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Comparison of Internal Fixation Outcomes in Basicervical Femoral Neck Fractures Using Dynamic Hip Screw Combined with Partial Threaded vs. Fully Threaded Anti-Rotational Screws: Randomized clinical Trial

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A B S T R A C T

Introduction: Basicervical femoral neck fractures are unstable injuries often resulting from trauma, particularly in patients with multitrauma. Effective fixation must ensure mechanical stability and allow early mobilization. This study compares the outcomes of dynamic hip screw (DHS) fixation combined with either a partially or fully threaded anti-rotational screw in traumatic basicervical fractures, aiming to identify the more effective method for improving clinical results in this challenging patient population.

Material and methods: This randomized, double-blind clinical trial was conducted at Shahda Hospital, affiliated with Tabriz University of Medical Sciences(2024-2025), involving approximately 50 patients with basicervical femoral neck fractures. Patients were randomly assigned to two groups: Group A underwent fixation with a Dynamic Hip Screw (DHS) plus a partially threaded anti-rotational screw, while Group B received DHS with a fully threaded anti-rotational screw.

Results: There were no significant differences between Group A and Group B in hospital stay (p=0.620), time to recovery (p=0.642), chronic pain incidence (p=0.545), avascular necrosis (p=0.402), non-union and infection rates (both p=0.321), or surgical success (p=0.572). Additionally, Harris Hip Score components and hip function measures at follow-ups showed no significant differences, with all p-values above 0.27, indicating comparable outcomes between the two fixation methods.

Conclusion: Based on the findings of this study, there were no statistically significant differences between partial thread and full thread screw fixation in treating basicervical femoral neck fractures regarding functional hip outcomes, postoperative complications, Harris Hip Scores, or early recovery parameters.

Introduction

Femoral neck fractures are among the most common and challenging orthopedic injuries, affecting a large number of patients annually, particularly the elderly. Within this category, Basi cervical femoral neck fractures represent a distinct subtype characterized by their unique anatomical location at the junction between the anatomical femoral neck and the intertrochanteric region(1).

These fractures exhibit specific biomechanical features and demand a tailored therapeutic approach, which sets them apart both in classification and surgical management (2).

From a pathophysiological perspective, Basi cervical fractures are predominantly traumatic in nature, typically resulting from the application of

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direct or indirect high-energy forces to the pelvic region and lower extremities(3).

In elderly patients, these injuries often occur due to low-energy trauma such as a fall from standing height, facilitated by underlying osteopenia or osteoporosis(4). In contrast, younger individuals more commonly sustain Basi cervical fractures following high-energy trauma, including motor vehicle accidents or falls from significant heights, frequently in association with other concurrent injuries(5). This traumatic etiology is associated with greater soft tissue damage, hematoma formation, bleeding, and a heightened risk of postoperative complications(6).

Surgically, Basi cervical fractures present considerable challenges due to their proximity to the trabecular-rich intertrochanteric region and the femoral neck(7). While the vascular supply in this region is not as compromised as in displaced femoral neck fractures thus reducing the risk of femoral head avascular necrosis the mechanical stability of Basi cervical fractures is generally lower compared to intertrochanteric fractures(8). As such, these injuries are associated with an increased risk of fragment displacement, delayed union, and non-union(9). Therefore, selecting an optimal internal fixation strategy is crucial for successful treatment outcomes(10).

The dynamic hip screw (DHS) remains a widely used internal fixation device for treating such fractures(11). As a sliding hip screw system, the DHS facilitates gradual compression at the fracture site, accommodating the natural process of bone healing(12). However, several studies have demonstrated that DHS alone may be insufficient in Basi cervical fractures due to the high torsional forces encountered at this junction(13). Consequently, the addition of an anti-rotational screw has been strongly recommended to augment rotational stability and overall construct integrity(14).

Among the anti-rotational options, the choice between partially threaded screws and fully threaded screws may significantly influence treatment outcomes(15). Partially threaded screws are designed to provide interfragmentary compression by drawing the fracture fragments together. In contrast, fully threaded screws, which offer increased surface contact with bone, may enhance mechanical stability and reduce the risk of postoperative displacement(16, 17).

