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Original Article

Role of Minimally Invasive Techniques in Reducing Intraoperative Blood Loss and Surgical Time in Intertrochanteric Fracture Fixation

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ABSTRACT

Background: Intertrochanteric fractures are common among the elderly, and they frequently require surgery. Compared to typical open procedures, minimally invasive surgical (MIS) approaches have been proposed as a way to reduce intraoperative blood loss and surgical time.
Aim: To assess the effectiveness of MIS approaches in reducing operating times and intraoperative blood loss during intertrochanteric fracture repair.
Methods: A retrospective observational analytical analysis was conducted on 94 patients who received care at Srinivasan Medical College and Hospital from January 2023 to January 2025. Patients were divided evenly into two groups: 47 had minimally invasive fixation, and 47 received traditional open fixation. Hospital records are utilized to collect information about demographics, surgical duration, intraoperative blood loss, and length of stay. Statistical analyses were conducted using independent t-tests and chi-square testing.
Results: There was no significant difference in age, sex distribution, or fracture type across groups. The MIS group had a significantly shorter surgical duration (34.79 ± 7.70 min vs. 59.04 ± 16.24 min, $p<0.001$), lower intraoperative blood loss (76.49 ± 14.78 ml vs. 237.23 ± 50.64 ml, $p<0.001$), and shorter hospital stay (5.45 ± 2.17 days vs. 9.36 ± 2.75 days, $p<0.001$).
Conclusion: Minimally invasive approaches for treating intertrochanteric fractures significantly reduce operating time, blood loss, and hospital stay duration. These benefits urge more widespread use of MIS procedures to improve perioperative outcomes for this patient population.

Keywords: *Intertrochanteric fracture, minimally invasive surgery, intraoperative blood loss, surgical time.*

INTRODUCTION

A femur intertrochanteric fracture is one of the most common injuries seen in orthopaedic practice, particularly in elderly patients with underlying osteoporosis and poor bone quality. These fractures account for 45–50% of all hip fractures worldwide and are associated with a substantial risk of morbidity and mortality, especially if treatment is delayed. Early and consistent fixation is critical for effective pain management, mobilization, and preventing consequences such as pulmonary infection, thrombosis, and long-term immobilization-related comorbidities [1]. Intertrochanteric fractures have historically been treated using open reduction and internal fixation procedures. Conventional techniques, on the other hand, usually require prolonged intraoperative manipulation and extensive surgical dissection, which increase intraoperative blood loss, lengthen surgery timeframes, and delay functional recovery. These considerations are

especially pertinent in elderly patients with comorbidities, where the physiological strain of surgery might have a direct impact on outcomes [2].

To address these constraints, minimally invasive surgical methods have recently been developed, including the minimally invasive proximal femoral nailing (MIPFN) and the minimally invasive dynamic hip screw (MIDHS). Minimally invasive fixation may provide benefits such as smaller incisions, less soft tissue damage, less intraoperative blood loss, faster recovery, and shorter operating times [3]. When compared to traditional open procedures, a number of clinical studies and meta-analyses have shown that minimally invasive approaches may significantly enhance perioperative outcomes [4]. However, there is contradicting data, as some studies demonstrate that the two treatments had identical surgical times and blood loss.

Given these uncertainties, additional institutional-level evaluation of the function of minimally invasive fixation in intertrochanteric fractures is still required, particularly when both methods are employed concurrently. This retrospective analytical study aims to compare intraoperative blood loss and surgical time in patients operated on in a tertiary care facility using minimally invasive and conventional fixation techniques. The findings could provide vital information about how to make better surgical decisions and improve perioperative outcomes for this high-risk patient population.

AIM

To assess the effectiveness of minimally invasive techniques in reducing intraoperative blood loss and surgical time in intertrochanteric fracture fixation

OBJECTIVES

1. To compare intraoperative blood loss between patients undergoing minimally invasive fixation and those undergoing conventional open surgical techniques for intertrochanteric fractures.
2. To compare the total surgical duration between minimally invasive and conventional techniques in the treatment of intertrochanteric fractures

STUDY METHODOLOGY

The retrospective observational analytical investigation was conducted at the Department of Orthopaedics, Srinivasan Medical College and Hospital between January 2023 and January 2025. This study was done among the patients with intertrochanteric fractures to assess intraoperative blood loss and surgery length between minimally invasive and conventional open fixation methods. Before beginning, consent from the institutional ethics committee was obtained. Informed permission was waived due to the use of anonymized data and the retrospective nature of the study. Patients with intertrochanteric femoral fractures who underwent surgery throughout the study period and were at least 18 years old were considered eligible. Patients who had surgical fixation using minimally invasive procedures (Group A) or traditional open techniques (Group B) met the inclusion criteria. Patients with pathological fractures, open fractures, polytrauma, past ipsilateral hip surgery, or medically unfit for surgery were also eliminated.

