



## VALGUS INTERTROCHANTERIC OSTEOTOMY USING DYNAMIC HIP SCREW FOR NEGLECTED NON-UNION OF NECK OF FEMUR FRACTURE IN A MIDDLE AGED MALE-A CASE REPORT.

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### ABSTRACT

Neck of femur fracture is a common orthopaedic problem. The management of the non union of the neck of femur is challenging because of the biological and the mechanical factors at play. Osteosynthesis is the modality of choice for the people aged 60 years or less while arthroplasty is the treatment offered for the older age group. Numerous techniques have been described for the osteosynthesis of the non union of neck of femur. The main principle of all these methods remains optimization of the biology and mechanics of the fracture to promote fracture union and delay the onset of hip arthritis. Here we describe a case of a young middle aged male who due to ongoing COVID-19 pandemic and the imposed lockdowns was not able to receive proper healthcare. He presented to us with 9 months duration of nonunion of right neck of femur fracture. Radiographs were obtained which revealed a Pauwels type 3 fracture and a Sandhu class 2 nonunion. MRI studies were done to ascertain the viability of the femoral head. After all the investigations, a decision was taken to attempt head salvage using a Valgus intertrochanteric Osteotomy. Careful preoperative assessment and calculations were done to accurately determine the osteotomy wedge, DHS pin insertion angle and the goal Pauwels angle. It was decided to correct the Pauwels angle to 30° to reduce shear forces at the fracture site and achieve compression at the fracture site. After the surgical procedure patient was followed up and the fracture as well the osteotomy site showed the signs of union at 24 weeks post operative. Patient achieved excellent function in his hip. He was able to walk pain and limp free, he could squat, sit cross-legged and perform his day to day activities as well as his ground level activities. His post operative Harris Hip Score was 90.8(excellent) at 24 weeks follow up. We thus conclude that a carefully planned valgus intertrochanteric osteotomy is able to achieve excellent outcomes in young patients with non union of neck of femur.

**KEYWORDS :** Non-union Neck of femur, Hip preservation, Proximal femoral osteotomy, Non-union

### INTRODUCTION

Fractures of neck of femur in young adults is a particularly difficult problem to treat due to the biological and the mechanical fractures at play at the fracture site. Given that the case, the nonunion of the fractures of neck of femur is a challenging problem for the treating physician as well as the patient. It has been the consensus that it is prudent to save the head of the femur as far as possible in the young adults and delay the need for total hip arthroplasty or hemiarthroplasty. Countless methods have been described for the management of the non union of the neck of femur fracture. The common denominator in all the methods is the need to optimize the biology and mechanical forces at the fracture site to allow healing of the fracture site. Numerous algorithms have been in place to decide the treatment options for nonunion of the neck of femur. Here we describe a valgus intertrochanteric osteotomy for a non union of neck of femur in a young male of 9 months duration.

### CASE STUDY

A 30-year-old male presented to emergency department of our hospital with complains of inability to walk and bear on right lower limb. Patient had a history of fall with trauma to his right hip 9 months ago. The patient received local treatment from a quack and could not seek appropriate medical treatment due to widespread lockdowns in the country due to on-going COVID-19 pandemic. The patient presented to us with a painful right hip and inability to bear weight on his right lower limb. The patient underwent radiographic evaluation with x ray of pelvis with both hips, Anteroposterior and shoot through lateral radiograph of right hip. The radiographs showed a fracture of the right neck of femur. A diagnosis of neglected non-union of right neck of femur was thus done. A traction and internal rotation antero-posterior radiograph of right hip was subsequently ordered to better delineate fracture morphology. The Pauwels angle was calculated on the radiograph and was found to be 50°. Given the age of the patient, it was prudent to try and salvage the native femoral head and delay the need for replacement. To determine whether the salvage of the

femoral head can be attempted, a Magnetic Resonance Imaging study was ordered to determine the vascularity and status of the femoral head. MRI revealed sufficient vascularity of the femoral head, hence the decision to salvage native femoral head was taken. Decision was taken to perform a valgus intertrochanteric femoral osteotomy with Dynamic Hip Screw to optimize the mechanical and biologic conditions at the fracture site to promote healing. After a thorough pre operative work up and optimization of the patient the patient was posted for the operative procedure.

