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Comparative Evaluation Of Proximal Femoral Nail And Dynamic Condylar Screw Fixation In Subtrochanteric Femur Fractures: A Prospective Study

Dr Raju Mandal[1], Dr. Ashoke Kumar Chanda[2], Professor Dr Sudipta Das Gupta[3], Dr Koushik Biswas[4]
[1]Assistant professor Department of Orthopaedics Calcutta National Medical College Kolkata
[2]Associate professor Department of Orthopaedics Calcutta National Medical College Kolkata
[3]Professor Department of Orthopaedics Calcutta National Medical College Kolkata
[4]Medical Officer Department of Orthopaedics Calcutta National Medical College Kolkata

Abstract

Background: *Subtrochanteric femur fractures pose a significant surgical challenge due to their high biomechanical stress and limited healing potential. This study compared clinical, radiological, and functional outcomes between Proximal Femoral Nail (PFN) and Dynamic Condylar Screw (DCS) fixation in such fractures.*

Methods: *A prospective comparative study was conducted involving 60 patients with subtrochanteric fractures, treated with either PFN (n = 30) or DCS (n = 30). Variables including demographics, fracture type, surgical parameters, complications, union time, and functional outcomes (Harris Hip Score, hip range of motion at 12 months) were analyzed.*

Results: *The PFN group had significantly shorter operative time (94.33 ± 21.72 min vs. 114.00 ± 14.76 min; $p < 0.0001$), lower intraoperative blood loss (107.50 ± 19.86 ml vs. 234.17 ± 62.80 ml; $p < 0.0001$), and earlier fracture union (13.21 ± 2.90 weeks vs. 19.97 ± 3.93 weeks; $p < 0.0001$). Full weight bearing was achieved sooner in the PFN group (14.54 ± 2.74 weeks vs. 21.67 ± 2.98 weeks; $p < 0.0001$). Functional outcomes were superior in the PFN group, with higher Harris Hip Scores (85.5 ± 7.62 vs. 80.2 ± 7.14; $p = 0.0073$) and greater range of motion.*

Conclusion: *PFN demonstrated clear advantages over DCS in terms of surgical efficiency, faster fracture healing, earlier mobilization, and improved functional recovery. It may be preferred, particularly in elderly or high-risk patients.*

Keywords: *Subtrochanteric femur fracture, Proximal Femoral Nail, Dynamic Condylar Screw, Functional outcome, Fracture fixation*

INTRODUCTION

Subtrochanteric femur fractures account for approximately 10–30% of all hip fractures and remain one of the most challenging injuries in orthopaedic trauma due to high mechanical stresses and frequent comminution in the subtrochanteric region [1]. These fractures are particularly common in elderly individuals with osteoporotic bone and in younger patients subjected to high-energy trauma [2]. Historically, treatment modalities have evolved from conservative traction and plating methods to intramedullary fixation devices, reflecting a better understanding of fracture biomechanics and the limitations of older techniques [3]. The Dynamic Condylar Screw (DCS) is an extramedullary device offering angular stability and controlled compression at the fracture site. It has been used extensively in managing subtrochanteric and distal femoral fractures
[4].Proximal Femoral Nailing (PFN), a more recent evolution in intramedullary fixation, is biomechanically superior due to its shorter lever arm, minimal soft tissue disruption, and the ability to bear early weight [5]. Several studies have demonstrated lower complication rates, reduced surgical times, and superior functional outcomes with PFN compared to conventional plating techniques [6]. Kumar et al. compared PFN and DCS in unstable intertrochanteric fractures and concluded that PFN offers better stability and faster rehabilitation [7]. Abraham et al. also emphasized the advantage of early weight-bearing and fewer implant-related complications with intramedullary nails [6]. Ghilzai et al. observed superior Harris Hip Scores in PFN-treated patients across multiple follow-up points [8]. Despite these advancements, implant choice continues to vary based on fracture pattern, surgeon preference, and institutional protocols. This study was therefore undertaken to prospectively compare the clinical, radiological, and functional outcomes of PFN and DCS fixation in subtrochanteric femur fractures over a 12-month follow-up period.

Aims and Objectives

The primary aim of this study was to compare the clinical, radiological, and functional outcomes of Proximal Femoral Nail (PFN) and Dynamic Condylar Screw (DCS) fixation in the management of subtrochanteric femur fractures.

