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Original Research Article

# A Study on Functional Outcome of Operative Management of Proximal Femur Fracture with Proximal Femur Nailing

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**Abstract:**

**Introduction:** Fractures in the proximal femur, particularly intertrochanteric fractures, are notably common among the elderly. The primary objective of treatment is the prompt restoration of patients to their pre-injury state. Given the diverse nature of fracture patterns and significant morphological variations, there are various available treatment approaches. The use of Proximal Femoral Nail (PFN) for fracture fixation has demonstrated advantages, including reduced blood loss, enhanced early mobilization, and a decreased incidence of infection and malunion in these patients. This study aims to evaluate the functional outcomes of surgically managed proximal femoral fractures using PFN.

**Material and Methods:** Conducted prospectively, this study focused on patients aged 40 to 75 years with proximal femoral fractures. A total of 60 patients from our hospital were selected, and the evaluation of outcomes was based on Kyle's Criteria.

**Results:** According to Kyle's criteria, 70 %, equivalent to 42 patients, demonstrated excellent results. Additionally, 20 % (12 patients) reported minimal pain at the 6th month post-surgery. Importantly, 80 % of patients successfully returned to their pre-injury status concerning daily routine activities, with only 2 patients experiencing limb shortening of approximately 2 cm.

**Conclusion:** Achieving anatomical reduction and stable fixation is crucial for favorable outcomes in unstable proximal femur fractures. PFN emerges as a beneficial minimally invasive option with limited soft tissue manipulation. Patients treated with proximal femoral nailing exhibited positive outcomes, highlighting the effectiveness of this approach. Keywords: Proximal femur, Intertrochanteric fractures, Subtrochanteric fractures, Proximal femoral nail.

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## Introduction

Intertrochanteric fractures, predominantly occurring in the proximal femur, extend from the extra capsular basilar neck to the region near the lesser trochanter, situated proximal to the origin of the medullary canal. This type of fracture is more prevalent among the elderly population, particularly in females with osteoporosis, and is often a consequence of relatively minor falls. [1]

The significance of these fractures is underscored by the increasing life expectancy witnessed over the past two decades, leading to a higher incidence of proximal femur fractures. This trend has contributed to elevated mortality and morbidity rates, especially among younger individuals. [2] The vulnerability of geriatric patients to proximal femur fractures is multifactorial. Factors such as osteoporosis, diminished muscle power, reflexes, compromised vision, and labile blood pressure make this demographic susceptible to fractures even following minor trauma. [3-4] In contrast, younger patients typically necessitate higher-energy trauma to incur such fractures.

Understanding the demographics and factors contributing to intertrochanteric fractures is crucial for effective management and prevention strategies. As populations age and life expectancy increases, addressing the unique challenges posed by proximal femur fractures becomes increasingly important for enhancing patient outcomes and reducing the associated mortality and morbidity risks, particularly in both the elderly and younger age groups.[5-6] Operative treatment is preferred

over conservative methods in the elderly due to increased comfort, early mobilization, and reduced morbidity and mortality. [7] Subtrochanteric fractures necessitate operative intervention, with limited scope for conservative management. [8] Utilizing a proximal femoral nail for fracture fixation has shown benefits such as lower blood loss, improved early mobilization, and reduced infection and malunion rates. The study's objective was to evaluate the functional outcomes of surgically managed intertrochanteric fractures using a proximal femoral nail.

**Material & Methods:**

This prospective study, conducted with institutional ethical approval, focused on proximal femoral fractures in individuals aged 40 to 75 with intertrochanteric and subtrochanteric fractures, were selected. Data collection involved informed consent, interviews, and record analysis, with follow-ups at 6 weeks, 12 weeks, and 6 months postoperatively. Kyle's criteria, encompassing postoperative pain, return to daily activities, range of movements, limb shortening, neck shaft angle, implant position, and radiological union, assessed outcomes. Inclusion criteria covered all proximal femoral fractures (intertrochanteric and subtrochanteric) in patients over 20 years. Exclusion criteria involved age under 20, compound or pathological fractures, and associated injuries. Fractures were treated with short PFN for intertrochanteric and long PFN for subtrochanteric fractures. A standard procedure, involving reaming and nail insertion under fluoroscopic control, was followed. Prophylactic antibiotics, early mobilization, and weight-bearing protocols were implemented postoperatively. Patients were monitored at regular intervals, assessing functional outcomes and addressing osteoporosis with calcium and bisphosphonates. The study aimed to comprehensively evaluate surgical management's impact on proximal femoral fractures.

**Results:** Kyle's criteria revealed that 70% (42 patients) experienced excellent outcomes after surgery. Additionally, 20% (12 patients) reported minimal pain at the 6-month follow-up. Notably, 80% of patients resumed their pre-injury daily activities. Complications included superficial infection in 1 patient, screw migration in 2, and varus angulation in 3 with communited fractures. Limb shortening of approximately 2 cm occurred in only 2 patients, while 3 cases showed grade 1 or 2 bed sores that healed upon mobilization. The most common injury was a trivial fall in 43 patients, followed by road traffic accidents in 15 cases and falls from height in 2 cases. Boyd's and Griffin's classification revealed 15 type I fractures, 33 type II, and 6 each of type III and IV. Seinsheimer's classification indicated 8 type II fractures, 12 type III, 7 type IV, and 5 type V. Additionally, 15 patients had osteoporosis (Singh's index grades 1 or 2), and 27 had borderline osteoporosis (grades 3 or 4).

