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Original Article

Comparison of the therapeutic efficacy of hip arthroplasty and proximal femoral nail antirotation internal fixation for unstable intertrochanteric femur fractures

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Abstract: Objective: To compare the therapeutic efficacy of total hip arthroplasty (THA) versus proximal femoral nail antirotation (PFNA) internal fixation for treating unstable intertrochanteric femur fractures (UIFF). Methods: In this retrospective study, the clinical data of 86 patients with intertrochanteric femur fractures (IFF) treated in Hangzhou Fuyang Hospital of Orthopedics of Traditional Chinese Medicine from January 2022 to December 2023 were collected and analyzed. Patients were categorized into two groups based on their treatment modality: the THA group (n=45, treated with THA) and the PFNA group (n=41, treated with PFNA internal fixation). The two groups were compared in terms of surgery-related indicators (operative time, incision length, intraoperative blood loss, postoperative drainage volume, and intraoperative fluoroscopy frequency), postoperative recovery indicators (time to first ambulation, length of stay, time until full weight-bearing ambulation), and the incidence of postoperative complications. The pain indicators (Wong-Baker Faces Pain Rating Scale) and hip joint function indicators (Harris Hip Scores) of patients in the two groups were assessed preoperatively and at 1, 3, and 6 months postoperatively. The hip joint function recovery outcomes of the two groups of patients were recorded at the last follow-up. Results: The PFNA group had significantly shorter operative time, shorter incision length, lower intraoperative blood loss, lower postoperative drainage volume, and higher intraoperative fluoroscopy frequency compared to the THA group (all $P < 0.05$). The PFNA group also had significantly longer time to first ambulation, length of stay, and time until full weight-bearing ambulation (all $P < 0.05$). There was no statistically significant difference in the incidence of postoperative complications between the two groups ($P > 0.05$). Postoperative Wong-Baker scores in both groups decreased compared to preoperative levels. At 1 and 3 months postoperatively, the PFNA group had significantly higher Wong-Baker scores than the THA group ($P < 0.05$), but at 6 months postoperatively, the difference was not statistically significant ($P > 0.05$). Postoperative Harris scores increased in both groups compared to preoperative scores. At 1 month postoperatively, the PFNA group had significantly lower Harris scores than the THA group ($P < 0.05$); however, at 3 and 6 months postoperatively, the differences were not statistically significant (all $P > 0.05$). There was no significant difference in the rates of excellent recovery of hip joint function between the two groups at the last follow-up ($P > 0.05$). Conclusion: Both THA and PFNA internal fixation yield favorable outcomes in treating IFF with no significant difference in complications. The difference lies in the shorter operative time and lesser trauma inflicted by PFNA internal fixation, despite it involving prolonged radiation exposure and bed rest. Conversely, THA requires longer operative time and causes greater trauma but results in shorter postoperative recovery periods, allowing earlier ambulation.

Keywords: Total hip arthroplasty, PFNA internal fixation, unstable intertrochanteric femur fractures, Harris, complications

Introduction

Intertrochanteric femur fracture (IFF) is a type of hip fracture that occurs between the base of the femoral neck and the lesser trochanter. Elderly individuals are at high risk for IFF, with a higher incidence in women than in men. This is primarily due to age-related calcium loss from

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bone, resulting in osteoporosis and instability in the trabeculae microstructure within the intertrochanteric femur (IF). In cases of accidents such as slips or falls, if excessive torsional force is applied and the soft tissues cannot adequately absorb and transfer it, excessive stress is exerted on the IF, leading to IFF [1]. The main symptoms of IFF include hip pain, swelling, subcutaneous ecchymosis, restricted range of motion, limb shortening, and external rotation deformity. Patients are unable to ambulate from the bed, significantly impacting their daily activities [2]. IFF has a large fracture surface and the IF is well-vascularized, which facilitates healing for most fractures. However, improper immobilization or inappropriate stress during the healing period can pose a great risk of coxa vara.

Current management of IFF consists of conservative and surgical treatments. Conservative treatment requires prolonged bed rest, which carries high risks of complications such as pressure ulcers, deep vein thrombosis, and urinary tract infections. Clinical recommendations suggest that patients without surgical contraindications should actively pursue surgical treatment. This approach facilitates early ambulation and weight-bearing exercises, reducing the risk of complications from bed rest and improving quality of life [3]. IFFs are classified into five types based on the fracture fragments and displacement (Evans classification). Type I and II fractures involve no displacement or minimal displacement of the fracture end, making them relatively stable and suitable for conservative treatment; in contrast, type III, IV, and V fractures are unstable IFF (UIFF) with poor outcomes from conservative treatment, thus surgical treatment is recommended [4]. Current surgical treatments include intramedullary fixation, extramedullary fixation, and femoral head replacement. Proximal femoral nail antirotation (PFNA) is a type of intramedullary fixation known for minimal surgical trauma, but it requires an extended period of bed rest for recovery. Total hip arthroplasty (THA), a femoral head replacement surgery, involves implanting prosthetic material to reconstruct stable hip joint function, with the advantages of accelerating weight-bearing ambulation recovery and reducing complication risks, serving as a salvage treatment after osteosynthesis failure. However, it involves large surgical trauma, excessive blood loss, and long-term risks of complications such as joint dislocation, loosening, and infection [5].

