

Evaluation of Results of Valgus Osteotomy in Non Union Neck Femur

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Abstract

Background: Femoral neck fracture is a very common injury encountered in orthopedics. The old fracture neck femur fixation is a great challenge to orthopaedic surgeons. The obliquity of the fracture line leads to shearing forces at the fracture site. By doing valgus osteotomy shearing forces are converted into compressive forces and it also compensates for the limb length shortening that occur due to absorption of neck and compressive forces increases healing. In this study, we have assessed the functional outcome of valgus osteotomy and fixation by dynamic hip screw (DHS) in femoral neck fracture patients.

Material and Methods: 10 cases which were diagnosed with fracture non union neck femur were included in this study. The details of history, mode of injury, time since injury, other relevant history for chronic illness, clinical and radiological examination, Harris Hip Score (HHS) were noted at the time of admission. All patients underwent valgus osteotomy and fixed using 135° angled dynamic hip screw and barrel plate assembly. Post operatively x-rays were done at 1 month, 3 months, 6 months and 1 year. At each visit Harris hip score was taken.

Results: In our study the time taken for fracture union was 5.00 ± 0.82 months with union seen in all the patients at the end of 12 months. HHS in 3 patients was excellent, good in 6 patients and fair in 1 patient. Mean HHS at end of 12 months was 84.30 ± 5.79 .

Keywords: Femur fixation; Valgus osteotomy; HHS; Condylar.

Introduction

Femoral neck fracture is a very common injury encountered in orthopaedics. It occurs commonly in elderly individuals. Only 2–3% of these occur in patients younger than 50 years.¹

However, the increased high-energy trauma has contributed to the increased incidence of femoral neck fracture in younger patients. The young and active patients are generally treated by anatomical reduction and internal fixation as soon as possible.²

Femoral neck fractures in relatively young patients should be treated by reduction and rigid fixation to preserve the patient's hip. However, this treatment may result in non union because of mechanical and biological factors.³

The old fracture neck femur fixation is a great challenge to orthopaedic surgeons. Complications associated with fracture neck femur (non-union and avascular necrosis) makes this injury all the more important. Femoral neck fracture is usually located intracapsularly with synovial fluid bathing the fracture site interferes with healing process. Femoral neck is deficient in periosteal layer so healing is entirely endosteal. The obliquity of the fracture line leads to shearing forces at the fracture site. These factors complementing with precarious blood supply make the non-union of fracture neck femur more frequent.^{4,5,6}

Incidence of avascular necrosis varies from 20% to 25%. The incidence of avascular necrosis increases in young adults because a greater force is required to break the femoral neck in this population and this may also damage the most important arterial group (the lateral epiphyseal) that supplies the lateral weight bearing portion of femoral head.⁷

Pauwel's postulated that in non-union of femoral neck the problem is both biological and mechanical. He suggested that by changing the fracture inclination the fracture site can be brought under compression, thereby resulting in union of fracture. These principles still hold true, most authors have used blade plate for fixation after osteotomy. As dynamic hip screw is a more familiar fixation device in use today and has replaced condylar blade plate for most indications, we used a 135° angled dynamic hip screw barrel plate assembly for fixation which we believe will further simplify the procedure and decrease the complication rate.^{8,9,10}

By doing valgus osteotomy shearing forces are converted into compressive forces and it also compensates for the limb length shortening that occur due to absorption of neck and compressive forces increases healing.

In our present study, we have assessed the functional outcome of valgus osteotomy and fixation by dynamic hip screw (DHS) in femoral neck fracture patients.

Material and Methods

The study was conducted at Department of Orthopaedics at Sri Aurobindo Medical College and P.G. Institute, Indore from January 2018 to December 2019. In this study we have included fracture neck of femur of Pauwel's Type 3. Pauwel's angle is the angle between the line of a fracture and the horizontal as on an anteroposterior radiograph. All patients were followed for period of 12 months.

10 cases which were diagnosed with fracture non union neck femur were included in this study. Out of them 8 were males and 2 were females. The age ranged from 22 to 50 years. The details of history, mode of injury, time since injury, other relevant history for chronic illness, clinical and radiological examination, Harris Hip Score (HHS) were noted at the time of admission.

For all cases true anteroposterior view of pelvis with both hip and lateral view of hip was taken using digital radiograph.