Specific Objectives:

1. To compare operative parameters such as surgical time, intraoperative blood loss, and time delay to surgery between PFN and DCS fixation methods.
2. To evaluate early postoperative outcomes, including duration of hospital stay and complication rates (e.g., infection, nonunion, implant failure).
3. To assess radiological outcomes, including time to fracture union and time to full weight-bearing.
4. To assess long-term functional outcomes using the Harris Hip Score and range of motion measurements (flexion, extension, abduction, internal and external rotation) at 12-month follow-up.
5. To determine the overall efficacy of PFN compared to DCS in achieving earlier mobility, fewer complications, and better hip function following subtrochanteric fracture fixation.

MATERIALS AND METHODS

This prospective, hospital-based comparative study was conducted in the Department of Orthopaedics at Calcutta National Medical College and Hospital over a period of 18 months. A total of 60 patients with radiologically confirmed subtrochanteric femur fractures were enrolled and equally divided into two groups of 30 each: one group treated with Proximal Femoral Nail (PFN) and the other with Dynamic Condylar Screw (DCS). Patients were selected based on inclusion and exclusion criteria that allowed for a homogeneous comparison.

Inclusion criteria comprised adult patients aged 18–80 years with closed, acute subtrochanteric fractures of the femur, who consented to surgical management and agreed to follow-up. Exclusion criteria included pathological fractures, open fractures, patients with polytrauma, or those unfit for surgery due to systemic illness.

All surgeries were performed under standardized operating room protocols by experienced orthopaedic surgeons. The PFN and DCS procedures were executed using established techniques. Time to surgery, operative duration, and intraoperative blood loss were recorded. Postoperative care was standardized for both groups, including antibiotic prophylaxis, thromboembolic prophylaxis, and guided rehabilitation.

Patients were followed up at regular intervals (6 weeks, 3 months, 6 months, and 12 months). Outcome measures included radiographic union (defined as bridging callus on at least three cortices), time to full weight-bearing, and complications such as infection, nonunion, and implant failure. Functional outcomes were assessed using the Harris Hip Score and goniometric measurements of hip range of motion in all anatomical planes at 12 months.

Data were analyzed using standard statistical methods. Continuous variables were expressed as mean ± standard deviation and compared using the unpaired t-test. Categorical variables were compared using the Chi-square or Fisher's exact test. A p-value <0.05 was considered statistically significant.

RESULTS:

1. Patient Flow and Study Population

A total of 60 patients presenting with subtrochanteric femur fractures were enrolled in this prospective comparative study, conducted at the Department of Orthopaedics, Calcutta National Medical College and Hospital. All patients met the inclusion criteria and consented to participate. No subjects were excluded, and there were no losses to follow-up during the course of the study.

Patients were equally allocated into two groups of 30 each by alternate assignment: one group underwent internal fixation using a Proximal Femoral Nail (PFN), and the other with a Dynamic Condylar Screw (DCS). Each patient was followed for a minimum duration of 12 months, with serial clinical and radiological evaluations conducted at defined intervals to assess healing, function, and complications.

The complete follow-up and absence of attrition ensured the robustness of data collection and analysis.

2. Demographic and Baseline Characteristics

The study population included 60 patients, evenly distributed between the two treatment groups. The mean age was significantly higher in the PFN group (48.20 ± 9.86 years) compared to the DCS group

(42.37 ± 12.36 years) (p = 0.0479). The male-to-female ratio in both groups was identical at 4:1, showing no statistically significant difference.

Comorbid conditions such as hypertension and diabetes mellitus were similar across groups, with hypertension being the most prevalent. Mechanism of injury was predominantly road traffic accidents (RTA), accounting for 56.7% in PFN and 70.0% in DCS, though not statistically significant (p = 0.2839). A significant difference was observed in fracture configuration: Russell-Taylor Type-2 fractures were far more frequent in the DCS group (86.7%) compared to the PFN group (13.3%) (p < 0.0001), indicating a potential selection bias or surgeon preference based on fracture morphology.

Table 1. Demographic and Baseline Characteristics of the Study Population

Variable	PFN Group (n = 30)	DCS Group (n = 30)	p-value
Number of patients	30	30	–
Mean age (years)	48.20 ± 9.86	42.37 ± 12.36	0.0479 †
Male:Female ratio	4:1	4:1	1.0000
Hypertension (%)	46.7%	43.3%	0.9063
Diabetes Mellitus (%)	10.0%	13.3%	0.6825
Mechanism of Injury: RTA (%)	56.7%	70.0%	0.2839
Russell-Taylor Type-2 fractures (%)	13.3%	86.7%	<0.0001 ††

† Statistically significant at p< 0.05
†† Highly significant at p< 0.001
RTA = Road Traffic Accident; PFN = Proximal Femoral Nail; DCS = Dynamic Condylar Screw

3. Perioperative Variables

Operative and perioperative data are summarized in Table 2. The PFN group demonstrated a significantly shorter mean operative time (94.33 ± 21.72 minutes) compared to the DCS group (114.00 ± 14.76 minutes), with a p-value < 0.0001. Similarly, mean intraoperative blood loss was significantly lower in the PFN group (107.50 ± 19.86 ml) versus the DCS group (234.17 ± 62.80 ml), also statistically significant (p < 0.0001). No statistically significant difference was observed between the groups in terms of time to surgery (p = 0.8490) or duration of hospital stay (p = 0.3923).