The aim of this study is to compare the therapeutic efficacy of total hip arthroplasty (THA) and proximal femoral nail antirotation (PFNA) internal fixation for treating intertrochanteric femur fractures (IFF). We hope this study helps patients and physicians select a treatment method suitable for their physiological tolerance.

Methods

Study design and grouping

In this retrospective study, the clinical data of IFF patients treated in Hangzhou Fuyang Hospital of Orthopedics of Traditional Chinese Medicine between January 2022 and December 2023 were retrospectively collected and analyzed. All data were extracted from the hospital's electronic medical records. The research was conducted under the approval of the Ethics Committee of Hangzhou Fuyang Hospital of Orthopedics of Traditional Chinese Medicine.

Inclusion criteria: (1) Patients diagnosed with IFF through X-ray or CT scan [6]; (2) Fresh fractures; (3) Evans classification of intertrochanteric fracture type III to IV; (4) Admission within 48 hours of injury; (5) Normal ambulatory function of the lower limb before the fracture; (6) First onset of IFF.

Exclusion criteria: (1) Concurrent severe vital organ dysfunction; (2) Concurrent malignancy; (3) Multiple fractures; (4) Pathological fractures; (5) History of previous hip surgery; (6) Loss to follow-up.

Finally, a total of 86 IFF patients were included in this study and grouped based on their treatment modalities. Specifically, 45 patients treated with THA were assigned to the THA group, while 41 patients treated with PFNA internal fixation were assigned to the PFNA group.

Treatment modalities

Before surgery, all patients admitted to the emergency department underwent routine preoperative examinations to maintain electrolyte balance. Special attention was given to glyce-

mic and blood pressure control in those with underlying diseases to ensure their tolerance to surgical treatment [7].

During PFNA internal fixation, the anesthesia method (general anesthesia in 14 cases, continuous epidural anesthesia in 27 cases) was determined based on the patient's condition and physical status. The patient was placed in the prone position on the traction bed. Under X-ray imaging with a C-arm machine, traction, adduction, and internal rotation were performed on the affected limb to reduce the fracture site of the IF. After successful reduction, sterilization and draping were performed. A longitudinal incision of approximately 5 cm in length was made 3-5 cm from the apex of the greater trochanter of the femur. The skin tissues, fascia lata, and muscular tissues were sequentially cut to expose the apex of the greater trochanter. A perforator was used to create apertures on the inner side of the apex, and a guide needle was inserted. The position of the guide needle was confirmed with X-ray imaging. After medullary reaming along the guide needle, an appropriately sized staple was inserted, and a helical blade was driven into place with the assistance of a sighter. Following depth measurement, suitable locking nails were inserted into the femoral shaft. The reduction was confirmed under X-ray guidance, and the tail cap was installed. The operative field was cleared of bleeding, a drainage tube was indwelled, and the incision was closed layer by layer, completing the procedure [8].

In the THA treatment, the anesthesia method (general anesthesia in 15 cases, continuous epidural anesthesia in 30 cases) was determined based on the patient's condition and physical status. Once the anesthesia took effect, the patient was placed in lateral decubitus on the unaffected side and underwent sterilization and draping. A longitudinal incision of about 12 cm was made along the posterior-lateral approach of the hip joint, followed by sequential dissection through the skin, fascia lata, and other tissues to expose the fracture site of the IF and the joint capsule. The femur was osteotomized about 1 cm above the lesser trochanter, with the greater trochanteric fossa as the osteotomy point. The femur was removed, and the acetabulum and surrounding residual tissues were cleansed until slight oozing of blood was observed. Vital ligamentous tissues were preserved. The acetabular prosthesis was installed and fixed with steel wires, and the femur was subjected to medullary reaming. The femoral trial mold was installed, and the hip joint was reduced. After confirming normal flexion and rotation functionality, a drainage tube was placed in the articular cavity, and the incisions were closed layer by layer, completing the procedure [9].

Postoperative treatment included administering sodium heparin within 12 hours postoperatively to prevent venous thrombosis, using vacuum drainage for 24-48 hours, providing prophylactic antibiotics, and scheduling regular dressing changes. At 24 hours postoperatively, the PFNA group began knee and ankle joint exercises, lower limb muscle contraction exercises, and had X-rays to determine the timing for ambulation and weight-bearing walking. The THA group was encouraged to start ambulating with walking aids within 24-72 hours postoperatively, gradually progressing to partial and then full weight-bearing ambulation. Regular follow-up was conducted after discharge [10].