A critical consideration in traumatic Basi cervical fractures is their inherent instability and frequent coexistence with polytrauma. In such cases, the chosen fixation construct must not only offer sufficient mechanical resistance but also permit early weight-bearing and mobilization. This is particularly important in trauma patients for whom early ambulation and expedited discharge are often crucial components of recovery. The present study aims to compare the clinical and radiological outcomes of internal fixation in Basi cervical femoral neck fractures using DHS in combination with either a partially threaded or a fully threaded anti-rotational screw.

Material and methods

Study design

This study is a prospective randomized clinical trial carried out between November 18, 2024, and June 14, 2025, at Shahda Hospital, affiliated with Tabriz University of Medical Sciences. It included patients presenting with Basi cervical femoral neck fractures who required surgical intervention.

Sampling

The sample size for this study was calculated based on the formula for comparing the means of two independent groups, using data from a pilot study comprising two groups of 7 participants each. The primary outcome was time to bone union measured in months. Considering a significance level of 0.05, a statistical power of 80%, a standard deviation of 3.8 months in both groups, and an expected mean difference of 3 months between groups, the required sample size was estimated to be approximately 25 patients per group. The number of participants from the pilot study was included in the final sample size. All eligible patients were consecutively enrolled in the present study using convenience sampling.

Eligibly criteria

The inclusion criteria for this study were patients with traumatic Basi cervical femoral neck fractures who were candidates for internal fixation using a Dynamic Hip Screw (DHS), underwent surgery performed by a single orthopedic surgeon, and provided written informed consent to participate in the study. The exclusion criteria included comminuted femoral neck fractures, uncontrolled intraoperative bleeding, history of previous femoral neck fractures, pathological fractures, absence of preoperative imaging, prior hip arthroplasty, congenital or acquired hip joint deformities, and lack of regular follow-up attendance.

Randomization

In this study, a total of 50 patients were randomly assigned to two groups using the block permutation randomization method to ensure balanced allocation. Blocks of four participants were used, and all six possible arrangements of two participants per group were considered: BBAA, AABB, ABAB, BABA, ABBA, and BAAB. Thirteen blocks were generated to accommodate all participants. Block selection was performed randomly by drawing numbers from 1 to 6, each corresponding to one of the predefined sequences. For example, if block 6 (BAAB) was selected first and block 2 (AABB) second, the first eight participants were assigned according to the combined sequence "BAABAABB" in the order of their enrollment. Participants were therefore assigned to either the partial-threaded group (Group A) or the fully-threaded group (Group B) based on the predefined random sequence.

Blinding

The statistician responsible for analyzing the results, as well as the participants, blinded to the type of procedure performed, ensuring that the study conducted in a double-blind manner. Since the participants were unaware of the specific technique used in their treatment, they also remained unaware of the technique administered to other patients throughout the study.

Surgical Procedure and Follow-Up

After random allocation into two groups, patients who were candidates for surgery underwent the designated intervention. Initial skin preparation was performed with brown povidone-iodine by the circulating nurse, covering the area from the distal thigh to the knee and proximally to the anterior superior iliac spine and lower abdomen. This was followed by a secondary scrub using green povidone-iodine. A large incision was made on the femur using a No. 20 scalpel, and the subcutaneous tissue was opened using electrocautery. The tensor fasciae latae muscle was carefully approached to minimize trauma, with only its fascia incised proximally. The lateral approach to the femur involved dissecting between the anterior and posterior compartments. The vastus lateralis and gluteus medius muscles were incised with Metzenbaum scissors. After retracting the skin, fascia, and muscles using Bennet retractors, electrocautery was used for hemostasis. The periosteum was then stripped from the femoral shaft. Two 2.5 mm guide pins were inserted from the lateral femur toward the femoral neck using a 135-degree guide, reflecting the typical angle between the femoral neck and shaft. Fluoroscopy (C-arm) employed in both AP and lateral views to confirm proper trajectory. A depth gauge then used to measure the length from the lateral cortex to the femoral head, typically around 130 mm. Reaming performed using a central reamer attached to a perforator to prepare the path for the lag screw of the DHS (Dynamic Hip Screw). The side plate tract was prepared using a side reamer mounted on the central one. The nail then inserted using a T-handle.

