

Original Research Article

Unstable intertrochanteric femoral fracture care in older population

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ABSTRACT

Background: The present study aimed to compare outcomes between geriatric patients treated with cementless bipolar hip arthroplasty (BHA) and proximal femoral nail (PFN) for intertrochanteric femur fractures, focusing on postoperative complications, reoperation rates, implant-related issues, and functional outcomes.

Methods: The present study took place at PRM medical college, Baripada for a period of 4 years and employed a prospective design with 76 individuals with femoral shaft fractures who underwent surgical treatment, wherein 40 were treated using cementless BHA and 36 with PFN. Evaluation included the HHS at the last follow-up, alongside recorded blood transfusion rates and surgery duration, statistically compared between the two groups.

Results: The study involved elderly patients with intertrochanteric femur fractures (average age: 82.9 years). BHA and PFN groups had differing average ages (81.4 and 83.9 years, respectively). Follow-up durations were 18.6 months overall, 23.8 months for BHA, and 13.1 months for PFN. PFN showed advantages in surgery duration and blood transfusion rates. Adverse effects in BHA included 4 epidermal infections, while PFN had 2 epidermal infections and 2 instances of implant malfunction, resulting in extraction. PFN demonstrated a 5.5% cut-out rate.

Conclusions: The study compares the outcomes of elderly patients with femoral shaft fractures treated with cementless BHA and PFN. The results indicate that PFN presents advantages over BHA in terms of shorter surgery duration and reduced blood transfusion rates. However, further research and extended review are warranted to draw definitive results about the superiority of either approach.

Keywords: Intertrochanteric femur fractures, Elderly patients, Cementless BHA, PFN

INTRODUCTION

Injuries stemming from accidents are the leading cause of hospitalization among the geriatric population, with intertrochanteric femur fractures constituting approximately 45% to 50% of hip joint fractures in geriatric patients.¹⁻³ The surgical management of femoral shaft fractures is still a matter of discussion, particularly regarding the selection of the fixation implant. Despite varying opinions, the compression hip screw is largely recognized as the preferred method for stabilizing these

fractures. BHA is also frequently utilized as a fixation approach for femoral shaft fractures.³

The PFN was specifically developed for addressing fractures of the subtrochanteric and trochanteric femur, with the latest PFN models offering robust stabilization. This intramedullary device enhances stability by having a shorter lever arm, distributing loading forces more effectively, and demonstrating a reduced risk of collapse following intertrochanteric femoral fracture fixation.⁴ However, the use of PFN may lead to complications, including proximal screw migration, femoral head

perforation, sideways collapse, and occurrences of fractures as well as cut-outs surrounding the femoral nail, as seen in cases of intertrochanteric femur fracture fixation with PFN.^{5,6}

For unstable intertrochanteric fractures, the recommendation leans towards prosthetic replacement due to potential complications associated with internal fixation.⁷⁻⁹ Unstable fractures of intertrochanteric femur are characterized by the disruption of the posteromedial buttress with a single fragment or a fracture extension into the sub-trochanteral region.¹⁰ For geriatric individuals with femoral shaft fractures, opting for an implant can effectively reduce complications linked to the fracture. Another notable advantage of this treatment approach is the facilitation of early mobilization for patients.¹¹

This study investigates the outcomes of treating unstable intertrochanteric femoral fractures in the elderly using PFN and BHA. The aim is to provide valuable insights for informed decision-making in selecting optimal interventions for this patient population.

METHODS

A retrospective assessment was conducted on 76 patients aged 65 years and older, with femoral shaft fractures treated either with cementless BHA (n=40) or PFN (n=36) between 2018 and 2022 at PRM medical college in Baripada, Odisha, India. The evaluation included the application of the Harris hip score (HHS), with additional documentation of duration of surgery and rates of blood transfusion.¹² Exclusions encompassed patients with complex injuries, lesion-induced fractures, or prior hip joint degeneration.

Surgery was carried out in horizontal position for patients receiving PFN, with use of non-intrusive methods employed for the nailing procedure following fracture reduction under fluoroscopic guidance. In contrast, all BHA procedures were carried out through a dorsolateral incision, utilizing implants without cement fixation and hooked hip plates across all cases.