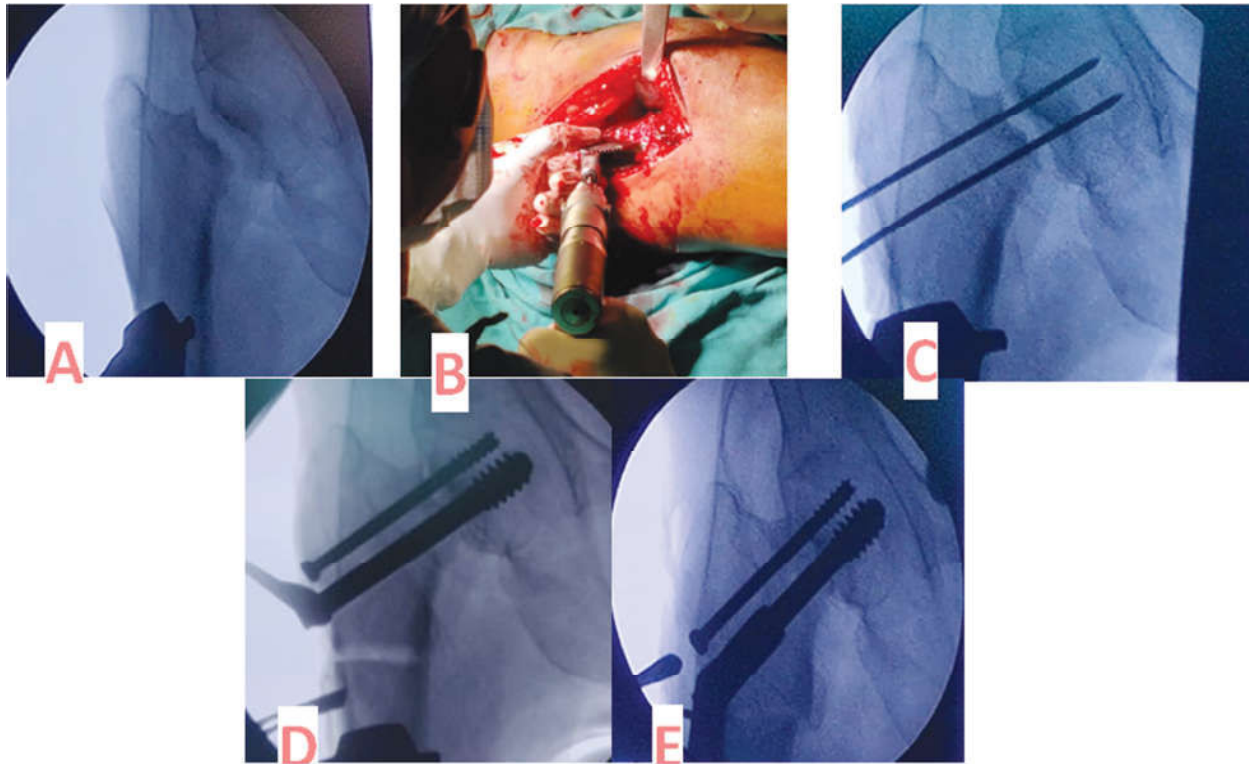
All patients underwent valgus osteotomy and fixed using 135° angled dynamic hip screw and barrel plate assembly. Post operatively anteroposterior view of pelvis with both hip and lateral view of hip was taken. Suture removal was done in 13 days. Patient was kept non weight bearing for 6 weeks. After that toe touch weight bearing was permitted followed by full weight bearing according to the progress of fracture and osteotomy healing seen on the radiographs.

Post operatively x-rays were done at 1 month, 3 months, 6 months and 1 year. At each visit Harris hip score was taken.

Fracture and osteotomy union was assessed radiographically after complete disappearance of the fracture line at the osteotomy site. Clinical union was confirmed when there was painless hip range of movement and painless full weight bearing mobilisation. Functional assessment was done using Harris Hip Score.