According to Arnab et al. (2022) [5] study, the estimated sample size is 52 patients (26 in each group), with 80% power and 95% confidence. The study's statistical power and reliability were enhanced by accepting 94 patients (47 in each group) due to availability. A bigger sample size increases the validity and reliability of the study result. The 94 patients who met the qualifying criterion were divided evenly into two groups: Group A with minimally invasive fixation (n = 47) and Group B with conventional surgical fixation (n = 47). Groups of patients were defined based on the surgical technique recorded in the hospital's records. Retrospective data extraction was performed using operating notes, computerized medical records, and hospital surgical records. Important variables gathered included demographic information (age, sex), clinical information (fracture type, cause, and side), intraoperative parameters (blood loss as determined by suction volumes and swab weights, surgical time from skin incision to closure), and the average length of hospital stay.

• Minimally Invasive Fixation (Group A): Patients were fixed with proximal femoral nailing or a minimally invasive dynamic hip screw (MIDHS) through modest incisions and restricted soft tissue dissection using fluoroscopy.

• Conventional Fixation (Group B): Patients had internal fixation and standard open reduction, which entailed making wider incisions that allowed for direct sight of the fracture site while also exposing a significant quantity of soft tissue.

Following institutional standards, all surgeries were performed by orthopaedic surgeons who were specialized in both procedures. The primary outcome measures were intraoperative blood loss (mL) and surgical time (minutes). Secondary outcomes were hospital stay duration (number of days) and demographic comparability.

STATISTICS

SPSS version 26.0 was used to analyse the data. To compare continuous variables represented as mean ± standard deviation (SD), independent samples t-tests or Mann-Whitney U tests are performed, based on data normality. Categorical variables were analysed using chi-square or Fisher's exact tests, if appropriate. The statistical significance level was established at a p-value < 0.05. 95% confidence intervals were calculated for mean differences and odds ratios, when appropriate.

RESULTS

The mean age of the MIS group was 60.6 ± 14.36 years, while that of the conventional group was 57.74 ± 15.85 years (p=0.396). Males comprised 61.7% of the MIS group and 57.4% of the traditional group, demonstrating a comparable gender distribution between the groups (p=0.674). Similarly, there were no significant differences between the two groups in terms of comorbidity status, fracture cause, fracture type, or fracture side (all p > 0.05), indicating that the baseline clinical parameters were comparable. (Table 1)

Key surgical parameters revealed substantial differences favouring the minimally invasive method. The MIS group's mean surgery time was 34.79 ± 7.70 minutes, significantly shorter than the traditional group's 59.04 ± 16.24 minutes (p < 0.001). The MIS group had considerably decreased intraoperative blood loss (76.5 ± 14.78 ml) compared to the conventional group (237 ± 50.64 ml) (p < 0.001). The MIS group had a considerably shorter average hospital stay than the traditional group (5.45 ± 2.17 vs. 9.36 ± 2.75 days, p < 0.001). (Table 2)

Table 1: Comparison of baseline characters between two groups (N = 47 in each group)

Variable		Group A N = 47n (%)	Group B N = 47 n (%)	Chi-Square	p value
Age		60.6 ± 14.4	57.7 ± 15.9		0.4
Sex	Male (56)	29 (52%)	27 (48%)	0.2	0.7
	Female (38)	18 (47%)	20 (53%)		
Comorbidity	Absent (51)	24 (47%)	27 (53%)	0.4	0.5
	Present (43)	23 (54%)	20 (47%)		
Cause of Fracture	Fall (64)	29 (45%)	35 (55%)	1.8	0.2
	RTA (30)	18 (60%)	12 (40%)		
Type of Fracture	A1 (28)	12 (43%)	16 (57%)	1.1	0.6
	A 2 (49)	27 (55%)	22 (45%)		
	A 3 (17)	8 (47%)	9 (53%)		
Fracture Side	Right (47)	26 (55%)	21 (45%)	1.1	0.3
	Left (47)	21 (45%)	26 (55%)		

Table 2: Comparison mean values of outcome (N = 47 in each group)

Variable	MIS		Conventional		t value	p value
	Mean	Std. Deviation	Mean	Std. Deviation		
Surgical Time (minutes)	34.8	7.7	59.0	16.2	-9.25	<0.001
Intra Operative Blood loss (ml)	76.5	14.8	237.2	50.6	-20.89	<0.001
Average Hospital Stay (days)	5.5	2.2	9.4	2.8	-7.68	<0.001

DISCUSSION

This study compared the efficacy of minimally invasive surgery (MIS) to traditional open fixation in patients with intertrochanteric fractures, focusing on intraoperative blood loss, surgical time, and hospital stay. While baseline demographic and fracture-related parameters were identical between groups, the study found that MIS dramatically reduced operative time, intraoperative blood loss, and length of hospitalization. These findings lend support to the growing body of clinical evidence supporting the use of minimally invasive procedures in the treatment of intertrochanteric fractures.

Minimally invasive procedures are gaining popularity due to their ability to prevent soft tissue injury and hence improve perioperative outcomes. Our findings of a mean reduction in operative time of about 24 minutes and a reduction in blood loss of about 160 ml are consistent with Mahmood et al. (2013) [6], who found that minimally invasive DHS procedures resulted in shorter operative times and less blood loss than conventional open methods. In a similar vein, Vidyarthi et al. [7] (2017) revealed that MIS considerably reduced surgery time and blood loss in a randomized study.

