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Original Article

Comparison of Dynamic Hip Screw and Proximal Femoral Nail in Cases of Unstable Intertrochanteric Fractures of the Femur, in Terms of Blood Loss and Operative Time: Experience in a Tertiary Care Hospital

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ABSTRACT

Objective: To compare Dynamic Hip Screw with Proximal Femoral Nail in unstable Inter Trochanteric femur fractures.
Study Design: Quasi-experimental study.
Place and Duration of Study: Department of Orthopaedic Surgery, Combined Military Hospital, Malir Pakistan, from Dec 2020 to Aug 2021.
Methodology: This study comprised patients aged 40 to 80 years with unstable inter Trochanteric proximal femoral fractures (AO Classification 31A2, 31A3). These patients were randomised into two Groups. Group-A patients underwent Dynamic hip screw fixation, and Group-B patients were subjected to Proximal Femoral Nailing. Follow-up was done at 2,6,12 weeks postoperatively. Two variables, namely operative time and blood loss, were evaluated.
Result: Thirty patients were recruited in this study, with 18 patients in each Group. The average blood loss for Group-A Dynamic Hip Screw was measured to be 193.3±29.10 ml, and for Group-B Proximal Femoral Nail was 79.44±17.98 ml ($p<0.001$). Group-A (DHS) scored an average operative time of 51.56±7.76 min, and Group-B Proximal Femoral Nail was 36.89±3.66 min ($p<0.001$).
Conclusion: Proximal femoral nailing is a better choice in unstable proximal femoral fractures regarding operative time and blood loss.

Keywords: Blood loss, Dynamic hip screw, Intertrochanteric fractures, Operative time, Proximal femoral nail.

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INTRODUCTION

The proximal femur is one of the most commonly encountered fractures by orthopaedic surgeons. Low-energy hip fractures leading to proximal fractures of the femur occur in excess of 250000 per year in the United States.[1] According to International Osteoporosis Foundation, approximately 1.6 million hip fractures occur yearly. This figure may rise to 6 million per year by 2050.[2]

Proximal femoral fractures have been classified in many ways, but one of the most comprehensive and widely accepted classification systems is by AO. A1 fractures are generally stable, whereas A2 and A3 fractures are unstable (Figure).[3]

Operative intervention is preferred for these fractures because of the advantage of early mobility and reduced complications secondary to prolonged immobilisation.[4] These fractures can be treated with extramedullary devices like DHS or intramedullary devices like Proximal Femoral Nails (PFN).[5,6]

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Extramedullary devices like DHS can lead to complications like medicalisation of the femoral shaft due to lack of lateral cortex. The integrity of the lateral cortex in the 31-A3 category is defining characteristic for implant selection, favouring an intra-medullary device because the extramedullary device is bound to loss of reduction due to lack of lateral buttress.[7] Biomechanical studies have shown that helical blades used in PFNA confer more stability in terms of rotational and translational displacements hence maintaining the reduction quality.[8] To avoid a tragic complication of 'cut through', pre-drilling is avoided for the entire length of the helical blade and the tip of the blade is kept at 10 mm from the articular surface of the head of the femur.[9] The objective of our study was to compare DHS with PFN in terms of blood loss and operative time. We hypothesised that PFN is associated with lesser blood loss & operative time than DHS.

METHODOLOGY

The quasi-experimental study conducted at the Department of Orthopaedic, Combined Military Hospital, Malir Pakistan, from December 2020 to August 2021 after approval from the Hospital Ethical Committee

(50/2021/TRG/ERC). The sample size was calculated, keeping mean blood loss in Group-1 as 224.33±43.44 ml, and 122.3±33.18 ml in Group-2.[10]

Inclusion Criteria: Patients of either gender, aged 40 to 80 years with unstable inter Trochanteric proximal femoral fractures (AO Classification 31A2, 31A3) were included in the study.

Exclusion Criteria: All cases with pathological fractures involving subtrochanteric fractures and pathological fractures were excluded.

Thirty-six patients were recruited in the study after the proper consenting procedure. Each Group comprised 18 patients Non-probability consecutive sampling techniques were used. Patients were prepared to keep in view COVID-19 precautions, and all were COVID-19 negative. All patients were subjected to spinal anaesthesia, and the fracture was reduced on the traction table. All patients received the same one-shot prophylactic antibiotics with 1 gm Transamine IV at least half an hour before the incision. An unstable fracture configuration was confirmed under the image intensifier. Group-A patients underwent DHS fixation after appropriate preparation and incision. Group-A patients were stabilised with four hole DHS plate with a locking configuration. Group-B patients were fixed with PFN through a minimally invasive approach, which involved the passage of guide wire through reduced fracture under an image intensifier. Initial reaming was done; PFN with jig was introduced under image guidance. After appropriate intra-medullary positioning of the nail, another guide wire was passed under image guidance through a proximal jig for intertrochanteric fracture stabilisation, over which helical blade introduction was done. Helical blade locking was done, followed by distal interlocking afterwards. Postoperatively, both Groups were subjected to the same rehabilitation protocol. All patients were discharged on the third post-operative day after achieving rehabilitation milestones. They were reviewed in OPD after 2, 4, and 12 weeks with x-rays on arrival till full weight bearing was started. One patient from Group-A developed a superficial surgical site infection that was treated with a one-week oral antibiotic course and eventually resolved.

Statistical Package for Social Sciences (SPSS) version 24.0 was used for the data analysis. Quantitative variables were expressed as Mean±SD and qualitative variables were expressed as frequency and percentages. Independent sample t-test and chi-square test were applied to explore the inferential statistics. The *p*-value of 0.05 or less was taken as significant.