The fracture site stabilized using a bone-holding clamp, and the side plate impacted into place with gentle mallet taps. Plate holes drilled with a perforator and tapped; compression screws and then cortical screws inserted using a screwdriver. In Group A, in addition to DHS, a partially threaded anti-rotational screw inserted. In Group B, a fully threaded anti-rotational screw used alongside DHS. At the end of the procedure, a 12 French Hemovac drain placed in the muscle layer, and muscle closure done with chromic catgut No. 1 sutures.

All patients received prophylactic anticoagulation with enoxaparin starting on the first postoperative day, continued for five days. Follow-up lasted for a minimum of one year and scheduled at 2 weeks, 4 weeks, 12 weeks, 6 months, and 12 months postoperatively. Patients were advised to avoid weight-bearing for the first two weeks, after which gradual weight-bearing as tolerated was permitted.

Data collected included age, gender, fracture location, mechanism of injury, timing of surgical intervention (within or after 24 hours of trauma), and incidence of complications (pain and limping, avascular necrosis, nonunion, and infection). Functional outcomes assessed at one-year follow-up using the Harris Hip Score (HHS), a 10-item questionnaire with a total score out of 100. This included pain (44 points), function (gait and activities -47 points), absence of deformity (4 points), and range of motion (5 points). Higher scores indicated better functional outcomes. Based on HHS, results categorized as excellent (90-100), good (80–89), fair (70-79), and poor (below 70).

Statically analysis

The data were entered into SPSS software version 25. Quantitative variables were presented as mean and standard deviation, while qualitative variables were reported as frequencies. The normality of the data distribution was confirmed using the Kolmogorov-Smirnov test. For between-group comparisons, independent t-tests and Chi-square tests were employed. A p-value of less than 0.05 was considered statistically significant.

Ethical considerations

The study was approved by the Research Ethics Committee of the Faculty of Medicine and Tabriz University of Medical Sciences (IR.TBZMED.REC.1403.146) and was registered in the Iranian Registry of Clinical Trials (IRCT20190325043107N51). The researcher formally introduced the study and its objectives to the relevant authorities at Shohada Educational and Medical Center, and coordination obtained with the clinic management for implementation. No additional costs imposed on participants, and withdrawal from the study was voluntary at any stage. Care taken in the selection of participants to enhance the validity of the findings, and the research procedures carried out with methodological rigor.

Results

The demographic characteristics of participants were compared between Group A (partial-threaded screw) and Group B (fully-threaded screw). The mean age was 71.6 ± 6.72 years in Group A and 72.88 ± 6.85 years in Group B, with no statistically significant difference (p=0.811). The gender distribution was also similar between the two groups, with 15 females and 10 males in Group A and 16 females and 9 males in Group B (p=0.925). Regarding fracture type, the proportion of non-displaced versus displaced Baso cervical fractures did not differ significantly between groups (p=0.922). Additionally, no significant difference was observed in the mechanism of injury fall, accident, or other causes between the two groups (p=0.953) (Table 1).

Table 1. Comparison of Demographic Characteristics of Patients Participating in the Study

Variable	Group A (Partial Thread)	Group B (Full Thread)	P-value
Mean Age (years)	71.6 ± 6.72	72.88 ± 6.85	0.811 *
Gender (Female/Male)	15 / 10	16 / 9	0.925 **
Type of Baso cervical Fracture (Non-displaced / Displaced)	14 / 11	15 / 10	0.922 **
Mechanism of Injury (Fall / Accident / Other)	22 / 2 / 1	21 / 1 / 3	0.953 **
*: Independent t-test, **: Chi-square test			

There was no statistically significant difference between the two groups in terms of mean length of hospital stay (p=0.620) and mean time to initial recovery (p=0.642) (fig 1).