All individuals were urged to stand on the day following the surgical procedure, with each patient participating in a prescribed rehabilitation program. Instances of post-operation complications, encompassing failure of implants and infections, were meticulously documented for both cohorts.

Statistical methods

Statistical analysis, using SPSS 11.5, presented continuous variables as mean. Fisher's exact test compared discrete variables, and either the student t test or Mann-Whitney U test assessed mean values, with statistical significance set at $p < 0.05$.

RESULTS

The average patient age was 82.9 years, with the BHA group having an average age of 81.4 years and the PFN group having an average of 83.9 yrs. The overall average follow-up duration was 18.6 months, with the BHA group having an average follow-up of 23.8 months and the PFN group having a average of 13.1 months. The ratio of males was higher in the BHA cohort when compared to the PFN cohort (Table 1).

Table 1: Demographic data of patient cohort.

Variables	BHA cohort, (n=40)	PFN cohort, (n=36)
Demographic data		
Average age (In years)	81.4	83.9
Male	29	17
Female	11	19
Average follow up (months)	23.8	13.1
Surgical characteristics		
Blood loss (cc)	687.2	605.7
Average duration of hospitalization (days)	8.4	7.9
Mean time to walking (days)	3.4	2.1

The average HHS for the whole cohort was 81.9 points, with the BHA group scoring 80.8 points and the PFN group scoring 82.5 points. Within the BHA cohort, 10 individuals received an excellent HHS, 14 had a considerable score, 12 received an average score, and 4 received a low score. In the PFN group, 20 patients achieved an excellent HHS, 6 achieved a considerable score, 6 achieved an average score, and 4 received a low score. The average volume of blood transfusion was 0.81 units for all patients, 1.39 units for the BHA cohort, and 0.29 units for the PFN cohort. The overall average surgery duration was 78.7 minutes, with the BHA cohort at 94.6 minutes and the PFN cohort at 60.4 minutes (Table 2).

Table 2: Findings from both cohorts.

Variables	Average age (In years)	Avg. follow-up period (months)	Mean HHP score	Rate of blood transfusion (units)	Duration of surgery (min)
Total	82.9	18.6	81.9	0.81	78.7
BHA cohort	81.4	23.8	80.8	1.39	94.6
PFN cohort	83.9	13.1	82.5	0.29	60.4

A significant difference was observed in the surgery duration of the two cohorts ($p < 0.05$), with the PFN procedure exhibiting a shorter duration compared to BHA. Furthermore, the blood transfusion rate showed a significant variation amongst the cohorts, indicating a reduced need for blood transfusion in the PFN group in contrast to the BHA group.

Within the BHA cohort, 4 individuals experienced epidermal infections, and no other adverse effects, like internal infections and implant failure without infection, were detected post-arthroplasty operation. Conversely, in the PFN cohort, only 2 patients encountered epidermal infections, and 2 other patients witnessed malfunctioning or failure of implant after six months, necessitating subsequent extraction. The cut-out rate in the PFN cohort was recorded at 5.5%.

DISCUSSION

Ensuring successful consolidation post-fracture fixation is a pivotal concern. Intramedullary devices demonstrate impressive union rates, reaching as high as 100%, in contrast to extramedullary devices, which have reported rates of up to 80%.¹³ The load-sharing capability of intramedullary devices in minor bending moments facilitates early weight-bearing capacity, thereby mitigating the potential for collapse. Within the PFN group, the absence of non-union instances was evident.

Elderly females with osteoporosis and compromised bone integrity, receiving treatment with compression hip screws, femoral nails or plates for intertrochanteric femur fractures, may encounter issues such as fracture collapse and varus displacement. Varus collapse, primarily linked to lateral protrusion or lag screw cut-out, is a frequent occurrence in the neck and head following the fixation of fractures of the femur using PFN and sliding compression screws.^{14,15} Complications like the reverse Z-effect and Z-effect may arise resulting in perforation of the femoral head and sideways collapse.¹⁶ A comparative study demonstrated that utilization of 2 lag screws resulted in enhanced outcomes for patients with satisfactory bone quality but posed an increased vulnerability of cut-out in osteoporotic patients.¹⁷ Another study found no statistically significant disparities in functional and radiological outcomes or complication rates when comparing PFN treatment using an integrated lag screw versus two separate lag screws.¹⁸ In the current study, all PFN patients underwent treatment with integrated lag screws, and only 2 cut-out complications were identified in this series.