Data collection and scale scoring method

The preoperative clinical data and postoperative follow-up data were collected and observed, including the following: (1) Surgery-related indicators: operative time, incision length, intraoperative blood loss, postoperative drainage volume, and intraoperative fluoroscopy frequency [11] were compared. (2) Postoperative recovery indicators: time to first ambulation, length of stay, and time until full weight-bearing ambulation were compared. (3) Occurrence of postoperative complications: incision infections, urinary tract infections, lower extremity vein thrombosis, pressure ulcers, and joint deformity were recorded in both groups, and the incidence of complications was calculated [12]. (4) Pain indicators: The pain severity of patients was assessed preoperatively and at 1, 3, and 6 months postoperatively using the Wong-Baker Faces Pain Rating Scale. This scale uses a form with six expressions, from smiling to crying, each corresponding to scores of 0, 2, 4, 6, 8, and 10. Patients either self-selected or were assisted by healthcare providers to determine their pain score, with total scores ranging from 0 to 10. Higher scores indicated more severe

Table 1. Comparison of basic clinical data between the two groups (mean ± SD)/[n (%)]

Clinical data		PFNA (n=41)	THA (n=45)	t/χ^2	*P*
Gender (cases)	Male	15	17	0.013	0.909
	Female	26	28		
Age (years)	-	69.32±4.38	68.87±3.98	0.499	0.619
Time from injury to admission (h)	-	8.68±3.36	9.13±3.08	0.648	0.519
BMI (kg/m^2)	-	23.63±3.22	23.37±3.28	0.370	0.712
Evans classification	Type III	26	29	0.010	0.921
	Type IV	15	16		
ASA classification	Grade 1	6	8	0.852	0.653
	Grade 2	25	23		
	Grade 3	10	14		
Comorbidities	Hypertension	13	16	0.481	0.786
	Diabetes	5	7		
	Osteoporosis	23	22		

PFNA: proximal femoral nail antirotation; THA: total hip arthroplasty; BMI: body mass index; ASA: The American Society of Anesthesiologists.

pain [13]. (5) Hip joint function indicators: The hip joint function of patients was assessed preoperatively and at 1, 3, and 6 months postoperatively using the Harris Hip Score. This scale assesses hip joint function across four domains: pain, joint function, joint deformity, and range of motion, with total scores ranging from 0 to 100. Higher scores indicated better hip joint function [14]. (6) Outcomes of hip joint function recovery: At the last follow-up (6 months postoperatively), the Harris score was used to determine recovery grades based on the scores obtained: ≤ 69 points indicated poor recovery; 70-79 points, fair; 80-89 points, good; 90-100 points, excellent. The excellent rate of hip joint function = (number of excellent cases + number of good cases)/total cases × 100%.

Statistical analysis

Statistical Package for the Social Sciences (SPSS) 22.0 was used for data statistical analysis. Continuous measurement data were represented in the form of mean ± standard deviation (mean ± SD), and intergroup comparisons were conducted using t-tests. Counting data were expressed as percentages (%) and examined using chi-square tests. Two-factor repeated measures ANOVA was conducted for multiple time-point indicators. The Shapiro-Wilk test was used to confirm that the data conformed to a normal distribution. Verification was performed to ensure that the values did not exceed ±3 times the standard deviation (SD) to confirm the absence of outliers. $P < 0.05$ was considered as statistical significance.

Results

Comparison of general clinical data between the two groups

The general clinical data, including gender, age, time from injury to admission, body mass index (BMI), Evans classification, The American Society of Anesthesiologists (ASA) classification, comorbidities, were compared between the two groups of patients, revealing no significant differences (all $P > 0.05$) (**Table 1**).

Comparison of surgery-related indicators between the two groups

The PFNA group had significantly shorter operative time, shorter incision length, lower intraoperative blood loss, lower postoperative drainage volume, and higher intraoperative fluoroscopy frequency compared to the THA group (all $P < 0.05$) (**Table 2**; **Figure 1**).

Comparison of postoperative recovery indicators between the two groups

The PFNA group had significantly longer time to first ambulation, length of stay, and time until full weight-bearing ambulation compared to the THA group ($P < 0.05$) (**Table 3**; **Figure 2**).

Table 2. Comparison of surgery-related indicators between the two groups (mean ± SD)

Groups	Cases	Operative time (min)	Incision length (cm)	Intraoperative blood loss (mL)	Postoperative drainage volume (mL)	Intraoperative fluoroscopy frequency (times)
PFNA	41	61.37±5.86	4.34±1.08	165.37±18.46	141.64±20.14	3.55±0.81
THA	45	78.08±6.15	8.69±1.46	230.14±20.04	206.63±20.29	1.68±0.69
t	-	12.870	15.582	15.541	14.889	11.556
P	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

PFNA: proximal femoral nail antirotation; THA: total hip arthroplasty.