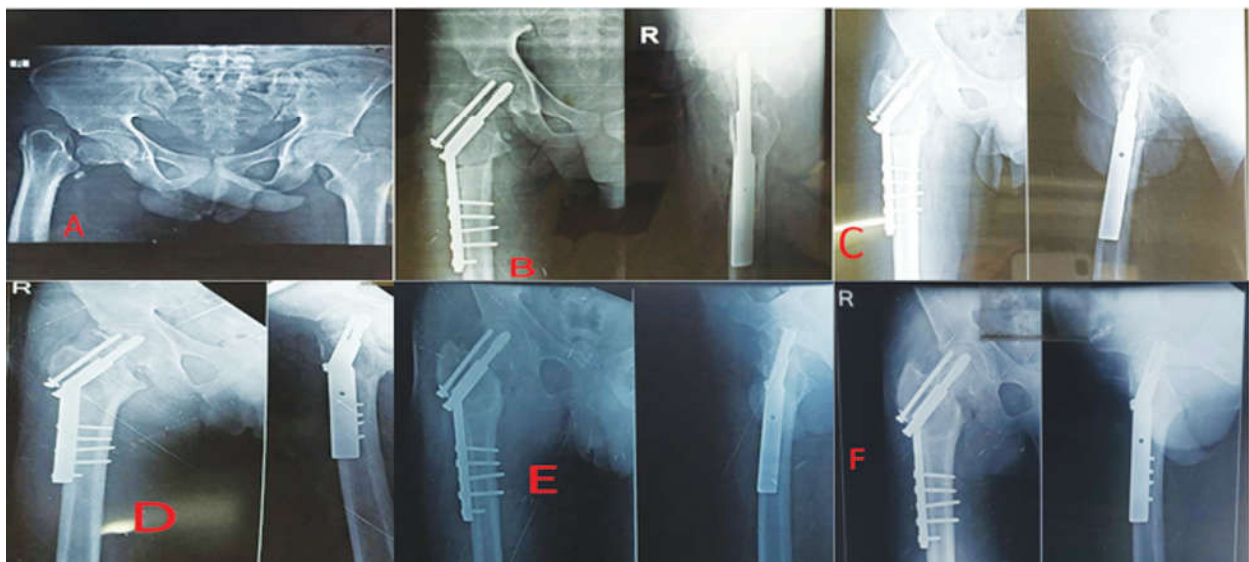
*Valgus osteotomy*¹¹: This procedure makes use of the Pauwel's principle which states that, if the fracture inclination is reduced to less than 30°, the forces acting on the fracture are converted into compression forces making the fracture unite. Here, a laterally based wedge is removed at the level of lesser trochanter and when the osteotomy is closed,

the fracture line will become more horizontal. The fracture and osteotomy are fixed using 135° dynamic hip screw and plate.



(A) Showing non union, fracture gap and varus. (B) Showing guide wire insertion using angle guide (C) Showing insertion of two guide wire. (D) Showing osteotomy site (E) Showing valgus osteotomy and fixation.

Follow Up



(A) Pre-operative X-ray showing non union fracture neck of femur. (B) Post operative X-ray showing valgus osteotomy with dynamic hip screw fixation. (C) One month follow up. (D) Three months follow up. (E) Six months follow up showing fracture union. (F) One year follow up.

Observations and Results

Table 1: Distribution of patients according to gender.

Gender	Number	Percentage
Male	8	80%
Female	2	20%
Total	10	100%

The above table shows the distribution of patients according to age.

There were 10 patients out of which 8 (80%) were males and 2 (20%) were females.

Graph 1: Bar diagram showing distribution of patients according to gender.

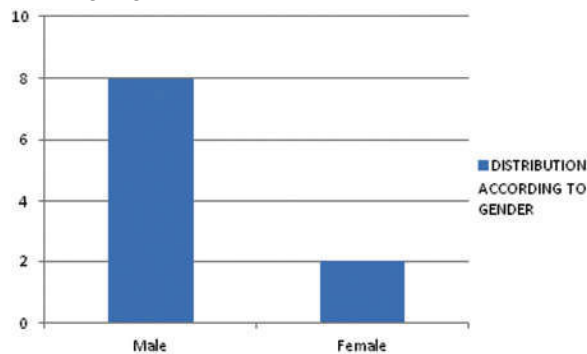


Table 2: Distribution of patients according to age.

Age Group	Number	Percentage
22-30 years	4	40.0
31-40 years	4	40.0
41-50 years	2	20.0
Total	10	100.0

The above table shows the distribution of patients according to age. There were 4 (40.0%) patients in the age group 22-30 years, 4 (40.0%) patients in the age group 31-40 years and 2 (20.0%) patients in the age group 41-50 years. The mean age of the patients was 33.30 ± 8.76 years with a range from 22 to 50 years. Majority of the patients were in the age group 22-30 years and 31-40 years.

Graph 2: Pie diagram showing distribution of patients according to age.

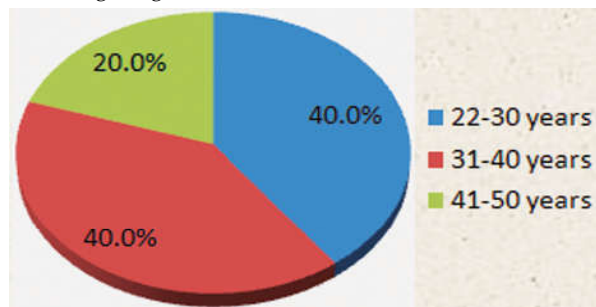


Table 3: Mean duration of injury to operation time.

