



NONUNION FRACTURE NECK OF FEMUR MANAGED BY SUBTROCHANTERIC VALGUS OSTEOTOMY WITH INTERNAL FIXATION AND FIBULAR STRUT GRAFT.

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ABSTRACT **Introduction:** Femoral neck nonunion continues to be regarded as 'the unsolved fracture'. The main risk factors are high energy injuries, fracture displacement, poor blood supply to femoral head and improper alignment and reduction of fracture. Treatment in elderly patients usually include prosthesis placement whereas in young patients' preservation of their own hip joint is crucial. **Materials And Methods:** This study comprised of 10 patients presented with nonunion neck of femur fractures in Department of Orthopedics, Government General Hospital, Kurnool for a period of 2 years. **Conclusion:** This study summarizes the functional outcome of valgus subtrochanteric osteotomy with fibular strut graft and internal fixation in the treatment of nonunion neck of femur fractures, with a note on factors predictive of good functional outcome and potential pitfalls to be avoided in this procedure.

KEYWORDS : Nonunion, neck of femur fractures, valgus osteotomy, fibular strut graft.

INTRODUCTION:

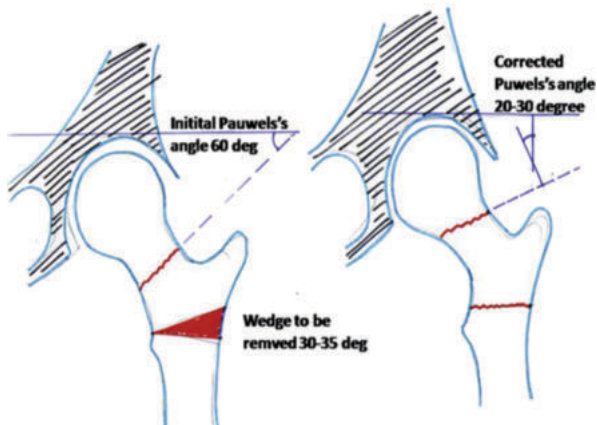
Nonunion neck of femur (NOF) fracture remains a significant challenge to treating orthopaedician even after the evolution of advanced techniques and implants. Nonunion following surgical fixation can result from initial fracture displacement, poor fracture reduction, or fractures with posterior comminution. Neglected NOF fractures are more commonly seen in the developing world and are associated with complications that includes osteopenia, resorption of neck, and avascular necrosis & these complications are also further detrimental to head salvage. These fractures occur due to high energy trauma in young and osteoporosis in old.

The methods of treating nonunion aim either at improving the biology and bone stock (non-vascularized and vascularized bone grafts, muscle pedicle graft) or improving the biomechanics (valgus osteotomy).

The concept of valgus osteotomy was refined by Pauwels in 1927, according to his findings showing that nonunion NOF was due to the high shear forces that increased with the vertical orientation of the fracture. The proposed biomechanical solution was to redirect these forces into compression forces *via* an angulation osteotomy and fixation with a plate device.

ANGLE OF WEDGE:

Weight bearing force at hip joint is at an angle of 16° to central axis and 25° to anatomic axis of femur. The desired wedge is calculated by angle between fracture line and a line perpendicular to weight bearing force. For every 10° angle 10 mm is taken as height of base of wedge.



1. Angle Of Wedge Calculation.

MATERIALS AND METHODS:

This study was conducted in Department of orthopedics, Kurnool medical college for a period of 2 years from July 2020 to July 2022. This study comprised of 10 patients with nonunion NOF fractures. Patients were diagnosed with x-rays - AP pelvis with both hips with 20 deg internal rotation and lateral view of involved side.

INCLUSION CRITERIA:

#NOF > 3 months old
Age < 40 years
Pauwel's type II / III
Garden's type III / IV

EXCLUSION CRITERIA:

#NOF < 3 months old
Age > 40 years
signs of collapse of head on x-ray



2. Pre operative x ray showing nonunion NOF# with fibrous dysplasia of proximal femur.



3. A case of previously treated NOF# presented with nonunion.

SURGICAL TECHNIQUE:

1. Pre op templating: Templating performed on normal hip provides information for position of implant and size of the wedge.
2. Reduction and stabilization: Closed reduction is done by Whittman technique and once the reduction is maintained with K-wire, lag screw is applied and a fibular strut graft is placed below the screw
3. Osteotomy and plate fixation: A subtrochanteric valgus osteotomy was done based on the calculated wedge angle and fixed with a DHS/DCS/ANGLE BLADE PLATE.



4. Immediate Postoperative X-ray.

Post Operative Management:

Quadriceps drill & ankle pump exercises were initiated as soon as patients tolerated. Patients were allowed to sit up and gradual mobilization as partial weight bearing begun. Full weight bearing was allowed after complete union of osteotomy site.



5.4 weeks follow-up x-ray with healed osteotomy site.

FOLLOW UP:

Functions were evaluated using modified Harris hip score four weeks, 3 months, 6 months and final at 12 months. Union, viability of the head and implant cut-out was studied in the radiographs.



6.ROM at 12 weeks postop.



