



E-ISSN: 2395-1958
P-ISSN: 2706-6630
IJOS 2023; 9(1): 567-571
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<https://www.orthopaper.com>
Received: 13-01-2023
Accepted: 22-02-2023

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Comparative study of the management of inter-trochanteric fractures in the elderly: Trochantric femoral nail vs dynamic hip screw

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DOI: <https://doi.org/10.22271/ortho.2023.v9.i1h.3343>

Abstract

Introduction: Trochanteric fractures are among the most common injuries necessitating hospital admission. Regardless the type of fracture, trochanteric fractures can lead to substantial morbidity and mortality, especially in elderly patients. Surgery has been the mainstay of the treatment for these fractures to allow early mobilization of the patient. Among the surgical treatment, dynamic hip screw (DHS) as extramedullary power transmission system and trochanteric fixation nail (TFN) as the means of intramedullary stabilization are the established and standard in the treatment of trochanteric femoral fractures, particularly in elderly patients.

AIM: The present study was designed to compare the results of TFN and DHS in treatment of intertrochanteric fracture femur.

Material and methods: After fulfilling the mentioned criteria, patients were screened for medical fitness and then further randomized in group I and II. Group I-Patients treated with TFN (n=30). Group II-Patients treated with DHS (n=30). The clinical assessment was done according to the "Salvati and Wilson Function Score (SWS Score)". Blood loss measurement and complications were also studied and compared.

Results: Thirty patients were included in the study in each group. Salvati and Wilson Function Score (SWS) Score was used to evaluate the results at follow up. Mean \pm SD of SWS at 16 weeks & 24 weeks was 18.93 ± 3.34 & 28.80 ± 5.33 respectively in group I whereas in group II, the value was 15.13 ± 2.18 & 21.67 ± 5.14 respectively. P-value was significant ($< .01$) Complications were observed in follow ups and the most frequent was varus displacement. It was observed that out of 30 subjects of Group 2, maximum i.e. 8 (26.67%) subjects had varus deformity whereas out of 30 subjects of group 1, only 1 (3.33%) subject had varus deformity Other complications include Non Union and Implant failure.

Conclusion: We conclude that the advantage with Trochanteric fixation nail is that a smaller exposure is required than for a sliding screw, it may therefore be associated with lesser blood loss, shorter operating time and less morbidity.

Keywords: Trochantric, management, trochanteric, elderly, dynamic

Introduction

Trochanteric fractures are among the most common injuries necessitating hospital admission^[1]. Regardless the type of fracture, trochanteric fractures can lead to substantial morbidity and mortality, especially in elderly patients. They are three to four times more common in women^[2]. Proximal femoral fractures in elderly are usually resulting from minimal to moderate physical trauma to areas of bone significantly weakened by osteoporosis. In younger patients, proximal femoral fractures are usually the result of high energy physical trauma. However pathologic fractures are common cause of trochanteric fracture which characterized by unusual fracture patterns.

Surgery has been the mainstay of the treatment for these fractures to allow early mobilization of the patient, with partial weight bearing restrictions, depending on the stability of the reduction and fixation achieved. A variety of internal fixation devices has been used for treatment of these fractures, like DHS, PFN, TFN, DCS, Proximal Femoral Locking Plates, blade Plate etc.

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Among the surgical treatment, dynamic hip screw (DHS) as extramedullary power transmission system and trochanteric fixation nail (TFN) as the means of intramedullary stabilization are the established and standard in the treatment of trochanteric femoral fractures, particularly in elderly patients.

The DHS implant system is technically simple and cost effective thus widely used for the treatment of pertrochanteric fractures of the femur particularly in stable type A1 and A2. Arbeitsgemeinschaft für Osteosynthesefragen (AO/ASIF) in 1996 designed a new intramedullary device, the proximal femoral nail (PFN).

Intramedullary nails are purposed to have superior biomechanical properties to the dynamic hip screw when used in the treatment of unstable intertrochanteric fractures of the femur³. Osteosynthesis with the PFN and TFN features the advantages of high rotational stability of the head neck fragment, an undreamed implantation technique and the possibility of static or dynamic distal locking.

TFN as intramedullary implant gives stability through following ways

1. The nail has a shorter lever arm, which decreased the tensile strain on the implant and reduced the risk of mechanical failure¹³.
2. It is subjected to lower bending force due to their intramedullary location. It is a load sharing device, allowing early weight bearing.
3. Controlled fracture impaction is maintained.

There are many studies have been published on I/T fracture managed by TFN and DHS but only few of them are on comparison between these two means.