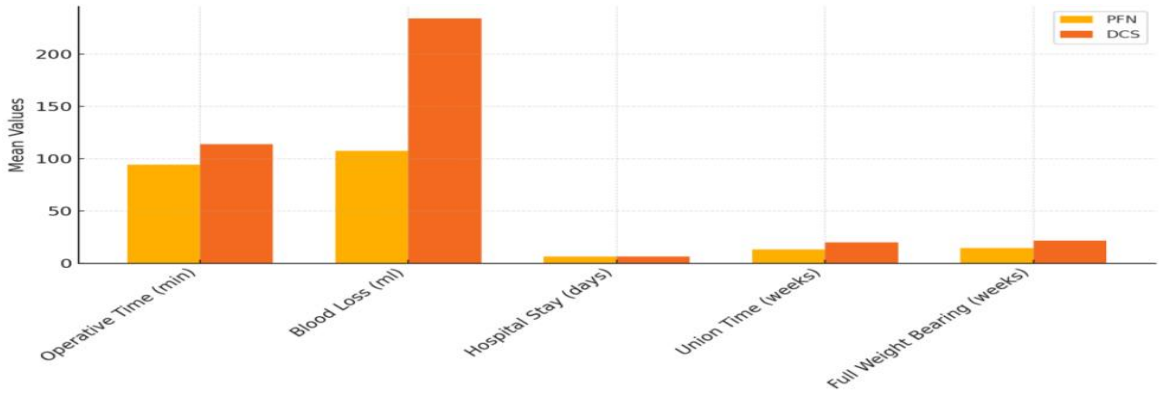
Table 2. Comparison of Perioperative Variables Between PFN and DCS Groups

Parameter	PFN Group (Mean ± SD)	DCS Group (Mean ± SD)	p-value
Operative time (minutes)	94.33 ± 21.72	114.00 ± 14.76	<0.0001
Intraoperative blood loss (ml)	107.50 ± 19.86	234.17 ± 62.80	<0.0001
Time to surgery (days)	5.23 ± 1.30	5.30 ± 1.39	0.8490
Duration of hospital stay (days)	6.53 ± 1.04	6.30 ± 1.06	0.3923

†† Highly significant at p < 0.001
PFN = Proximal Femoral Nail; DCS = Dynamic Condylar Screw

Figure 2. Comparison of Operative and Recovery Parameters Between PFN and DCS

Bar chart comparing mean operative time, intraoperative blood loss, hospital stay, fracture union time, and full weight-bearing time between PFN and DCS groups. The PFN group consistently demonstrated superior outcomes in all parameters except hospital stay, which was comparable.



4. Radiological Outcomes

Radiological healing was assessed by evaluating time to fracture union and the duration until full weight bearing was achieved.

The PFN group demonstrated a significantly shorter mean union time (13.21 ± 2.90 weeks) compared to the DCS group (19.97 ± 3.93 weeks), with a highly significant p-value (<0.0001). Similarly, the mean time to full weight bearing was significantly earlier in the PFN group (14.54 ± 2.74 weeks) than in the DCS group (21.67 ± 2.98 weeks) ($p < 0.0001$). These findings underscore the biomechanical stability and early rehabilitation advantages of PFN fixation.

Table 3. Radiological Outcomes in PFN and DCS Groups

Parameter	PFN Group (Mean ± SD)	DCS Group (Mean ± SD)	p-value
Fracture union time (weeks)	13.21 ± 2.90	19.97 ± 3.93	<0.0001
Full weight-bearing time (weeks)	14.54 ± 2.74	21.67 ± 2.98	<0.0001

†† Highly significant at $p < 0.001$

PFN = Proximal Femoral Nail; DCS = Dynamic Condylar Screw

5. Functional Outcomes

Functional assessment at the 12-month follow-up revealed consistently superior outcomes in the PFN group compared to the DCS group.

The mean Harris Hip Score was significantly higher in the PFN group (85.50 ± 7.62) than in the DCS group (80.20 ± 7.14) ($p = 0.0073$), indicating better overall functional recovery. Across all measured planes of hip movement—including flexion, extension, abduction, and internal and external rotation—the PFN group demonstrated significantly greater range of motion, as detailed in Table 4. The trend of progressive functional improvement over time is illustrated in Figure 3, which shows a higher and faster recovery trajectory in the PFN group. Figure 4 graphically depicts superior joint range of motion across all directions in the PFN cohort at 12 months.