Parameter	Mean \pm SD
Mean duration of injury to operation time (months)	3.40 ± 0.97 months

The above table shows the mean duration of fracture. The mean duration of injury to operation time in the present study was 3.40 ± 0.97 months.

Table 4: Mean time taken for fracture union.

Parameter	Mean \pm SD
Mean time taken for fracture union (months)	5.00 ± 0.82 months

The above table shows the mean time taken for fracture union.

The mean time taken for fracture union was 5.00 ± 0.82 months.

Table 5: Mean Harris Hip Score at different follow-ups.

Follow-up	Mean \pm SD
At 1 month	47.80 ± 6.61
At 3 months	54.00 ± 5.75
At 6 months	65.50 ± 6.77
At 12 months	84.30 ± 5.79

The above table shows the mean Harris Hip Score at different follow-ups.

The mean Harris Hip Score at 1 month was 47.80 ± 6.61 , at 3 months it was 54.00 ± 5.75 , at 6 months it was 65.50 ± 6.77 and at 12 months it was 84.30 ± 5.79 .

There is a continuous improvement in the mean Harris Hip Score at 3 months, at 6 months and at 12 months in comparison to mean Harris Hip Score at 1 month.

Graph 5: Line diagram showing mean Harris Hip Score at different follow-ups.

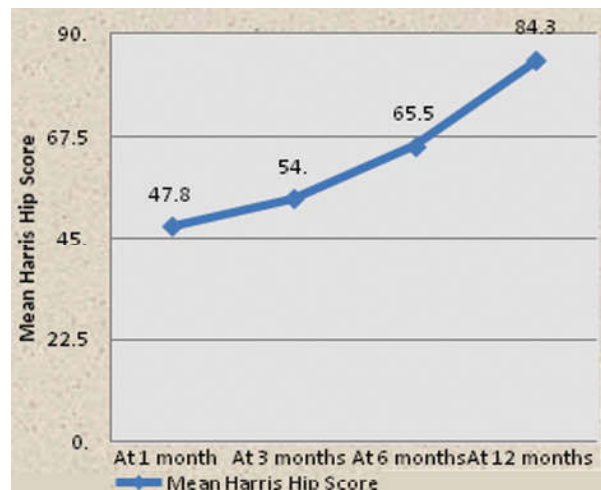


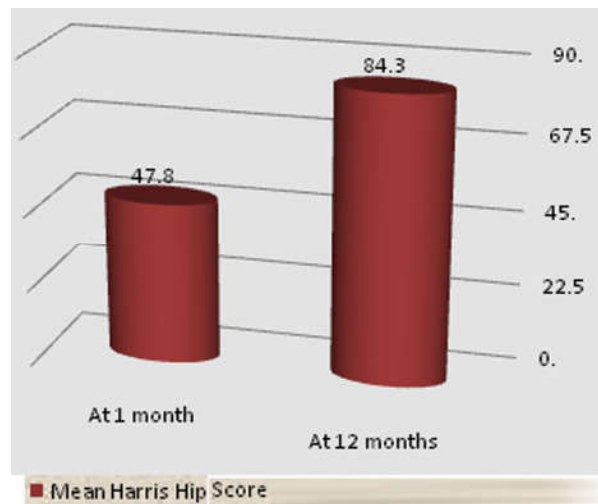
Table 6: Change in Mean Harris Hip Score at 12 months in comparison to 1 month.

Follow-up	Mean \pm SD	't' value	P value
At 1 month	47.80 \pm 6.61	-13.812, df=9	0.001*
At 12 months	84.30 \pm 5.79		

Paired 't' test applied. P value = 0.001, Highly significant

The above table shows the comparison of mean Harris Hip Score between 12 months and 1 month. The mean Harris Hip Score at 1 month was 47.80 \pm 6.61 and at 12 months it was 84.30 \pm 5.79. The mean difference in mean Harris Hip Score was found to be statistically significant ($p=0.001$), showing a significantly higher mean Harris Hip Score at 12 months in comparison to 1 month.

Graph 6: Bar diagram showing comparison of mean Harris Hip Score at 12 months and at 1 month.



Discussion

In our study, 10 patients of non union neck femur were studied. We evaluated our results and compared them with the result of various studies in the literature. Mean age in our study was 33.30 \pm 8.76 years with a range from 22 to 50 years while Manish et al¹² had 36.5 years with range from 17 to 52 years and Himanshu et al¹³ had 38.68 \pm 11 years. In our study there were 8 (80%) males and 2 (20%) females while Manish et al¹² had 63.63 % males and 36.37% females.