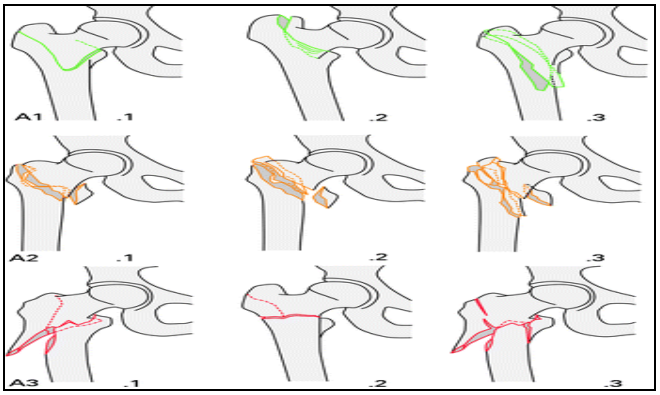

Figure: Arbeitsgemeinschaft für Osteosynthesefragen AO /Orthopaedic Trauma Association Classification of Pertrochanteric fractures

RESULTS

There were 36 patients in the study divided equally into two Groups, Group-A undergoing DHS and Group-B having PFN surgery, containing 18 patients in each. The distribution between groups in terms of age, BMI and gender is shown in Table-I. The primary mechanism of injury among the study population was a history of falls in 26(72.2%) patients, followed by road traffic accidents in 10(27.8%).

Table-I: Demographic Distribution in the Study Groups (n=36)

Variables	Group-A (DHS)	Group-B (PFN)	*p*-value
Age (years)	37.17±14.79	43.72±14.24	0.185
BMI (kg/m2)	22.51±2.24	23.13±2.24	0.415
Gender			
Male	14(77.8%)	13(72.2%)	0.700
Female	4(22.2%)	5(27.8%)	

The mean operating time in all cases was 44.22±9.56 minutes, and the mean blood loss was 136.39±62.480 ml. The further distribution between the two groups is shown in Table-II. The PFN Group-B showed significantly less operative time (*p*-value <0.001) and blood loss (*p*-value<0.001) as compared to DHS Group-A.

Table-II: Operative Time and Blood Loss Comparison Between the Groups (n=36)

Variable	Group-A(DHS)	Group-B(PFN)	*p*-value
Operative Time(mins)	51.56±7.76	36.89±3.66	<0.001
Blood Loss (ml)	193.3±29.10	79.44±17.98	<0.001

DISCUSSION

Intertrochanteric fractures of the femur are prevalent in the old age Group, and this type of population also has many concomitant co-morbidities and osteoporosis, making them vulnerable to such

fractures with trivial falls.[11] Many studies have been done on these two modalities for such fracture fixations.[12,13] Our study compares these fixation methods for varying intertrochanteric fractures regarding operative time and blood loss. Other parameters have also been compared, like union time and complications like implant failure, non-unions and wound infections.

This study had similar results to a study by Bhakat *et al*. which treated 31% stable intertrochanteric fractures, 58% unstable and 11% reverse oblique type fractures.[14] A study by Geol *et al*. comprised 50 patients and was fixed by DHS and PFN for intertrochanteric fractures. A mean blood loss of 111.8 ml was calculated for patients treated with PFN, and 325.6 ml was calculated for the DHS Group. The mean operative time for PFN Group was found to be 111.6 min, and it was calculated to be 106.4 min for DHS Group.[15]

A meta Analysis by zhang *et al*. included eight studies that compared both fixating modalities, i.e. PFN and DHS, for both stable and unstable fractures in terms of operative time, blood loss and length of skin incisions, wound complications, operations and mortality. This meta-analysis revealed shorter operative time and lesser per-operative blood loss in cases treated with PFN compared to DHS.[16]

In our study, the PFN Group had lesser operative time with less blood loss than the DHS Group. Our study revealed lesser operative time in the PFN Group, averaging 36.89+/-3.66 min compared to the DHS Group, which had 51.56+/-7.76 min. At the same time, blood loss was calculated to be 79.44+/-17.98 ml in the PFN Group in contrast to the DHS Group, where it was measured at 193.3+/-29.10 ml. Our results are very much comparable to a similar study done by Ashraf *et al*., which also revealed that a lesser incision length of an average of 4.71+/-0.74 cm was witnessed in the PFN Group as compared to 7.62+/-0.91 cm in the DHS Group.[12]

However, Wessels *et al*. have shown no difference in peri or post-operative outcomes once DHs or PFN was used for AO/OTA 31A1-3 fractures. Nevertheless, functional outcomes could be improved in favour of PFN in cases of AO/OTA 31A1 and 31A2.[17] The reason for such results is that PFN is a minimally invasive operative technique with smaller incisions and subsequently lesser blood loss per operatively. This also leads to shorter operative time as lesser tissue dissection is done and needs lesser time to close the wounds. Similar findings were also documented in a study by Sharma, which comprised a sample of 60 patients with stable intertrochanteric fractures being treated by PFN and DHS.[18]

LIMITATIONS OF STUDY

Our study had some limitations. The sample size was small, and we followed up with the patients till 12 weeks when full weight bearing was started. We recommend that further studies with larger sample sizes and longer follow up be conducted to verify our results.

CONCLUSION

Unstable intertrochanteric fractures of the femur fare better to PFN fixating modality than DHS regarding operative time and blood loss.

Conflict of Interest: None.

Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

AMK & SFA: Data acquisition, data analysis, drafting the manuscript, critical review, approval of the final version to be published.

ABS & AUJ: Data interpretation, conception, study design, approval of the final version to be published.

MOR: Critical review, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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