

Role of Pauwels Valgus Osteotomy in Management of Femoral Neck Fractures: A Prospective Study

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ABSTRACT

Background: Femoral neck fractures are significant injuries that can lead to serious complications, particularly non-union and Avascular Necrosis of the femoral head. Altering the angle of the femoral neck, surgeons can improve the chances of healing by changing the mechanical forces acting on the fracture. For this reason, a valgus osteotomy is sometimes performed in cases with a high risk of non-union. This approach has the potential to offer the best long-term outcomes, as it avoids the complications associated with artificial joints and allows the patient to retain their natural hip joint, significantly enhancing mobility and quality of life.

Methodology: This prospective study was conducted on 20 patients with neck of femur fractures, at N.S.C.B. Medical College, Jabalpur, between April 2023 and March 2025. Patients were followed up at 1, 3, 6 and 12 months postoperatively for clinical and radiological assessment using the Harris Hip Score (HHS).

Results: Of the 20 patients enrolled, 18 patients had a complete follow up of 12 months postoperatively. Majority of patients were in age group of 41-45 years. Mean time for radiological union was 14.75 ± 2.34 weeks. Mean duration of surgery was 97 ± 12.6 min and mean amount of blood loss was 140 ± 34.18 ml. Average HHS after 1,3, 6 and 12 months was 42.8 ± 2.28 , 61.7 ± 4.40 , 84 ± 4.96 , 86.45 ± 5.12 respectively.

Conclusion: From our study, we conclude that Pauwels osteotomy combined with internal fixation using a Dynamic Hip Screw (DHS) is a reliable salvage and primary procedure for Pauwels type II and III femoral neck fractures in younger patients, achieving high union rates and satisfactory functional outcomes.

Keywords- Dynamic Hip Screw (DHS), Harris Hip Score (HHS), Pauwels osteotomy, Femoral neck fractures

INTRODUCTION

Fracture of neck of femur present a unique challenge due to tenuous blood supply to the femoral head and adverse biomechanics that can promote nonunion and avascular necrosis. In younger, active patients' preservation of native hip is a priority; arthroplasty is avoided where possible. Pauwels described the role of fracture inclination and shear force in predisposing to non-union and proposed valgus osteotomy to convert shear into compressive forces, thereby enhancing union potential. Previous studies also indicate satisfactory union rates with valgus intertrochanteric osteotomy in selected patients, though complications such as limb length discrepancy and avascular necrosis remain concerns. With clinical relevance of this technique, we present a prospective single centered series evaluating

functional and radiological outcomes after Pauwels valgus osteotomy with DHS fixation in Pauwels type II and III fracture neck of femur.

MATERIAL AND METHODS

This prospective study was done in the Department of Orthopaedics, N.S.C.B. Medical College, Jabalpur, (M.P), from 1st April 2023 to 31st march 2025. This study included 20 patients with neck of femur fracture.

METHOD OF SAMPLING

All patients with fractures of neck of femur who fulfilled the inclusion criteria and presented during the study period were included until the required sample size was reached.

SELECTION OF THE PATIENTS:

Inclusion Criteria-

- All admitted patient undergoing the fracture neck of femur of age group 20 to 60 years

- Duration of injury > 3 weeks
- Patient medically fit for surgery
- Ambulatory before the trauma

Exclusion Criteria-

- Fractures associated with vascular injuries, open fractures
- Pathological fractures
- Associated pelvic injury
- Patients who are not willing for surgery
- Cognitive impairment.

METHODOLOGY-

- The selected patients were briefed about the nature of the study and a written informed consent was obtained.
- The information such as sex, age, details of injury, duration and progression were obtained through an interview.
- Patients were subjected to clinical and local examination. and these findings were recorded on predesigned and pretested proforma

OPERATIVE TECHNIQUE

All surgeries were done under spinal/epidural/general anesthesia. Surgeries completed on a radiolucent OT table under

C-arm guidance with fracture table attached to it. The fracture is reduced before starting the operative procedure.