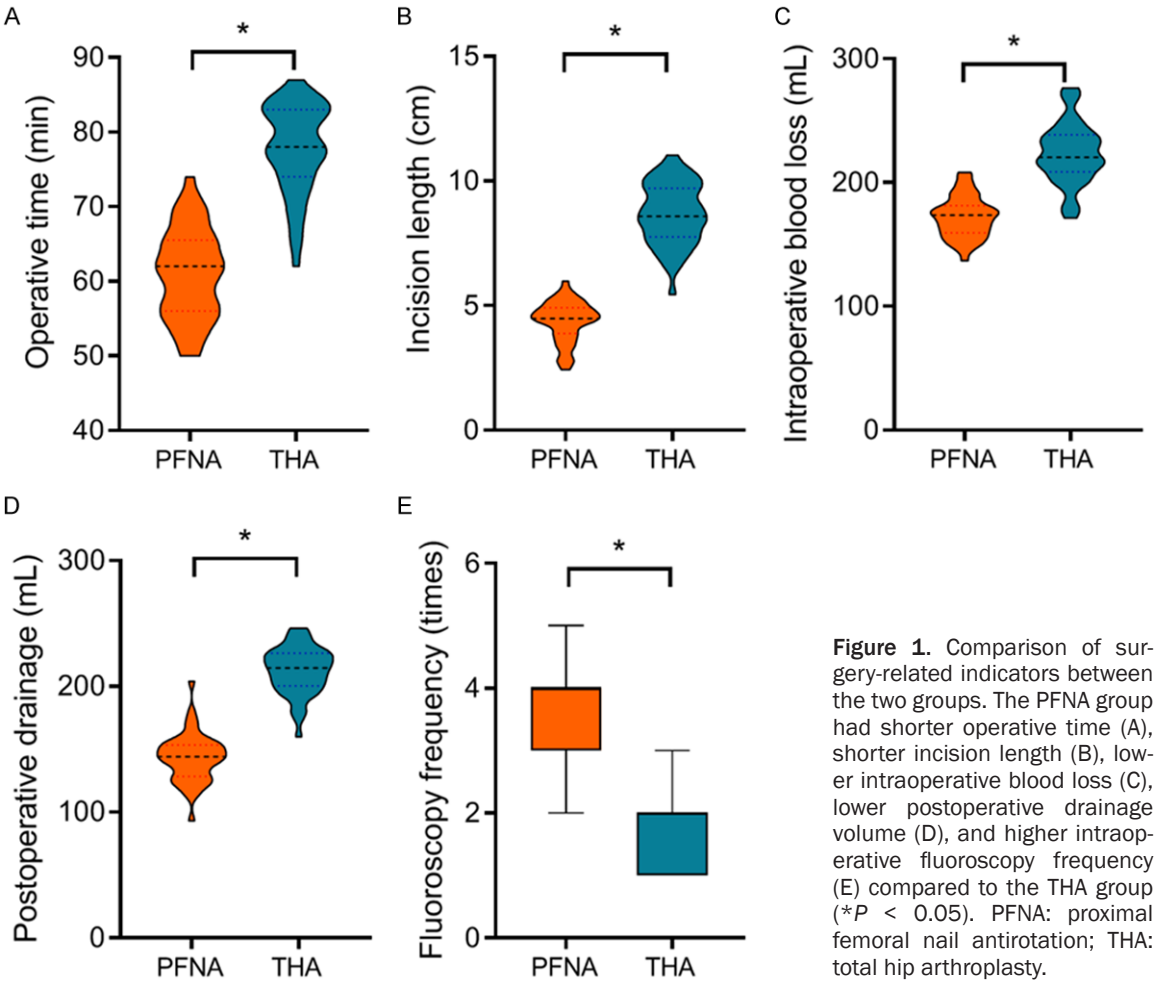

Figure 1. Comparison of surgery-related indicators between the two groups. The PFNA group had shorter operative time (A), shorter incision length (B), lower intraoperative blood loss (C), lower postoperative drainage volume (D), and higher intraoperative fluoroscopy frequency (E) compared to the THA group (*P < 0.05). PFNA: proximal femoral nail antirotation; THA: total hip arthroplasty.

Comparison of the incidence of postoperative complications between the two groups

There was no statistically significant difference in the incidence of postoperative complications between the two groups (P > 0.05) (**Table 4**).

Comparison of pain indicators between the two groups

Two-factor repeated measures ANOVA was conducted on Wong-Baker score data, which met the sphericity assumption. Time and the interaction of treatment modalities were the two effects. Time had a statistically significant impact on the Wong-Baker score (P < 0.05). An individual effect test for treatment modalities indicated that there was no significant difference in preoperative Wong-Baker scores between the two groups (P > 0.05). At 1 and 3 months postoperatively, the PFNA group had significantly higher Wong-Baker scores than the THA group (P < 0.05), but at 6 months postoperatively, the difference was not statistically significant (P > 0.05) (**Table 5**; **Figure 3**).

Table 3. Comparison of postoperative recovery indicators between the two groups (mean ± SD, d)

Groups	Cases	Time to first ambulation	Length of stay	Time until full weight-bearing ambulation
PFNA	41	15.26±2.03	16.69±1.84	66.82±4.19
THA	45	5.75±1.23	7.67±1.52	55.49±6.03
t	-	26.539	24.868	10.024
P	-	< 0.001	< 0.001	< 0.001

PFNA: proximal femoral nail antirotation; THA: total hip arthroplasty.