Table 4. Functional Outcomes at 12 Months Between PFN and DCS Groups

Parameter	**PFN Group (Mean ± SD)**	**DCS Group (Mean ± SD)**	**p-value**
Harris Hip Score	85.50 ± 7.62	80.20 ± 7.14	0.0073 †
Hip Flexion (°)	96.00 ± 12.48	86.67 ± 11.55	0.0039 †
Hip Extension (°)	6.33 ± 4.90	3.00 ± 4.66	0.0091 †
Hip Abduction (°)	36.17 ± 10.48	26.67 ± 8.84	0.0004 ††
Hip Internal Rotation (°)	29.83 ± 11.18	24.67 ± 7.65	0.0411 †
Hip External Rotation (°)	32.17 ± 9.62	24.67 ± 4.72	0.0003 ††

† Statistically significant at $p < 0.05$
†† Highly significant at $p < 0.001$
PFN = Proximal Femoral Nail; DCS = Dynamic Condylar Screw

Figure3:Line graph showing progression of Harris Hip Scores over time (6 weeks to 12 months).

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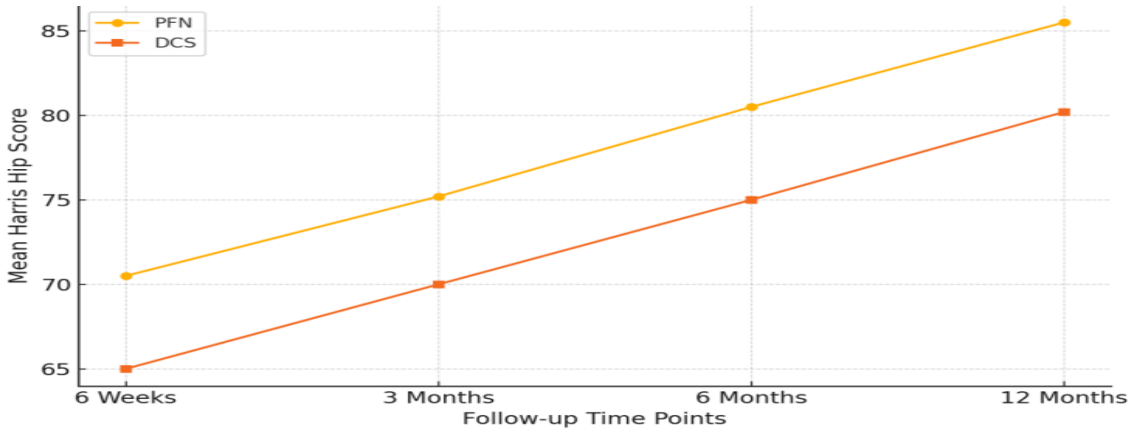
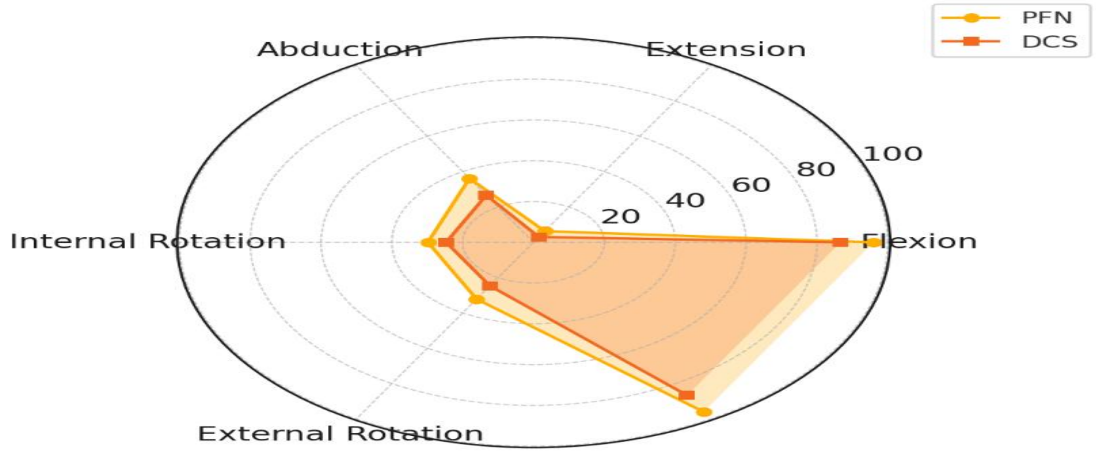


Figure 4. