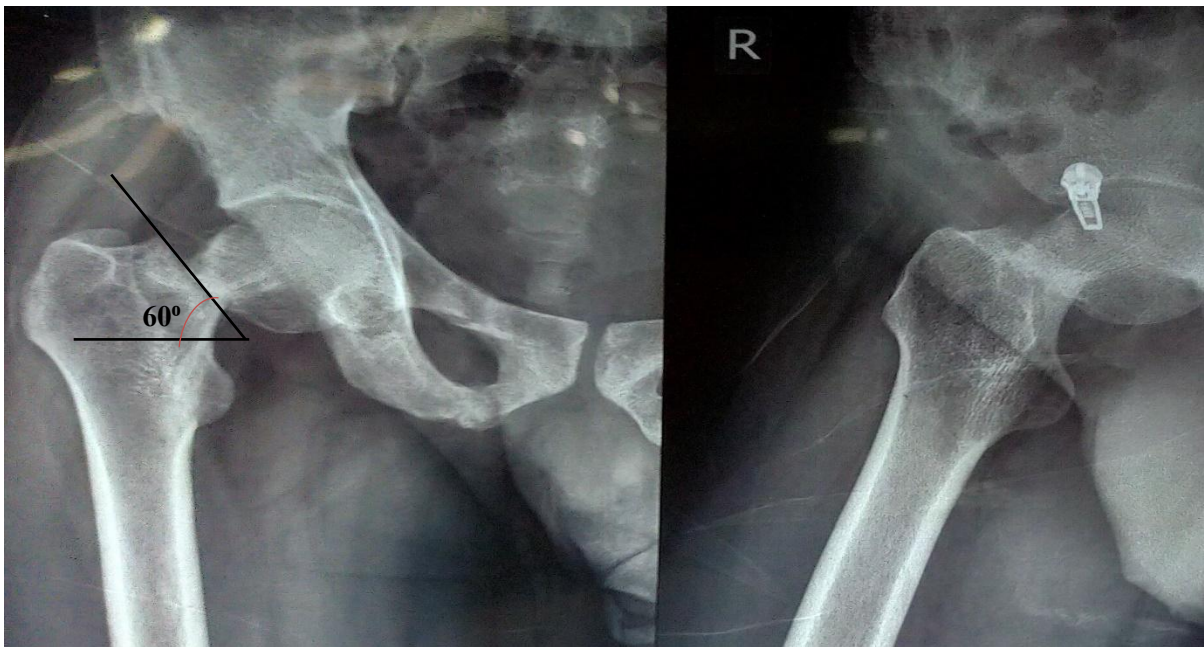
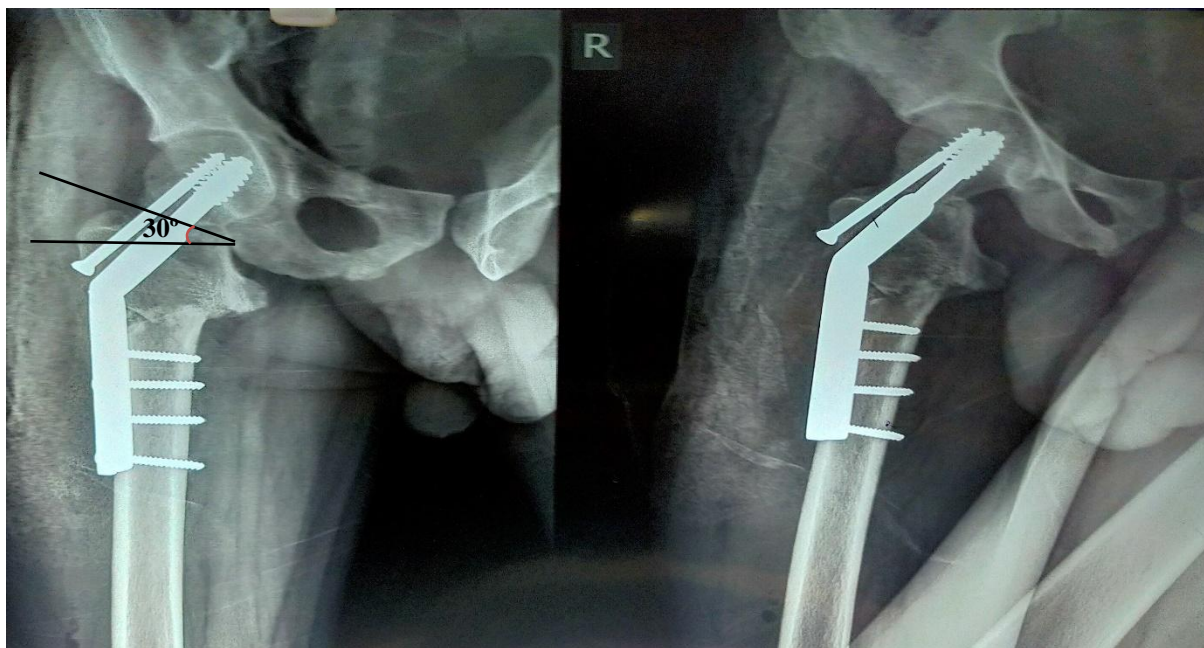