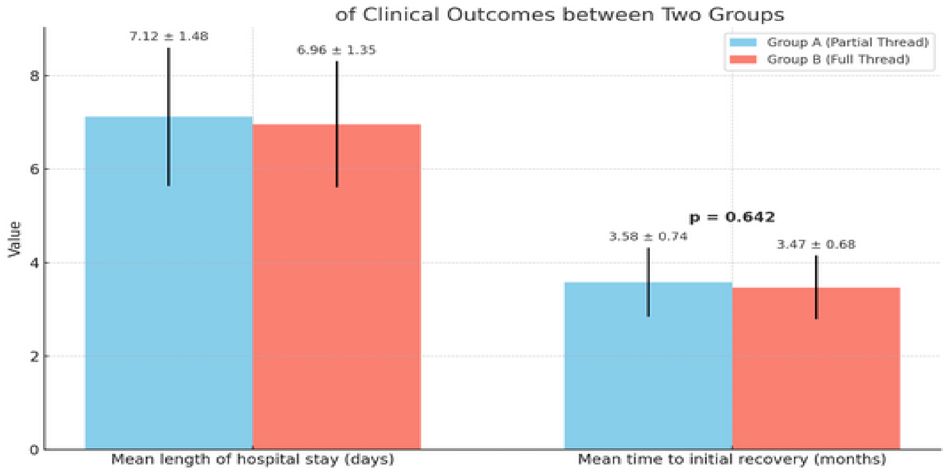

Figure 1. Comparison of clinical outcome between two groups

The incidence of chronic pain was 12% in Group A and 16% in Group B (p=0.545). Avascular necrosis occurred in 8% of Group A and 4% of Group B (p=0.402). Non-union and infection were each observed in 4% of Group A and 8% of Group B (p=0.321 for both). The surgical success rate was 92% in Group A and 88% in Group B (p=0.572). None of these differences statistically significant (fig 2).

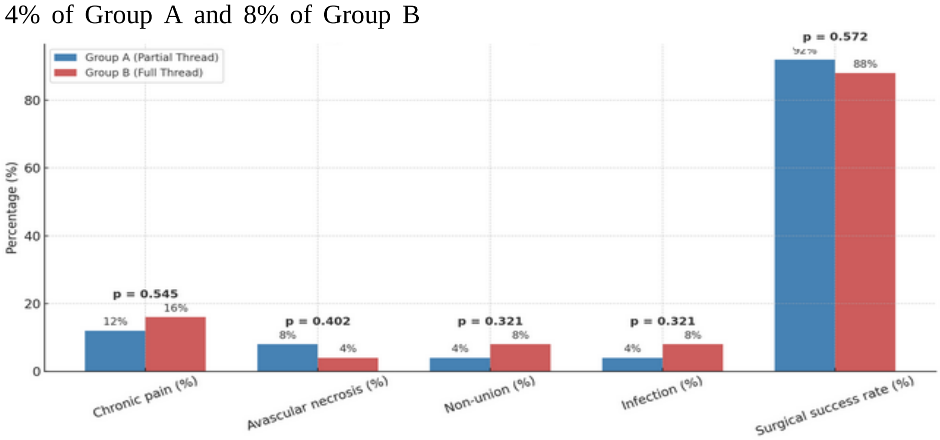

Figure 2. Comparison of Surgical Success Rate and Postoperative Complications between Partial Thread and Full Thread Screw Fixation

The comparison of mean scores across various components of the Harris Hip Score (HHS) between Group A (Partial Thread) and Group B (Full Thread) revealed no statistically significant differences. The p-values were 0.341 for the total score, 0.412 for the pain score, 0.348 for the function score, 0.546 for the deformity score, and 0.968 for the range of motion score. These results indicate that both fixation methods yielded comparable outcomes across all measured parameters (fig 3).