Shorter operating periods (34.8 vs. 59 min) reduce physiological stress and anaesthetic exposure, which is especially useful for older patients with depleted physiological reserves. Kapoor and Mehrotra et al. [8] (2024) found that the MIS approach reduced intraoperative transfusion requirements and surgical length when compared to standard DHS fixation;

however, there were no statistically significant differences in postoperative hospital stay. However, our study found that the MIS cohort had a statistically significant shorter hospital stay, which is consistent with other recent studies that show faster rehabilitation and discharge with MIS.

Besnard et al. [9] (2023) found that minimally invasive side plate fixation considerably reduces perioperative bleeding when compared to standard techniques, which is consistent with the MIS group's reduction in intraoperative blood loss from 237 ml to 76 ml. Reduced blood loss improves postoperative recovery and morbidity by reducing the need for transfusions and the likelihood of transfusion-related complications. Prete et al. [10] (2012) found that MIS patients had much lower levels of surgical trauma markers such as interleukin-6, highlighting the less invasive nature of the treatment.

Our findings add to a significant body of literature demonstrating that surgical approach influences perioperative outcomes without compromising fixation quality or fracture reduction. According to functional outcomes from Shams et al. [11] (2022) and other comparable prospective investigations, MIS procedures produce high functional scores with union and early weight bearing comparable to standard surgery. Shorter hospital stays and less operational trauma contribute to improved recovery profiles, even if postoperative functional ratings were not assessed in this study.

STUDY LIMITATION

The study limitations include a retrospective design, a single-centre location, and the absence of long-term functional outcome evaluation. To corroborate these findings and examine outcomes like complication rates, union times, and functional recovery, bigger randomized controlled trials are required. Cost-effectiveness studies would also help to understand the potential financial benefits of MIS in resource-constrained contexts.

CONCLUSION

This study concludes by reinforcing previous findings that minimally invasive fixation procedures for intertrochanteric fractures offer significant benefits in terms of reduced blood loss, shorter operating times and shorter hospital stays. These advantages stimulate the increasing use of minimally invasive procedures to improve perioperative safety and accelerate recovery in this vulnerable patient population.

CONFLICT OF INTEREST: Nil.

Figure 1: Preoperative X ray of Intertrochanteric fracture on Left side

Figure 2: Normal Incision wound used for PFN / DHS (Figure shows after exposure)

Figure 3: Minimally Invasive wound used for PFN (Figure shows after exposure)

Figure 4: Minimally Invasive wound used for PFN (Figure shows after closure)

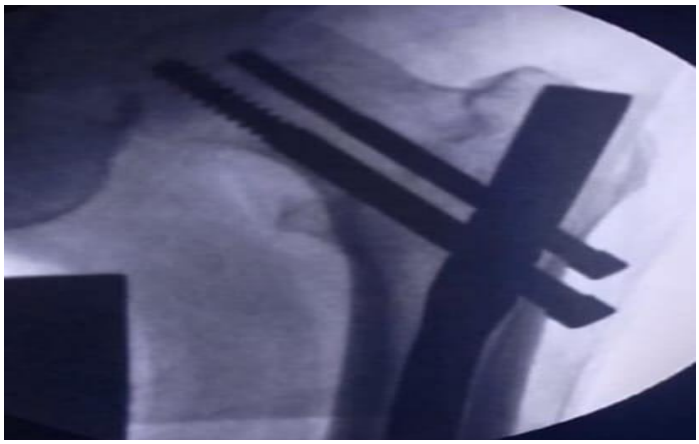

Figure 5: Immediate Postoperative x-ray of PFN (figure shows Antero Posterior view of the fixation)

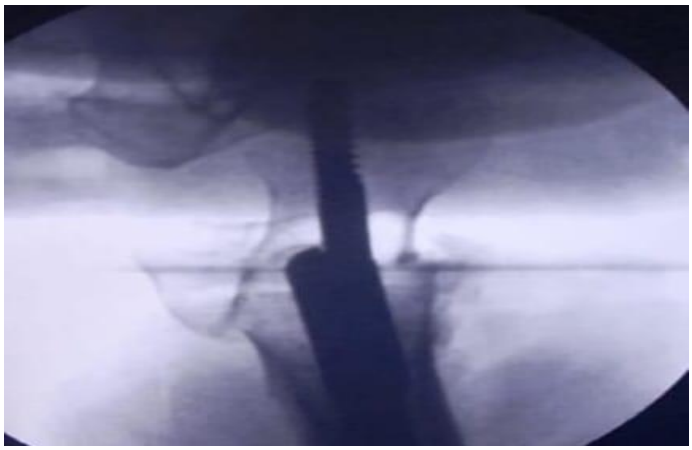

Figure 6: Immediate Postoperative x-ray of PFN (figure shows Lateral view of the fixation)

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