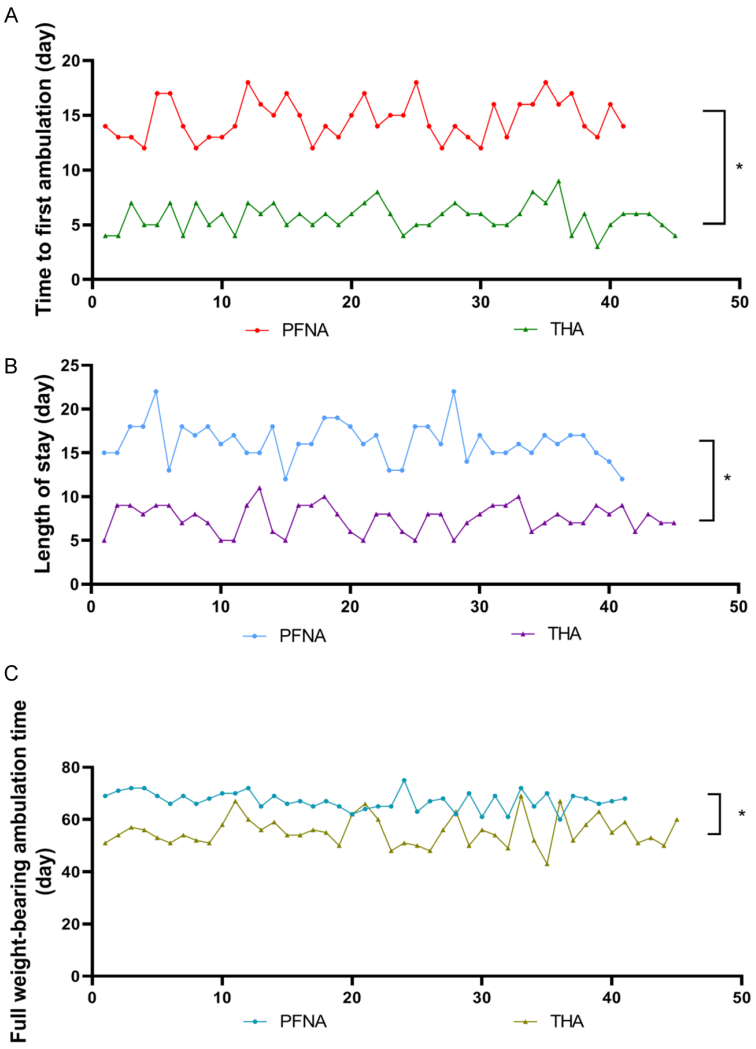

Figure 2. Comparison of postoperative recovery indicators between the two groups. The PFNA group had significantly longer time to first ambulation (A), longer length of stay (B), and longer time until full weight-bearing ambulation (C) compared to the THA group, with statistically significant differences (*P < 0.05). PFNA: proximal femoral nail antirotation; THA: total hip arthroplasty.

Comparison of hip joint function indicators between the two groups

Two-factor repeated measures ANOVA was conducted on Harris score data, which met the sphericity assumption. Time and the interaction of treatment modalities were considered as two effects. Time had a statistically significant impact on the Harris score (P < 0.05). An individual effect test for treatment modalities indicated that there was no statistically significant difference in preoperative Harris scores between the two groups (P > 0.05). At 1 month postoperatively, the PFNA group had significantly lower Harris scores than the THA group (P < 0.05), but at 3 and 6 months postoperatively, the difference was not statistically significant (P > 0.05) (**Table 6**; **Figure 4**).

Comparison of the outcomes of hip joint function recovery between the two groups

The difference in the rates of excellent recovery of hip joint function was not statistically different between the two groups at the last follow-up (P > 0.05) (**Table 7**).

Discussion

Intertrochanteric femur fracture (IFF) is a common type of fracture among the elderly, primarily resulting from high-energy injuries such as falls or fall from height. These fractures occur when rotational and axial forces or intense traction exceed the bone's tolerance. Elderly individuals, especially postmenopausal women, often have severe osteoporosis, leading to decreased

Table 4. Comparison of incidence of postoperative complications between the two groups [n (%)]

Groups	Cases	Incision infections	Urinary tract infections	Lower extremity vein thrombosis	Pressure ulcers	Joint deformity	Incidence
PFNA	41	0 (0.00)	2 (4.88)	1 (2.44)	1 (2.44)	0 (0.00)	4 (9.76)
THA	45	2 (4.45)	1 (2.22)	0 (0.00)	0 (0.00)	0 (0.00)	3 (6.67)
χ^2	-	-	-	-	-	-	0.274
P	-	-	-	-	-	-	0.601

PFNA: proximal femoral nail antirotation; THA: total hip arthroplasty.

Table 5. Comparison of Wong-Baker scores between the two groups (mean ± SD, point)

Groups	Cases	Preoperatively	At 1 month postoperatively	At 3 months postoperatively	At 6 months postoperatively
PFNA	41	7.52±0.63	4.23±0.85	2.94±0.65	1.45±0.37
THA	45	7.57±0.65	3.66±0.82	2.52±0.61	1.48±0.41
F	-	0.463	6.620	4.058	0.364
P	-	0.522	0.011	0.003	0.688

PFNA: proximal femoral nail antirotation; THA: total hip arthroplasty.