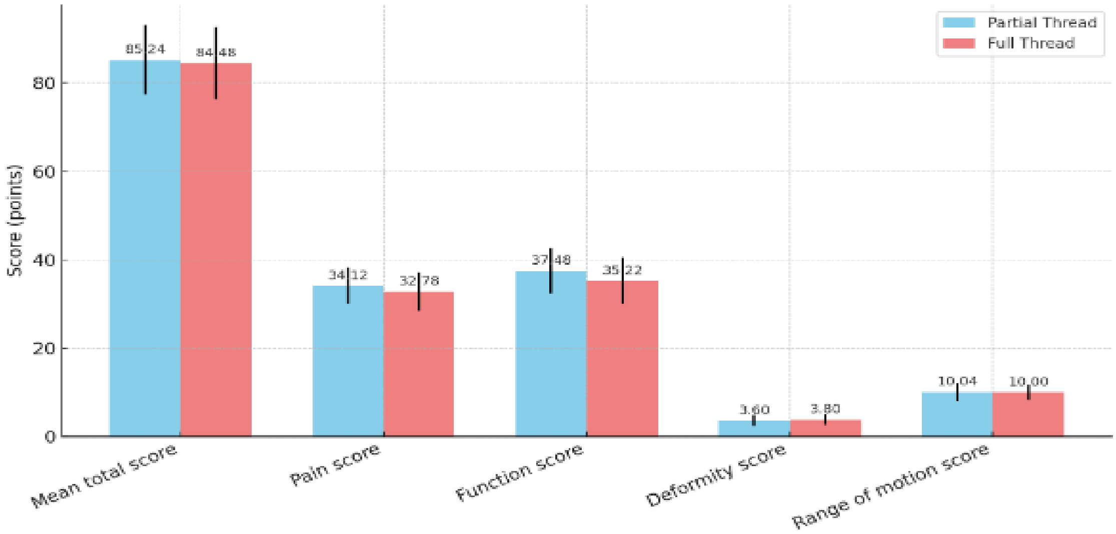

Figure 3. Comparison of Harris Hip Score (HHS) Results Between the Two Study Groups

The comparison of hip joint functional outcomes between Group A (Partial Thread) and Group B (Full Thread) at various follow-up intervals showed no statistically significant differences in any measured parameter. Specifically, the p-values for hip flexion ranged from 0.321 at 2 weeks to 0.350 at 1 year, indicating comparable recovery of flexion between the two groups over time. Similarly, internal rotation showed p-values between 0.568 and 0.275, adduction ranged from 0.470 to 0.330, and limb length discrepancy from 0.432 to 0.485 across all time points. These p-values consistently suggest that there were no significant differences in hip function or limb length discrepancy between the two fixation methods throughout the postoperative follow-up period (table 2).

Table 2. Comparison of Hip Joint Functional Outcomes at Different Follow-Up Times After Surgery

Follow-up Time	Variable	Group A (Partial Thread)	Group B (Full Thread)	p-value
2 weeks	Hip flexion (degrees)	60.00 ± 32.60	58.00 ± 6.10	0.321
	Internal rotation (degrees)	20.00 ± 4.15	21.00 ± 4.20	0.568
	Adduction (degrees)	25.00 ± 4.55	24.00 ± 5.0	0.470
	Limb length discrepancy (cm)	1.00 ± 0.20	1.10 ± 0.25	0.432
4 weeks	Hip flexion (degrees)	70.00 ± 6.25	68.00 ± 6.50	0.402
	Internal rotation (degrees)	25.00 ± 4.50	24.00 ± 4.55	0.610
	Adduction (degrees)	35.00 ± 5.00	34.00 ± 5.25	0.521
	Limb length discrepancy (cm)	0.80 ± 0.18	0.85 ± 0.20	0.580
12 weeks	Hip flexion (degrees)	80.00 ± 5.75	78.00 ± 6.00	0.350
-	Internal rotation (degrees)	30.00 ± 5.00	28.00 ± 5.25	0.290
	Adduction (degrees)	45.00 ± 5.50	44.00 ± 5.75	0.467
	Limb length discrepancy (cm)	0.60 ± 0.15	0.65 ± 0.18	0.488
6 months	Hip flexion (degrees)	85.00 ± 5.20	83.00 ± 5.40	0.400
	Internal rotation (degrees)	35.00 ± 4.75	33.00 ± 5.00	0.322
	Adduction (degrees)	50.00 ± 5.00	48.00 ± 5.25	0.360
	Limb length discrepancy (cm)	0.50 ± 0.12	0.55 ± 0.15	0.504
1 year	Hip flexion (degrees)	90.00 ± 4.85	88.00 ± 5.10	0.350
	Internal rotation (degrees)	40.00 ± 5.10	38.00 ± 5.20	0.275
	Adduction (degrees)	55.00 ± 5.25	53.00 ± 5.40	0.330
	Limb length discrepancy (cm)	0.40 ± 0.10	0.45 ± 0.12	0.485

Discussion

The primary objective of this study was to compare two internal fixation methods using partial thread screws and full thread screws for the treatment of Basi cervical femoral neck fractures, aiming to assess their effects on clinical outcomes, functional recovery, and postoperative complications. The central question was whether full-thread screws offer any distinct advantage in improving hip function, reducing complications, or accelerating the recovery process compared to partial-thread screws.