Pre operative calculations-  
Pauwels Angle- 50°  
Target Pauwels Angle- 30°  
Osteotomy wedge angle-20°  
Wedge size to be removed= 2cm  
DHS angle- 135°  
DHS pin insertion angle- 115°

### Surgical Technique

Position of patient- Supine on traction table with appropriate draping of limb to keep the hip and thigh exposed

**Incision-** Standard lateral approach to hip

### Operative steps-

1. After through draping and painting of the limb, surface marking of greater trochanter was done and a 8 cm incision was taken over lateral aspect of the thigh.
2. Sharp subcutaneous dissection was done.
3. Iliotibial band was sharply divided.
4. Vastus lateralis muscle was elevated off the femoral shaft from the vastus ridge to expose the lateral aspect of the femoral shaft
5. Care was taken to avoid tunneling of the incision.
6. The perforators were ligated or cauterized to minimize bleeding.
7. Fracture was reduced with traction and manipulation using k wires. Reduction of the fracture was confirmed

using fluoroscopy.

8. Temporary reduction was held with K-wires.
9. Richard screw of DHS was inserted using variable angle guide at an angle of 115°.
10. A Cannulated cancellous screw was inserted parallel and superior to the Richard screw to stabilize the proximal fragment and avoid rotational malalignment while triple reaming and insertion of the Richard screw.
11. A k-wire was inserted to mark the proximal osteotomy site in the intertrochanteric region.
12. Another k-wire inserted 2 cm below the first k-wire (to form a wedge shaped osteotomy) obliquely such that it met the first k wire at the medial femoral cortex.
13. An oscillating saw was used to make osteotomy using the two k-wires as guide. Care was taken to keep the medial cortex of the femur intact.
14. The k-wires were removed.
15. DHS barrel plate was inserted over the Richard screw.
16. The plate now stood away from the femoral shaft.
17. The limb was now abducted to bring the shaft toward the plate.
18. The femoral shaft was held with the plate and distal screws of the DHS inserted to complete the fixation

Post-Operative calculations-  
Corrected Pauwels angle-30°

**Post-Operative protocol-**

Suture removal was done at 15 days post op.  
Patient was allowed partial weight bearing at 2 weeks  
Patient was allowed full weight bearing with support at 6 weeks  
Patient was allowed to walk without support at 12 weeks.

**Post-Operative follow up**

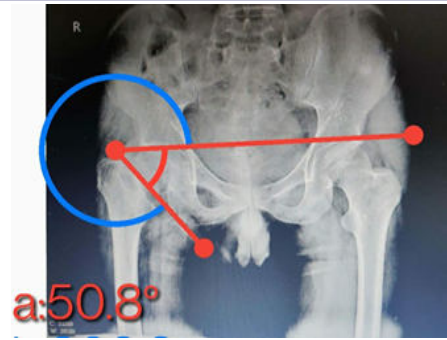
At 18 weeks post operative signs of union were present at the fracture site as well as the osteotomy site and patient had regained full range of motion in the affected hip. Patient was able to squat, sit cross-legged and perform his day to day activities without any assistance. Harris Hip score was- 90.8 (Excellent)



**Fig 1- Radiograph of pelvis with both hips showing fracture right neck of femur**



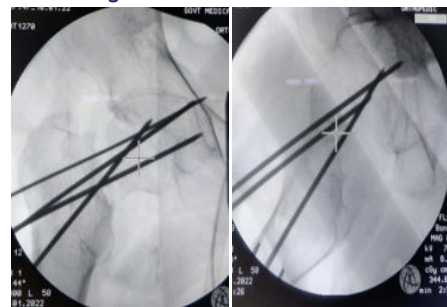
**Fig 2- Traction radiograph to delineate the fracture morphology**



**Fig 3- Calculation of pre-operative Pauwels Angle.**



**Fig 4- MRI showing viable femoral head.**



**Fig 5- Fluoroscopic Image showing fracture held with K-wires**



**Fig 6- Fluoroscopic image showing Richard screw and derotation screw inserted. K wire inserted at the site of proximal limb of osteotomy**

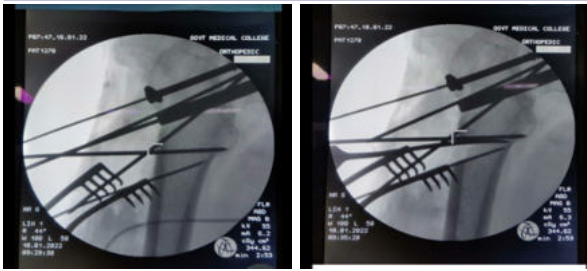


Fig 7- Osteotomy done and lateral wedge of 2 cm removed.