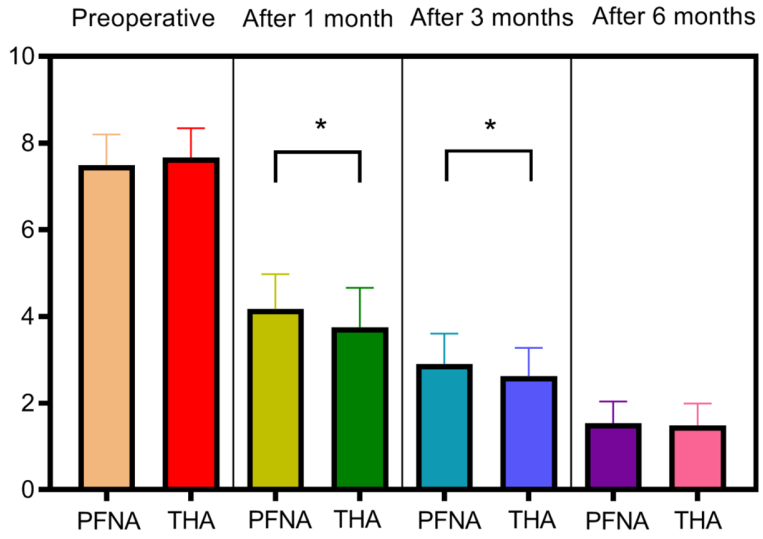

Figure 3. Comparison of pain indicators between the two groups. Time and treatment modalities: Time had a statistically significant impact on the Wong-Baker score ($P < 0.05$). An individual effect test for treatment modalities showed that there was no statistically significant difference in preoperative Wong-Baker scores between the two groups ($P > 0.05$); at 1 and 3 months postoperatively, the PFNA group had significantly higher Wong-Baker scores than the THA group ($^*P < 0.05$), but at 6 months postoperatively, the difference was not statistically significant ($P > 0.05$). PFNA: proximal femoral nail antirotation; THA: total hip arthroplasty.

bone mass, increased fragility, and susceptibility to IFF [15]. The intertrochanteric femur (IF) has a rich blood supply and heals quickly, allowing for conservative treatment. However, for unstable intertrochanteric femur fracture (UIFF), conservative treatment poses challenges in maintaining proper anatomical alignment, thus leading to malunion and impaired limb function. Additionally, conservative treatment requires prolonged bed rest, significantly increasing the risk of complications such as pressure ulcers, pneumonia, and thrombosis, especially in elderly patients with multiple comorbidities, rendering it suboptimal for treatment [16]. At present, PFNA internal fixation and THA are the common surgical procedures for UIFF.

PFNA internal fixation is an improved technique that combines the benefits of the proximal femoral nail (PFN). Biomechanically similar to PFN, it provides support and prevents rotation at the fracture site of IF by inserting artificial fixation materials. This facilitates healing and prevents displacement of the fracture ends. The staples of these two procedures are roughly similar, with the primary difference lying in the cephalocervical screws. In PFN, two cephalocervical screws are used for fixation. In PFNA, a helical blade is used instead, which not only achieves anti-rota-

Table 6. Comparison of Harris scores between two groups (mean ± SD, point)

Groups	Cases	Preoperatively	At 1 month postoperatively	At 3 months postoperatively	At 6 months postoperatively
PFNA	41	16.05±3.34	64.14±4.02	77.54±5.89	85.00±7.20
THA	45	15.92±3.28	71.08±5.20	78.57±3.83	86.18±6.17
F	-	0.375	10.357	0.546	0.577
P	-	0.502	0.001	0.142	0.362

PFNA: proximal femoral nail antirotation; THA: total hip arthroplasty.

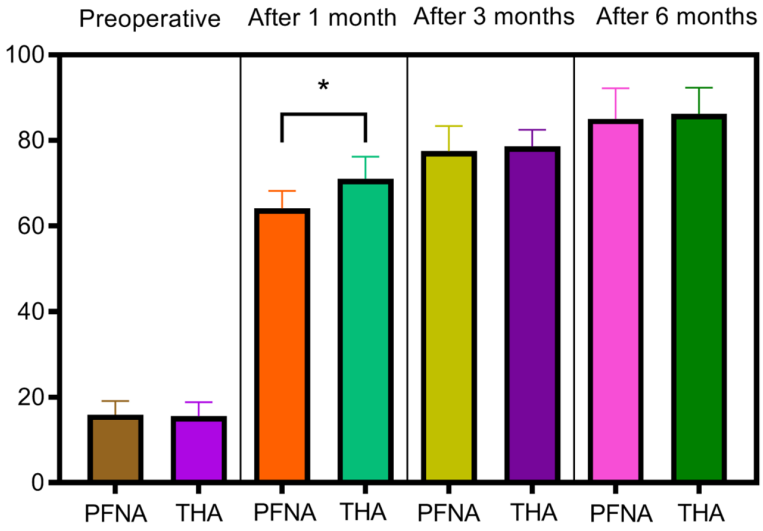

Figure 4. Comparison of hip joint function indicators between the two groups. Time and the interaction of treatment modalities: Time had a statistically significant impact on the Harris score ($P < 0.05$). An individual effect test for treatment modalities showed that there was no statistically significant difference in preoperative Harris scores between the two groups ($P > 0.05$); at 1 month postoperatively, the PFNA group had significantly lower Harris scores than the THA group ($^*P < 0.05$), but at 3 and 6 months postoperatively, the difference was not statistically significant ($P > 0.05$). PFNA: proximal femoral nail antirotation; THA: total hip arthroplasty.