The results revealed no statistically significant differences in the mean length of hospital stay (p=0.620) or time to initial recovery (p=0.642) between the two groups. These findings are likely due to similarities in surgical technique, patient characteristics, and standardized postoperative care protocols across both groups. Since the only variable between the groups was the type of screw used, and all other perioperative factors were controlled, this lack of difference is expected(18). Additionally, the minor design differences between screw types do not appear to have significantly influenced early recovery or hospitalization duration(19).

The incidence of chronic postoperative pain was 12% in Group A and 16% in Group B (p=0.545), which was not statistically significant. Chronic pain following hip surgery may result from multiple factors such as soft tissue trauma, inflammatory responses, or delayed nerve healing(20). Given that both groups underwent similar surgical techniques and only differed in the screw design, no significant difference in tissue irritation or perioperative trauma was expected. Moreover, appropriate patient selection and consistent postoperative care may have contributed to minimizing chronic pain in both groups(21).

AVN occurred in 8% of patients in Group A and 4% in Group B (p=0.402). Although this difference was not statistically significant, it may have some clinical relevance in select cases. Since blood supply to the femoral head is primarily through specific vascular branches, any disruption can lead to necrosis(22). However, the type of screw used likely has minimal impact on vascular integrity, with AVN being more strongly associated with factors like fracture displacement and surgical delay (23).

Nonunion and infection rates were 4% in Group A and 8% in Group B (p=0.321 for both), without statistically significant differences. These outcomes may relate to the biomechanical characteristics of the screws, such as thread length, compression capability, and contact surface with bone(24).

Full-thread screws may theoretically exert less compressive force, possibly affecting bone healing or remodeling. However, the comparable outcomes suggest both screw types provided adequate fixation and stability(25).

No statistically significant differences were found in the HHS components between the two groups (total score: p=0.341; pain: p=0.412; function: p=0.348; deformity: p=0.546; range of motion: p=0.968). This indicates that both fixation methods were equally effective in restoring hip function. The comparable scores suggest that both screw types achieved sufficient mechanical stability to support fracture healing and functional recovery(26).

Hip flexion improved progressively in both groups, with no significant differences observed at any follow-up interval (p-values ranging from 0.321 to 0.350). This improvement is likely attributed to standardized rehabilitation protocols and consistent fracture stabilization in both groups. The design of the screws appeared to have minimal influence on joint mobility restoration(27).

No significant difference was observed in the recovery of internal rotation (p-values between 0.568 and 0.275). This motion is largely dependent on the condition of periarticular muscles, particularly the gluteal and piriformis muscles, which were likely affected similarly in both groups, regardless of screw type(28).

Adduction also showed no statistically significant differences (p-values ranging from 0.470 to 0.330). Since this movement relies on pelvic stability and balanced muscular strength, and screw design does not directly impact muscle function, the comparable outcomes are consistent with expectations(29).

Limb length measurements showed no significant differences between the groups across all time points (p-values ranging from 0.432 to 0.485), indicating that both screw types were effective in achieving and maintaining proper anatomical alignment during fracture fixation. Mechanical stability provided by both fixation methods likely contributed to the preservation of limb length(30).

Conclusion

Based on the findings of this study, there were no statistically significant differences between partial thread and full thread screw fixation in treating Basi cervical femoral neck fractures regarding functional hip outcomes, postoperative complications, Harris Hip Scores, or early recovery parameters. These results suggest that both fixation methods are clinically effective, safe, and capable of restoring hip function. Therefore, the choice of screw type guided by surgeon preference, patient anatomy, or cost considerations, without compromising the quality of the treatment outcome.

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Authors' Contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

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