- A straight lateral incision is made two finger breadths below the vastus ridge to a point 5–7 cm distally. Subperiosteal dissection is performed to sweep the subcutaneous tissue from either side of the IT band, followed by an incision in line with the fascia lata. Blunt dissection between the vastus lateralis and the IT band is done. The vastus lateralis is pulled anteriorly, exposing the bone.
- DHS angle guide is aligned with the femoral shaft axis
- Guide wire inserted through the angle guide; position confirmed under c-arm
- Guide wire that measured using the direct measuring tool
- DHS triple reamer assembled, preset to required depth; attached to power drill

- Reamer advanced over the guide wire from barrel junction to preset depth
- Guide wire for derotation screw inserted parallel to Richard's screw under c-arm and derotation screw inserted
- Osteotomy site marked 1-1.5 cm below Richard's screw entry point using a K-wire
- Horizontal K-wire inserted making apex at medial cortex
- Wedge removed using battery saw
- Limb abducted to close osteotomy gap
- DHS plate slid onto Richard's screw; seated using DHS impactor and fixed with 4.5mm cortical screws

OPERATIVE IMAGES



Figure 1



Figure 2



Figure 3



Figure 4



Figure 5



Figure 6



Figure 7

- Figure 1 shows marking of incision site
- Figure 2 shows osteotomy site
- Figure 3 shows size of wedge removed
- Figure 4 shows fixation of femoral neck fracture with sliding hip screw and derotation wire with marking of osteotomy site with 2 K-wires
- Figure 5 shows osteotomy site after wedge removal
- Figure 6 shows attachment of DHS plate
- Figure 7 shows valgization of osteotomy site followed by DHS plate fixation

RESULTS

Majority of patients were in age group of 41-45 years. Among the patients, 70% are male, 30% are female. Fracture of neck femur of left side 30% and of right side 70%. Accidental fall was the most common mode of injury followed by road traffic accident. Mean duration of surgery was 97 ± 12.6 min and mean amount of blood loss 140 ± 34.18 ml. Mean time for radiological union was 14.75 ± 2.34 weeks. The mean pre-operative Pauwels angle was 52 degrees, which reduced to 28 degrees post-operatively. Average HHS after 1 month was 42.8 ± 2.28 . Average HHS after 3 months was 61.7 ± 4.40 . Average HHS after 6 months was 84 ± 4.96 . Average HHS after 12 months was 86.45 ± 5.12 . Complications like superficial infection, backout of derotation

screw seen in patient. Limb length discrepancy (0.5-cm) was seen in 8 patients. None of the cases showed signs of AVN on follow up.

TABLE-1: AGE DISTRIBUTION

Age (In Years)	No. of Patients	Percentage
25 - 30	1	5%
31 - 35	1	5%
36 - 40	4	20%
41- 45	5	25%
46- 50	3	15%
51-55	4	20%
56-60	2	10%

TABLE- 2: MEAN DURATON OF SURGERY (MIN)

Duration of Surgery (in min.)	No. of Patients	Percentage
70-90	08	40%
91-110	10	50%
111-130	02	10%

TABLE- 3: RADIOLOGICAL UNION

RADIOLOGICAL UNION (WEEKS)	NO. OF PATIENTS
12 WEEKS	1
13 WEEKS	1
14 WEEKS	5
15 WEEKS	8
16 WEEKS	5

TABLE- 4: MEAN HARRIS HIP SCORE

Time Point	MEAN	SD	P-value
1 month	42.8	2.28	< 0.05
3 months	61.7	4.40	< 0.05
6 months	84	4.96	< 0.05
12 months	86.45	5.12	< 0.05

A 42 years old male patient having history of RTA and was diagnosed with 2 months old Closed fracture neck of femur right (Pauwels type-2).