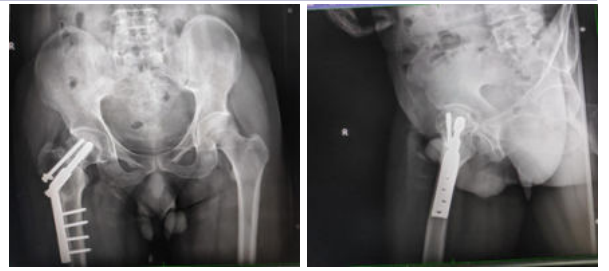


Fig 11- 24 weeks post Operative radiograph showing union at fracture site and the osteotomy site.

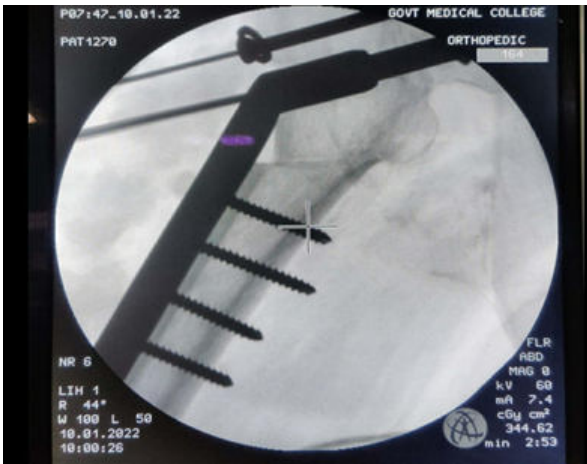


Fig 8- Osteotomy site closed with limb abduction and DHS plate fixed with screws.



Fig 12- Hip Range Of Motion.

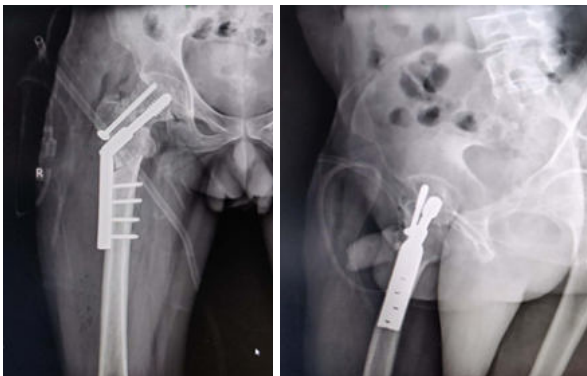


Fig 9- Post Operative radiograph

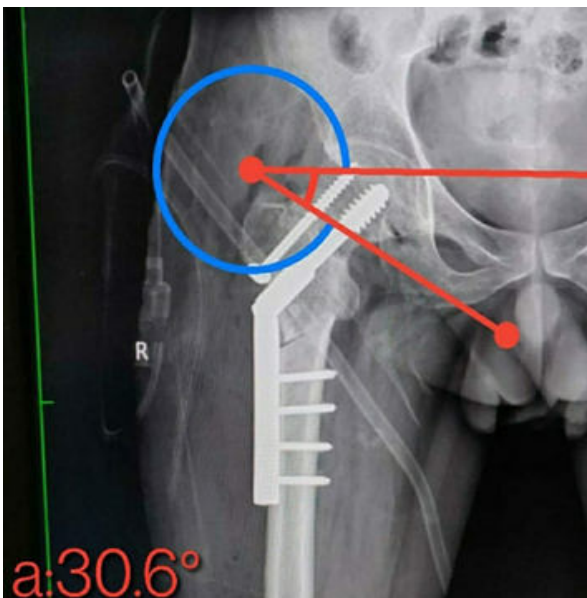


Fig 10- Post-Operative corrected Pauwels Angle.