tion and angular stabilization of the femur but also reduces the contact area with the tibial neck. This makes PFNA more suitable for patients with femoral neck fractures. The core diameter of the helical blade used in PFNA is not fixed but gradually increases, which gradually compacts the cancellous bone during insertion and improves the anchoring force of the blade to the femur. The unique anti-rotation and anti-shear forces of the helical blade greatly enhance stability of the fixation site, which is beneficial for patients with osteoporosis [17]. Baek et al. [18] indicated that compared to PFN, patients undergoing PFNA internal fixation exhibited higher postoperative motor function scores, and imaging indices also showed shorter screw sliding distances in PFNA. This is primarily due to the strong stability of the helical blade used in PFNA. Baral et al. [19] conducted a retrospective analysis of data from 100 patients with peritrochanteric fracture of femur, revealing that PFNA provides excellent functional outcomes due to its strong support and antirotation properties. PFNA internal fixation is an intramedullary central fixation that uses minimally invasive techniques, characterized by simplicity in operation and minimal surgical incisions. The findings of this study indicated that the operative time, incision length, intraoperative blood loss, and postoperative drainage volume in the PFNA group were significantly lower than those in the THA group. These results align with the findings in the study of Li et al. [4], demonstrating that PFNA exhibits minimally invasive characteristics, with the surgical incision of only 3-5 cm, causing less cutting and stripping of tissues such as skin, fascia, muscles, with minimal disturbance to blood supply and reduced trauma to patients. Although PFNA internal fixation effectively treats IFF, it has certain limitations. The use of helical blades and staples to fix IF can endure shear forces but also exert reaction forces on the femur. This can easily lead to bone cutting and healing with misalignment, and the integrity and thickness of the femoral lateral wall also affect the quality of PFNA internal fixation [20]. Inaccurate depth measurement during treatment may result in protrusion of helical blades. To reduce the risk of hip internal rotation and helical blade dislocation following PFNA inter-

Table 7. Comparison of outcomes of hip joint function recovery between the two groups [n (%)]

Groups	Cases	Excellent	Good	Fair	Poor	Excellent rate
PFNA	41	15 (36.59)	20 (48.78)	3 (7.32)	3 (7.32)	35 (85.37)
THA	45	14 (31.11)	23 (51.11)	6 (13.33)	2 (4.44)	37 (82.22)
χ^2	-	-	-	-	-	0.156
P	-	-	-	-	-	0.693

PFNA: proximal femoral nail antirotation; THA: total hip arthroplasty.

nal fixation, prolonged bed rest exceeding 2 weeks is necessary. This is particularly challenging for elderly patients and those with poor physical performance, as extended bed rest increases the risks of complications such as pressure ulcers and pulmonary infections. Additionally, prolonged bed rest in the elderly hinders early physical exercise, leading to muscle weakness, joint stiffness, and other adverse effects.

Early THA has typically been used for chronic hip conditions such as arthritis and osteonecrosis of the femoral head. Recently, its efficacy in acute femoral injuries has been validated. Compared to the minimally invasive characteristics of PFNA internal fixation, THA involves greater surgical trauma. However, THA uses artificial femoral and acetabular prostheses to replace diseased bone, enabling rapid restoration of hip joint function. This approach reduces the risk of complications from slow healing and prolonged bed rest after fractures. Additionally, post-reconstruction hip joint deformities rarely occur [21]. The findings of this study revealed that the PFNA group had significantly longer time to first ambulation, length of stay, and time until full weight-bearing ambulation compared to the THA group. This indicates that in contrast to PFNA internal fixation, THA expedites the process of weight-bearing ambulation. Patients with PFNA often require prolonged bed rest to ensure fixation effect and the healing of comminuted trochanteric fractures. In contrast, patients undergoing THA do not have such concerns. Physicians encourage THA patients to use assistive tools for ambulation and gradually transition to full weight-bearing, adapting to the prosthesis progressively. This approach helps strengthen lower-limb muscle strength, improve joint motion, and reduce complications such as deep vein thrombosis and urinary tract infections.