In our study injury operation interval was 3.40 \pm 0.97 months while in Manish et al¹² it was 3 months.

The time taken for fracture union in our study was 5.00 \pm 0.82 months with union seen in all the patients while Himanshu et al¹³ had union in 3.46 \pm

1.92 months with union in 95.5 % patients. Marti et al¹⁴ published the series of Pauwel's osteotomy in 50 patients with a union rate of 86% at an average of 3.6 months while Angelen et al¹⁵ reported 13 patients with neglected fracture neck femur treated with valgus osteotomy and achieving a union rate of 100%. In our study at the end of 12 months HHS in 3 patients was excellent, good in 6 patients and fair in 1 patient. Mean HHS at end of 12 months was 84.30 \pm 5.79 while Narender et al¹⁶ had 71.4 while Khan et al¹⁷ had 88 and Gupta et al¹⁷ has 87.5.

Conclusion

Certain factors reduce the potential for fracture healing that includes high Pauwel's angle, fracture displacement and late presentation. Valgus osteotomy with internal fixation using dynamic hip screw being a head preserving surgery provides good results in non union and neglected neck of femur fracture since surgeon is familiar with implant. This technique converts vertical fracture line into horizontal, thereby converting shearing forces into compressive forces at fracture site.

References

1. Khan A, Shahnawaz M, Agarwal R. Role of valgus osteotomy and fixation with dynamic hip screw and 120 double angle barrel plate in the management of neglected and ununited femoral neck fractures in young patients. J Orthop Traumatol 2009; 10:71-78.
2. Taneja A, Sharma H, Gupta J. Evaluation of results of intertrochanteric valgus osteotomy in ununited fracture neck femur. J Clin Orthop Trauma 2011; 2:29-34.
3. Ayoub MA, Gad HM. Neglected neck femur fractures in adolescents and young adults: Factors predicting the surgical outcome. J Orthop Sci 2013; 18:93-100.
4. Campbell-pathophysiology off non-union, "fracture and dislocation" 11th edition:3272
5. Phemister DB. The pathology of ununited Fractures of the Neck of the femur with special reference to the head. /BJS. 1939;21:681-693.
6. Sherman Ms and Phemister DB, The pathology of ununited fractures of the neck of the femur, J. Bone Joint Surg 1947;29,19.
7. Damany et al.- A met analysis of 18 published studies involving 564 fractures, injury 2005;36:131.
8. Marti RK, Schuller HM, Raymakers ELFB. Intertrochantric osteotomy for non-union of femoral neck. J Bone Joint Surg (Br). 1989: 71:782-787.

9. Angelen JO. Intertrochantric osteotomy for failed internal fixation of femoral neck fractures. *Clin Orthop.* 341:1997 :175-182.
 10. Ballmer FT et al. Pauwel osteotomy for nonunion of femoral neck. *Orthop Clin North Am.* 1990; 21:759-767.
 11. Pauwel's Osteotomy for Nonunions of the Femoral Neck *Orthopedic Clinics of North America* Vol.21 No.4, 759- 767,1990.
 12. Manish Sharma et al valgus osteotomy for nonunion fracture neck femur indian journal of orthopaedics vol. 38, no. 2, April 2004.
 13. Himanshu Jain, Sonal Garg, Sachin Yadav, Saurabh Sultania. Functional outcome of old fracture neck of femur treated by double angle DHS with valgus osteotomy with fibular grafting. *International Journal of Contemporary Medical Research* 2017;4(9):1974-1977.
 14. Marti RK, Schuller HM, Raaymakers ELFB. Intertrochanteric osteotomy for nonunion of the femoral neck. *J Bone Joint Surg [Br]* 1989;71 -B:782-787.
 15. Anglen Jo. Intertrochanteric osteotomy for failed internal fixation of femoral neck fracture *Clin Orthop.* 1997;341:175-82.
 16. Narender et al Functional outcome of modified Pauwels' intertrochanteric osteotomy and total hip arthroplasty in femoral neck fractures in elderly patients *Indian J Orthop.* 2008 Jan-Mar; 42(1): 49-55.
 17. Khan AQ, Khan MS, Sherwani MK, Agarwal R. Role of valgus osteotomy and fixation with dynamic hip screw and 120 degrees double angle barrel plate in the management of neglected and ununited femoral neck fracture in young patients. *J Orthop Traumatol* 2009; 10: 71-78.
 18. Gupta S, Kukreja S, Singh V. Valgus osteotomy and repositioning and fixation with a dynamic hip screw and a 135° single-angled barrel plate for un-united and neglected femoral neck fractures. *J Orthop Surg (Hong Kong)* 2014; 22: 13-17.
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