Figure 2 : A 30° wedge was removed based on the preoperative Pauwel angle (60°) to get the desired Pauwel angle of 30° and fixed with 135° Single angle barrel plate and a 6.5mm CCS.



Discussion

Femoral neck fractures are associated with significant rates of nonunion and avascular necrosis.^[8] Various factors collectively play the role in hampering the union; a) precarious blood supply of the head and neck region, b) absence of cambium layer of the

periosteum, and c) bathing of fracture in the synovial fluid owing to its intracapsular location.^[9] Fractures that fail to unite even after >90days are defined as nonunion.^[3] Fractures that are operated after 3 weeks have less potential to unite if, only internal fixation has been done.^[10]

There are various treatment options available and described in the literature for the treatment of femoral neck non-union. Valgus intertrochanteric osteotomy is the one procedure which has stood the test of the time and is quite rewarding. The earlier methods described by Pauwels and later on many have followed it and produced good outcomes.

In Indian scenario, study of Magu et al in 48 adults was performed by modified Pauwels intertrochanteric osteotomy and fixed by double angle blade plate showed average neck shaft angle 132.7, average Harris hip score to be 86.7, union in 44 patients while AVN in two.^[11] In another study by Kulkarni et al in 44 patients had osteotomy fixed by simple DHS and showed union in 93% patients while 3 had AVN.^[12] Gupta et al operated on 60 patients using dynamic hip screw and showed 93% union rate and AVN in 4 patients.^[13]

Schoenfeld et al performed valgus intertrochanteric osteotomy in 4 patients and all of them demonstrated healing at an average duration of 6 weeks, no cases of AVN identified while 2 patients had a slight Trendelenburg limp in their gait.^[14] In our study, successful fixation and union was achieved in all 6 patients who received a valgus intertrochanteric osteotomy with sliding hip screw and only 1 patient developed AVN.

Valgus intertrochanteric osteotomy fixation done using DHS is quite advantageous to other fixation method like double angle blade plate as it has easy learning curve and does not have the risk of splitting the head as in the latter, moreover the lateralisation of the shaft in simple DHS allows to maintain the normal knee biomechanics and osteoarthritis. One disadvantage of repositioning valgus osteotomies is that valgus positioning of the proximal femur shortens the lever arm and alters the hip biomechanics, thus increasing contact pressure on the femoral head. This may increase the risk of osteoarthritis and avascular necrosis.^[15] Excessive valgus alignment > 15 degrees, compared to the normal hip, after the osteotomy results in poorer functional outcome.^[16]

Conclusion

Valgus intertrochanteric osteotomy offers an excellent bail out method to salvage the head for non-union femoral neck fracture in the delayed presenting

cases. Osteotomy fixation using dynamic hip screw and 135° single angled barrel plate offers greater advantage over other fixation devices. It has good union rate and fewer complications. However, our study has the limitation of few numbers of cases and a shorter duration of follow up.

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