CASE- 1



Fig.8 – Pre operative X-Ray AP view



Fig- 9A



Fig- 9B



Fig- 10A



Fig- 10B

Fig. 9 (A and B) Immediate Post Op X-Ray

Fig. 10 (A and B) Follow up at 8 months



Fig- 11A



Fig- 11B

Fig. 11 (A and B) Follow up at 18 months



Fig- 12A- Cross leg sitting



Fig- 12B- Squatting

CASE- 2

A 50 years old male patient having history of Fall from height and was diagnosed with 1 months old Closed fracture neck of femur right (Pauwels type-2).



Fig. 13A



Fig. 13B

Fig.13 (A and B) – Pre operative X-Ray AP and lateral view



Fig- 14A



Fig- 14B



Fig- 15A



Fig- 15B

Fig. 14 (A and B) Immediate Post Op X-Ray

Fig. 15 (A and B) Follow up at 3 months



Fig- 16A



Fig- 16B

Fig. 16 (A and B) Follow up at 6 months



Fig- 17A- Cross leg sitting



Fig- 17B- Squatting

DISCUSSION

In our study, reported a mean age of 44.27 years. Yashwanth Subash (2018) ⁽¹⁾ reported a mean age of 45 years, with an age range of 30 to 58 years. Gupta et al. 2014⁽²⁾ also reported a mean age of 45 years. Our study reported a male predominance of 70%, with 30% female participants. Yashwanth Subash (2018) ⁽¹⁾ reported that 60% of participants were male, while 40% were female. In our study, the mean pre-operative Pauwels angle was 52 degrees, which reduced to 28 degrees post-operatively. Gupta et al. (2014) ⁽²⁾ reported a mean pre-operative Pauwels angle of 65 degrees, which decreased significantly to 26 degrees post-operatively. Similarly, Eid et al. (2010) ⁽³⁾ observed a pre-operative mean angle of 64 degrees, reducing to 34 degrees after surgery. In our study, the average radiological union time was 14.75 ± 2.34 weeks. Yashwanth Subash (2018) ⁽¹⁾ observed a radiological union at an average of 12.8 weeks, indicating a relatively quicker recovery. Jain et al. (2015) ⁽⁴⁾ reported a longer union time of 16.8 weeks. Average HHS after 1,3, 6 and 12 months was 42.8 ± 2.28 , 61.7 ± 4.40 , 84 ± 4.96 , 86.45 ± 5.12 respectively. Schwartzmann et al. (2015) ⁽⁵⁾ reported an average HHS of 81.2, while Gupta et al. (2014) ⁽²⁾ observed a higher score of 87.5, indicating better functional recovery. Our study recorded an average LLD of 0.65 cm, while Schwartzmann et al. (2015) ⁽⁶⁾ reported an average LLD of 2.5 cm, Eid et al. (2010) ⁽³⁾ and Said et al. (2010) ⁽⁷⁾ both observed a much smaller discrepancy of 0.5 cm

CONCLUSION

From our study, we conclude that Pauwels osteotomy combined with internal fixation using a Dynamic Hip Screw (DHS) provides successful results in the treatment of neck of femur fractures, specifically Pauwels type II and type III. This method facilitates fracture union, ensures stable internal fixation, and allows for an early return of hip function. Pauwels osteotomy improves the loading characteristics at the fracture site by subjecting it to predominantly compressive forces, promoting osseous union without the need for bone grafting. The technique is simple, can be performed with routine implants, and has shown predictably successful results in 85–100% of patients in published studies. Careful preoperative planning and meticulous surgical execution are crucial to prevent or minimize limb length discrepancies and to maintain the mechanical axis and femoral offset. Based on our study, we suggest Pauwels osteotomy as a viable treatment option for Pauwels type II and type III neck of femur fractures, which can be challenging to manage surgically. This technique requires careful planning and precise execution to achieve anatomical reduction and secure fixation, thereby optimizing patient outcomes.

Declaration by Authors

Ethical Approval: Approved

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Conflicts of Interest: None declared

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