## DISCUSSION

Hip fractures are a common orthopaedic injury which pose a serious burden to the healthcare system. These fractures are associated with morbidity as well as mortality. Despite great advances in the implant design and surgical techniques, non union of the neck of femur fractures continue to be a burden to the healthcare system. Neglected neck of femur fracture is almost always a nonunion. In India, poor socio-economic status, lack of adequate healthcare facility in the peripheral parts, ignorance of the patients further increase the risk of non-unions. Recently with the COVID-19 pandemic and the associated lockdowns have been a major cause of delay in obtaining adequate healthcare. A patient of femoral neck fracture with complains of pain at 3-6 months should be suspected of a nonunion. A timely intervention is required to treat the nonunion. Nonunion of neck of femur are usually treated by Arthroplasty in the patients older than 60 yrs of age. Osteosynthesis is the preferred modality of treatment for people aged less than 60 years. The goal in these patients is to preserve the native femoral head and delay the need for arthroplasty. Since a large fraction of the population of India resides in the villages and is required to carry out ground level work, it is beneficial to attempt at osteosynthesis as the arthroplasty procedures limit these ground level activities, further causing trouble to the patients, many of whose livelihood depend on their ability to do ground level work. Valgus intertrochanteric osteotomy has stood the test of time as a procedure to address the biology as well as the mechanical factors at play at the fracture site. (Mueller, 1999) Intertrochanteric valgus osteotomy also helps in restoring limb length, making fracture bone more horizontal, buttressing the head from below to improve stability by internal fixation and converting shearing forces into compressive forces. Preoperative determination of Pauwell's angle, reducing this shear angle to about 30 to horizontal so as to achieve compression and get union are key point of this procedure. Lateralisation of the distal shaft of femur restores the mechanical axis and the problem of future knee valgus. Fixation with Dynamic Hip Screw helps to achieve lateral translation. (Kulkarni et al., 2017). Before planning

osteosynthesis it is essential to document the vascular status of the femoral head using MRI. Indications for valgus osteotomy include: non-union of neck of femur and vertical shear fracture patterns and delayed presentation of fracture neck femur >7 days. (Huang, 1986)(Jørring & Movin, 1973). The typical causes described for the nonunion of the neck of femur include- absence of the cambium layer which doesn't allow callus to form, predominance of shear forces in a vertical fracture line which doesn't allow compression at the fracture site, avascularity of the femoral head due to trauma to the blood vessels, intra-articular fracture which doesn't allow formation of fracture hematoma due to continuous washing away of the healing factors due to synovial fluid flow. Therefore, the femoral neck must heal via direct endosteal healing. For the patients aged 60 years or less, osteosynthesis is indicated. The main principle of the valgus intertrochanteric osteotomy is to convert shear forces at the fracture site to compressive forces which then promote fracture healing. (Magu et al., 2005)(Magu, 2006). With this said, it is clear that the more vertical fracture configurations (Pauwels 2, Pauwels 3) are most likely to result in nonunion. Sandhu et al gave a useful classification which helps in guiding the treatment of nonunion of neck of femur. (Sandhu et al., 2005) Our patient had a Pauwels type 3 and Sandhu class 2 fracture for which a decision was taken to attempt osteosynthesis. Goals of treatment in such cases include-1. Promote union, 2- Stable fixation, 3-Convert shearing forces to compressive forces, 4-Maintain viability of head, 5-Preserve the vascular supply to the head, 6-Prevent early arthritis of hip. The preoperative calculations necessary include-

Pauwels angle = x

Goal Angle = 30°(to maximize compressive forces)

Osteotomy wedge angle (x-30°) = y

DHS Angle = 135°

Pin insertion angle = (135-y)°

#### Other Hip preserving methods include-

1. Fixation alone using CC screws or DHS
2. ORIF with bone grafting
3. ORIF with revascularization procedure
4. Proximal femoral osteotomy with bone grafting.

#### CONCLUSION

A valgus intertrochanteric osteotomy is an effective surgical technique for the salvage of neglected neck of femur non-union in middle aged population to delay the necessity of the Hip arthroplasty. The patient selection should be based on the fracture morphology, vascular status of the femoral head and the expected outcome for the patients in terms of his functional needs. It is a technique which can delay or obviate the need for hip arthroplasty in such patients and help preserve the native hip.

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