**Discussion**

Intertrochanteric fractures, commonly observed in elderly individuals with osteoporotic bones, often stem from low-energy trauma incidents. On the other hand, subtrochanteric fractures are more frequently associated with high-energy trauma due to the intricate stress patterns and the nonhomogeneous structure of the proximal femur. The complexity of these fractures, particularly in the subtrochanteric region, complicates closed reduction and the maintenance of reduction, limiting the effectiveness of conservative treatment approaches.[9]

In addressing these challenges, medical practitioners tend to lean towards intramedullary fixation as a preferred method over extramedullary fixation. This choice is grounded in the belief that intramedullary fixation offers biological advantages. By opting for intramedullary devices, the risk of complications such as malunion, non-union, and delayed union is reduced. This approach recognizes the unique structural and biomechanical considerations of the proximal femur, aiming to provide more stable and secure fixation for fractures in this region.[10] In essence, the preference for intramedullary fixation in the context of intertrochanteric and subtrochanteric fractures reflects a strategic approach to enhance the chances of successful healing and minimize potential complications associated with these specific types of fractures, especially in the vulnerable population of elderly individuals with osteoporotic bones.

The advancements in treating unstable trochanteric fractures involve the adoption of the Proximal Femoral Nail (PFN), which brings notable benefits to patients. One key advantage of PFN is the incorporation of anti-rotational screws, contributing to the stability of the implant. Additionally, PFN addresses stress concerns at the nail tip, aiming to reduce the likelihood of complications related to this area.[11]

In contrast to the conventional Dynamic Hip Screw (DHS), the Proximal Femoral Nail (PFN) brings notable advancements in biomechanics when addressing fractures. One key improvement is the reduction of the lever arm distance, a pivotal factor in the fixation of fractures. This reduction has a significant impact on the biomechanical forces applied to the fracture site. By minimizing the lever arm distance, PFN enhances compressive forces within the fracture region, thereby contributing to improved stability and support during the critical healing process. A distinctive feature of the PFN approach lies in its facilitation of early weight-

bearing for patients, marking a substantial advantage over traditional methods. Early weight-bearing is crucial for patients' postoperative mobility and overall recovery. This benefit is achieved through the adoption of a minimally invasive surgical technique associated with the PFN approach. The minimally invasive nature of the procedure not only reduces the extent of surgical trauma but also accelerates the recovery process, making it particularly advantageous in the context of trochanteric fractures.

The biomechanical enhancements offered by PFN, including the reduction of lever arm distance and the promotion of compressive forces, coupled with the ability to allow early weight-bearing through a minimally invasive approach, collectively make it a valuable alternative to the traditional DHS. These improvements contribute to a more favorable patient experience and potentially expedite the healing and recovery timelines for individuals undergoing treatment for trochanteric fractures.

While the Proximal Femoral Nail (PFN) is not without recognized shortcomings such as instances of screw cut out and lateral migration, its overall advantages position it as a valuable choice, particularly for elderly patients grappling with unstable peri-trochanteric and subtrochanteric fractures. The standout feature of PFN lies in its ability to allow immediate weight-bearing, a critical factor in the post-operative recovery process.

The reported instances of screw cut out and lateral migration acknowledge specific challenges associated with PFN. However, these drawbacks are weighed against the broader benefits the implant offers. For elderly patients, who are often more vulnerable to complications and extended recovery times, the advantages of PFN become particularly noteworthy. Immediate weight-bearing, made possible by PFN, plays a pivotal role in post-operative care, facilitating early mobility and potentially reducing the risk of complications associated with prolonged immobilization.[12-13]

In essence, despite its limitations, PFN emerges as a favorable choice due to its positive impact on the overall recovery experience. The ability to support immediate weight-bearing not only enhances the patient's quality of life post-surgery but also contributes to a reduction in post-operative morbidity. This feature makes PFN a valuable intervention for individuals facing the challenges of unstable peri-trochanteric and subtrochanteric fractures, especially in the context of the unique needs and considerations associated with the elderly patient population. Studies by Kish et al, S F Kammar et al and Menezes et al support the advantageous use of PFN, demonstrating benefits like immediate full weight-bearing, low rates of fixation failure, and usefulness in treating unstable intertrochanteric and subtrochanteric fractures. Despite occasional issues like the Z effect or cut-out of the neck screw, PFN shows promise as a valuable alternative to DHS in managing these fractures.[14]

**Conclusion:**

In conclusion, the imperative for achieving precise anatomical alignment and secure fixation in unstable proximal femur fractures underscores the significance of the Proximal Femoral Nail (PFN) as an effective and minimally invasive solution. The approach minimizes soft tissue manipulation, contributing to positive outcomes in patients treated with proximal femoral nailing. The alignment of results with Kyle's criteria further reinforces the success of this procedure, emphasizing its potential as a valuable option for managing challenging cases of unstable proximal femur fractures.

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