In this study, postoperative complications were compared between patients undergoing PFNA internal fixation and THA. The PFNA group had 2 cases of urinary tract infections, 1 case of lower extremity vein thrombosis, and 1 case of pressure ulcers, mainly due to the prolonged bed rest time and limited patient mobility, leading to poor blood circulation, suggesting that perioperative interventions such as cardiopulmonary function exercise, sputum excretion, muscle stretching, and turning should be considered [22]. The THA group had 2 cases of incision infections and 1 case of urinary tract infection, primarily due to larger incisions, significant intraoperative trauma, increased bleeding, and higher infection risk, necessitating adequate postoperative anti-infection treatment at the incision site. Despite different types of postoperative complications, the overall incidence did not significantly differ. Comprehensive data on complication rates after PFNA and THA surgeries are currently lacking. Wang et al. [23] followed up 76 elderly IFF patients for 13-17 months and found lower incidence of complications with THA compared to PFNA. Similarly, Li et al. [4] followed up 110 IFF patients (59 PFNA cases and 51 THA cases) for 12 months, reporting lower incidence of complications with THA than PFNA. However, Chen et al. [24], in a meta-analysis, found no significant difference in complications between THA and PFNA. Variations in complications may be attributed to differences in patient age, sample size, follow-up duration, and physician expertise, necessitating further in-depth analysis. In this study, we compared postoperative pain indicators between the two groups, and the results revealed that at 1 and 3 months postoperatively, the PFNA group had significantly higher Wong-Baker scores than the THA group, but at 6 months postoperatively, the difference was not statistically significant. After PFNA internal fixation, patients must wait for osseous healing. Turning or movement may induce pain at the fracture site. Elderly patients have limited bone regenerative capacity, resulting in prolonged pain, and by the 6 months

postoperatively, osseous healing is typically complete, with diminishing pain. THA treatment does not involve fracture healing. It allows for rapid recovery of hip joint function. Once postoperative wound pain is managed, patients can bear weight and ambulate, leading to significant reduction in both short-term and long-term pain.

Postoperative hip joint function recovery is a key indicator for the assessment of IFF treatment efficacy. The Harris score, a commonly used assessment scale for hip joint function, includes domains such as pain, joint function, joint deformity, and range of motion. Higher Harris scores correlate with better hip joint function. This study found a rising trend in postoperative Harris scores in both groups, indicating the significant efficacy of both treatment modalities for IFF. At 1 month postoperatively, the PFNA group had significantly lower Harris scores than the THA group, but at 3 and 6 months postoperatively, the difference was not statistically significant. In the early postoperative period, patients treated with PFNA internal fixation still require bed rest to maintain fixation at the greater trochanter of the femur. THA treatment rapidly restores hip joint function, shortens bed rest time, and facilitates early ambulation, which aids in improving hip joint function scores. As bone substance gradually recovers, pain decreases in both PFNA internal fixation and THA-treated patients. This leads to restored hip joint function and improved weight-bearing ambulation, as evidenced by increased Harris scores, with the gap between the two approaches narrowing over time. The research results indicated no statistically significant difference in the rates of excellent recovery of hip joint function between the two groups at the last follow-up, suggesting comparable long-term efficacy of the two treatments. To ensure proper healing of the fractured site, it is crucial to select a staple that fits well with the femur during the PFNA internal fixation. The helical blade should be positioned correctly on the femoral neck and adjusted to the proper angle to prevent issues such as bone cutting and screw revision. These issues can increase the surgical fluoroscopy frequency. This study revealed that the PFNA group had a higher intraoperative fluoroscopy frequency compared to the THA group, suggesting the need to consider the exposure risk to both medical staff and patients during PFNA internal fixation. Due to the high prevalence of osteoporosis in elderly patients with IFF, severe osteoporosis can lead to inadequate fixation strength of internal fixation materials, resulting in fixation shear failure and subsequent loosening of internal fixation and coxa vara. Therefore, the degree of osteoporosis should be thoroughly considered in PFNA internal fixation. For elderly patients with multiple comorbidities, the benefits of minimally invasive PFNA fixation may not compensate the risks associated with prolonged bed rest [25, 26]. THA treatment can reduce bed rest time, but the toxic risks of bone cement used during artificial femur fixation mainly arises from the substantial heat released during the cement hardening process, which may trigger cement reactions, necessitating proactive preventive measures. Due to the large wound from THA treatment, diabetic patients face a heightened risk of infection, requiring thorough consideration before treatment. Additionally, artificial hip joints have a limited lifespan. When hip joint loosening or damage occurs, a new prosthesis is needed. However, for elderly patients, the risk of a second surgery significantly increases when the joint reaches its lifespan. PFNA internal fixation is advisable for younger patients with a favorable bone condition, while for patients with a shorter life expectancy, multiple comorbidities, high postoperative bedridden risks, and severe osteoporosis, THA treatment is recommended [27].

In conclusion, both THA and PFNA internal fixation yield favorable outcomes in treating IFF patients with no significant difference in complications. The difference lies in the shorter operative time and lesser trauma inflicted by PFNA internal fixation, despite it involving prolonged radiation exposure and bed rest. Conversely, THA requires longer operative time and causes greater trauma but results in shorter postoperative recovery periods, allowing earlier ambulation.

Disclosure of conflict of interest

None.

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