The rate of cut-out incidents in individuals belonging to the PFN cohort and treated with dynamic hip screws typically falls between 3% and 10%.^{14,15} In the present investigation, 2 female patients with osteoporosis encountered femoral head perforation six months post-reconstruction of the intertrochanteric femur fracture using PFN, leading to the necessity of implant extraction.

The cut-out rate observed in our study closely mirrors the figures documented in existing literature.

As indicated in the work conducted by Kumar et al in comparison to internal fixation, the management of femoral shaft fractures with cemented BHA offers the advantages of faster mobilization and reduced hospitalization.¹⁹ In this investigation, patients belonging to the 2 cohorts were mobilized on the day after the surgical procedure, challenging the notion that BHA provides an edge in early ambulation. However, we did not scrutinize the duration of patients' hospitalization post-surgery. Kapicioglu et al examined hip fractures in exceptionally aged individuals, revealing that individuals treated with PFN tended to have extended life expectancies compared to those subjected to bipolar cemented hemiarthroplasty.²⁰ Importantly, our study did not evaluate mortality rates.

In treating unstable intertrochanteric femur fractures in geriatric patients, primary cemented BHA offers benefits such as early mobility, favorable motor outcomes, and painless motion of the hip joint.²¹ Trochanter healing post-BHA can be challenging, but cerclage fixation has shown success in preventing femoral component loosening and promoting complete trochanter healing.²² Our study utilized cementless BHA with trochanteric hook plates, demonstrating positive clinical outcomes and no loosening of femoral component the monitoring period.

A study by Rodop et al on 37 geriatric patients treated with primary BHA for unstable intertrochanteric fractures revealed excellent and good HHS assessments in 45% and 37% of patients, respectively, at the 12-month mark post-surgery.⁸ Our investigation, focusing on cementless BHA with trochanteric hook plates, similarly achieved positive clinical outcomes without femoral component loosening during the follow-up period.

Luo et al comparative analysis between PFN anti-rotation and BHA for intertrochanteric femur fractures found no significant differences in surgical complications, rates of re-surgery, surgery time, or HHS.²³ However, distinctions were noted in rate of blood transfusion, health complications, and period of hospitalization, with a higher 1-year post-surgery fatality rate seen in the BHA cohort. Their findings align with our study results, suggesting PFN treatment may offer advantages over BHA.

Geiger et al advocated for PFN in addressing unstable intertrochanteric femoral fractures and hip screws for stable fractures.²⁴ The authors observed no notable distinction in mortality risk when comparing primary cemented hip arthroplasty with alternative treatment modalities for intertrochanteric femoral fractures. Hip arthroplasty emerges as a viable alternative for individuals with osteoarthritis and osteoporosis, particularly benefiting those unable to bear full weight

after experiencing intertrochanteric femoral fractures. Notably, none of our patients displayed indications of osteoarthritis prior to undergoing surgery.

Limitations

The limitations of this study include a small sample size and a post hoc design, introducing potential biases. The absence of long-term follow-up data and a direct comparison with other fixation methods further restricts the generalizability and comprehensive assessment of the findings.

CONCLUSION

The study focussing on Treatment of unstable intertrochanteric femoral fractures in elderly population reveals that in contrast to PFN, hip arthroplasty demonstrates a reduction in implant-related complications and reoperation rates for intertrochanteric femoral fractures. In our study, no re-surgery was necessary for the BHA group, although the follow-up period may be considered too brief for definitive conclusions on reoperation rates. Notably, 2 patients treated with PFN required implant extraction. PFN procedures were more time-efficient compared to BHA, with the PFN group experiencing a reduced volume of blood transfusions compared to the BHA group. Consequently, for surgical treatment of intertrochanteric femur fractures in geriatric patients, PFN appears to be a more favorable option than BHA, showing potential advantages in terms of reduced complications and improved efficiency.

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