The present study was designed to compare the results of TFN and DHS in treatment of intertrochanteric fracture femur

Material & Methods

This was a randomized comparative study of unstable trochanteric femoral fractures treated by Dynamic Hip Screw (DHS) and Trochanteric Fixation Nail (TFN) in adults and elderly patients of both genders admitted in a tertiary level health center of Jaipur Rajasthan (During the study period between April 2015 to December 2016).

The patients were divided into two groups

Group I-Patients treated with TFN (n=30) as group I.

Group II-Patients treated with DHS (n=30) as group II.

Inclusion criteria

- Close unilateral unstable fracture intertrochanteric femur.
- AO/OTA fractures 31A2.2 through 31A3.3.

- Elderly (50-70 years of age) patients.
- Patients giving consent.
- No associated injuries.

Exclusion Criteria

- Open and pathological intertrochanteric fracture.
- Patients with vascular injury.
- Medically or anaesthetically unfit patients.
- Patient refusing consent.

After fulfilling the above mentioned criteria, patients were screened for medical fitness and then further randomized in group I and II. The duration of surgery was measured from the incision until wound closure. All the information regarding preoperative, intraoperative, and postoperative condition and the follow-up of the patient (minimum for 24 weeks at 4 weeks interval) were recorded. The clinical assessment was done according to the "Salvati and Wilson Function Score (SWS Score)".

Blood Loss Measurement

Surgical sponge method {carrying capacity of completely soaked sponge 10x10cm = 10cc+2cc, 5x5cm=5cc+ 2cc}.

Observation and Results

Thirty patients were included in the study in each group. There were 10 & 7 patients in group I & II respectively below 60 years of age, whereas, 20 patients in group I and 23 patients in group II were above 60 years in the present study. The mean ASA (American Society of Anesthesiologists) score in group I and group II was 1.3 & 1.6 respectively in the present study (table 9 and graph). Blood loss measurement was done in both groups and the results are shown in table 1. Mean \pm SD was 129 \pm 22.74 & 221.33 \pm 49.8ml in group I & group II respectively which is highly significant ($p < .001$).

Table 1: Blood loss during surgery

Blood loss (In ml)	Group I		Group II	
	No.	%	No.	%
100-149	25	83.33	0	0.00
150-199	4	13.33	11	36.67
200-249	1	3.33	10	33.33
250+	0	0.00	9	30.00
Total	30	100.00	30	100.00

Salvati and Wilson Function Score (SWS)^[4] Score was used to evaluate the results at follow up. Mean \pm SD of SWS at 16 weeks & 24 weeks was 18.93 \pm 3.34 & 28.80 \pm 5.33 respectively in group I whereas in group II, the value was 15.13 \pm 2.18 & 21.67 \pm 5.14 respectively. P-Value was significant ($< .01$).

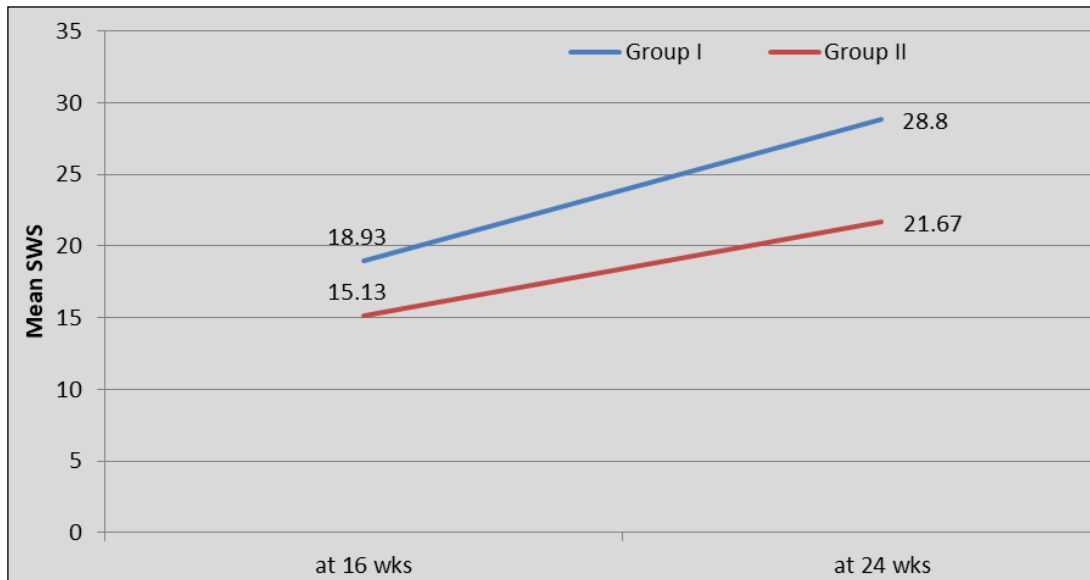


Fig 1: SWS score over time in both groups



Fig 2: A. Patient operated with DHS at follow up, B. Patient operated with TFN at follow up



Fig 3: X-rays of DHS and TFN at 24 weeks follow up

Complications were observed in follow ups and the most frequent was varus displacement. It was observed that out of 30 subjects of Group 2, maximum i.e. 8 (26.67%) subjects had varus deformity whereas out of 30 subjects of group 1, only 1 (3.33%) subject had varus deformity. The varus deformity was found 8 times higher in TFN subjects as compared to DHS subjects. There is a significant association

of occurrence of varus deformity in two groups i.e. $p < .01$. Other complications include Non Union and Implant failure. While cases of implant failure were seen in 6.67% cases in TFN group, it was only 3.33% in DHS group. There was no difference noted in Non-union rates among both the groups (FIG 4 and FIG 5).

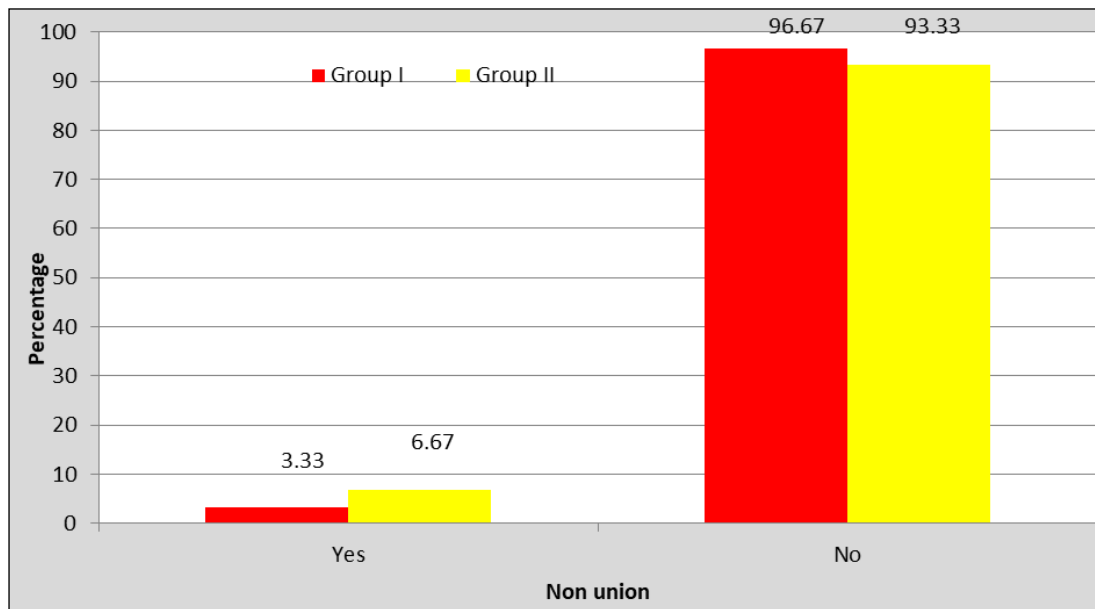


Fig 4: Non-Union among both groups

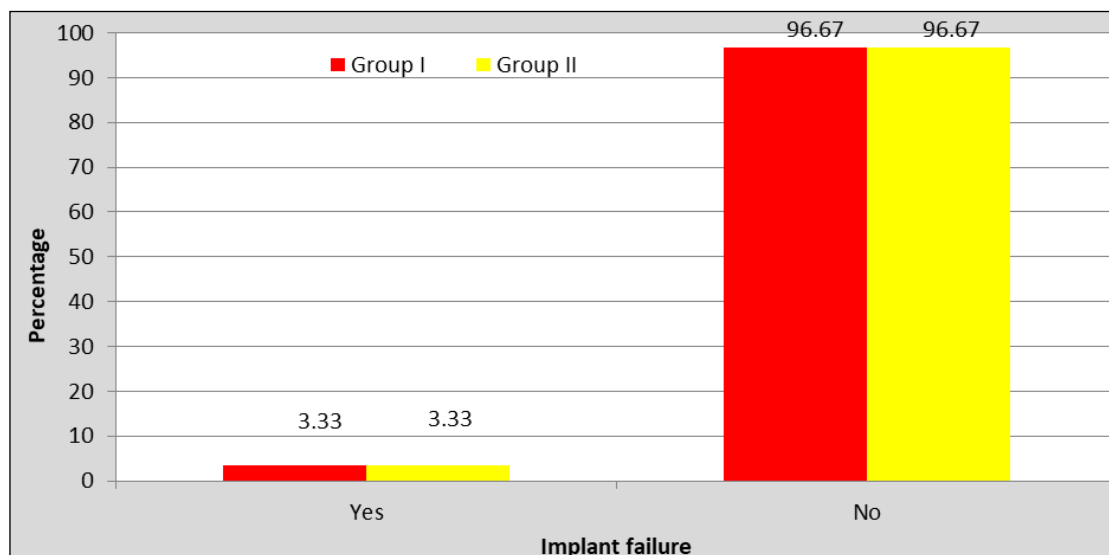


Fig 5: Implant failure among both groups

Discussion

Fractures of intertrochanteric femur have been recognized as a major challenge by the Orthopaedic community, not solely for achieving fractures union, but for restoration of optimal function in the shortest possible time that to with minimal complications. The aim of management accordingly has drifted to achieving early mobilization, rapid rehabilitation and quick return of individuals to premorbid home and work environment as a functionally and psychologically independent unit.

Operative treatment in the form of internal fixation permits early rehabilitation and offers the best chance of functional recovery, and hence has become the treatment of choice for virtually all fractures in the trochanteric region. Amongst the various types of implants available i.e. fixed nail plate devices, sliding nail/screw plate and intramedullary devices, the compression hip screw is most commonly used but recently techniques of closed intramedullary nailing have gained popularity.

In this study an attempt was made to survey, evaluate, document and quantify and compared the results of patients treated by using Trochanteric Fixation Nail (TFN) and Dynamic Hip Screw (DHS) implants.

Salvati and Wilson's scoring system was used for evaluation of results at follow up in this study. The overall functional outcome measured with Salvat Wilson scoring scale at 16 & 24 weeks was better with TFN group. L. Banodha A, D.K. Sharma B, Afsar Khan C, *et al.* (2013) [5] did a similar study in past and used Harris Hip Score for evaluation. They observed that excellent to good functional outcome (Harris Hip Score > 60) was seen in TFN treated group. Average functional score was 84 in TFN group & 69 in DHS group. 16 patients (67%) out of 24 in TFN group had HHS > 60 after 6 months of surgery, whereas only 12 patients (42.8%) out of 28 in DHS group. Thus, replicating the results seen in our study.

Considering the fact that additional surgical exposure can theoretically prolong the operative time and thus the blood loss in DHS more than TFN [6-10], it can also be noted in our study that the blood loss and operative time was more in DHS group and the p-value for which was significant. Nubers, Schonweiss T *et al.* (2003) [8] observed that a significantly shorter operation time (44.3 vs. 57.3 min) was with PFN. Xu Yaozeng [11] concluded that there was significantly increased mean perioperative blood loss in DHS group.

In our study there were one cases of fixation failure in TFN

implant due to the poor technical performance causing implant breakage which was re-operated.

There was one case of implant cut-out with failure in the DHS group. Several authors reported on the complication of femoral shaft fracture with intramedullary nail and recommend against its use [12-15], but in our study no such fracture was found. As in many studies comparing intramedullary hip screws and sliding hip screw [13, 15] our minimum follow up was six months for both groups.

Varus deformity was found 1 case (3.33%) in group I & 8 (26.67%) cases in group II. One case (3.33%) of non-union was found in group I and two (6.67%) cases in group II, which is not significant ($p > 0.05$).

Agrawal Nargesh, Tiwari Ashok *et al.* (2012) [16] were found that tendency towards varus angulations in the DHS group ($n = 22$) with the mean angulation 10.5, while in the PFN group, less patients ($n = 16$) were noted with varus angulation with mean of 8 which was a significant difference. In DHS, 23 patients were noted with limb length shortening with mean of 1.68 cm. while in PFN seven patients were noted with limb length shortening with mean of 0.857 cm.

Conclusion

We conclude that the advantage with Trochanteric fixation nail is that a smaller exposure is required than for a sliding screw, it may therefore be associated with lesser blood loss, shorter operating time and less morbidity (minimizes the jeopardy to the vascularity). There may also be mechanical advantages, because the shaft fixation is nearer to the centre of rotation of the hip, giving a shorter lever arm and a lower bending movement on the device, which leads to a biomechanically sound fixation.

Acknowledgement

Not available

Author's Contribution

Not available

Conflict of Interest

Not available

Financial Support

Not available.

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How to Cite This Article

Sharma RK, Sharma P, Shekhawat V. Comparative study of the management of inter-trochanteric fractures in the elderly: Trochanteric femoral nail vs dynamic hip screw. *International Journal of Orthopaedics Sciences.* 2023;9(1):567-571

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