7.12 weeks follow up with healed fracture.

RESULTS:

We got 10 patients, of which there were 7 males and 3 females. Out of the 10 patients, there were 1 sub-capitals, 6 trans-cervical and 3 basal neck fractures. Pauwels III was measured in 7 patients (70%) and II in 3(30%). Fracture union was achieved in all but 10 patients (100%). Time to fracture union ranged from 16 to 28 weeks with mean of 19.94 weeks. Healing of the osteotomy site was also complete (100%) from 8 to 12 weeks with mean of 10.35 weeks. (spearman's RHO value 0.484). The average correction of Pauwels changed was from 70 deg to 30deg. Limb length was regained in 9 patients (90%) and 1 had 2cm of shortening.

Functional outcome was good to excellent (Harris hip score >80) were seen in 90 % patients. We got mild knee pain in 2 and persistent limp in 1 patient. However, there was no case of screw cut-outs. One patient developed avascular necrosis post union (10%), was scheduled for total hip arthroplasty at later date. We had no case of screw migration into the joint or implant cut-out.

DISCUSSION:

Nonunion NOF fractures particularly in the younger age group has always been challenging to manage. Arthrodesis is not accepted in our country particularly for the desire to squat or sit cross legged. Total hip arthroplasty (THA) is a substituting procedure and reserved for the elderly patient. Even in the elderly with femoral neck fracture Magu et al. have suggested osteotomy provides comparable results with THA.

The most common cause for nonunion remains a high shearing Pauwels angle at the fracture site and Gardens type III & IV and Pauwel recognized that nonunion of femoral neck fracture would consolidate within few months if shearing force acting on fracture site was transformed into compression forces.

In the developing countries like ours late presentation is common as the fracture often remains untreated, sometimes patient's unwillingness to seek treatment but mainly due to treatment primarily by osteopaths. Avascular necrosis remains a potential threat with the rate reported in the literature ranging from 12% to 86%.14 The risk is directly proportional to the severity of trauma and displacement of the fracture. MRI can detect this early than the conventional X-ray, but we did not include this special study as pre collapse avascular necrosis of femoral head is not considered to be a contraindication for valgus osteotomy.

Some authors namely Pauwel, Muller and Sharma used the Yshaped wedge-closing/open osteotomy but V-shaped lateral closed wedge osteotomy is technically simpler and provides equally broad osteotomy surface that ensures good bony contact on closure of the osteotomy. This osteotomy also results in rotation of the upper segment of the femur making the osteotomy line oblique. In most of the case series reported in the literature on valgus osteotomy, blade plate fixation has been used, which is more technically demanding. There is always a risk of splitting of femoral head by the sitting chisel in new hands. Most orthopedic surgeons are accustomed to the use of the conventional fixed angle DHS, which is more commonly used in the treatment of intertrochanteric fractures, and is technically much

simpler than the blade plate fixation. Fixation with a single-angled blade plate or a simple DHS will pull the femoral shaft laterally correcting the medialisation of the femoral shaft, restoring the normal inclination of the femur to the sagittal plane and resulting in desirable lengthening.

The weight bearing compressive forces at the hip subtend an angle of 20-25 and the fracture plane is reclined to subtend near this value for optimum output. When blade plate is compared to the DHS, there is a theoretical risk of greater chances of avascular necrosis with DHS as there is thermal necrosis and rotatory motion during reaming and intraosseous vascularity disruption due to large screw placement. Yet the procedure is much simpler and the purchase is good particularly in the younger age patients.

The rate of fracture union (80%) in our patients is comparable to rates achieved by others by valgus osteotomy using the conventional double angled blade plates. The functional outcome in our patients is also comparable with reported outcomes. Seventy percent of patients could squat on floor or sit in the crossed-leg position which is the most satisfying functional gain besides a near normal gait. The causes of limping in our patients were residual shortening of 2 cm. Avascular necrosis (AVN) and nonunion are the most notorious complications in the late neck fractures, and although great efforts have been made in past decades, the real prognosis of the young NOF fractures has not been improved dramatically. Valgusization osteotomy does not increase the chances of nonunion or AVN and there are enough studies that prove it is the temporary instability after fracture which is more detrimental for vascularity of head. Magu et al. had 5 nonunions and 2 AVN in their series of 49 patients however they classified using Pauwels angle only. We had 1 sub-capital fracture went to AVN (union and AVN). Gupta et al. did their study in failed & un-united as well as neglected fractures using the conventional 120 DHS and found to have a radiological outcome of 93% and functional outcome of 90% (good to excellent). They did have 2 cases of implant cut-out (3%) in their series which we did not have.

The limitations of this study are small sample size and short term follow-up. We have not done MRI preoperatively to access the vascularity of femoral head in planning but excluded avascularity on X-ray. Comparing studies with blade plate fixation may be helpful in finding out any significant outcome differences. In conclusion, the results are encouraging for the use of universally available simple DHS for valgus intertrochanteric osteotomy fixation in NOF fractures with high Pauwels angle in relatively young adult patients and are having favourable outcome although AVN exists.

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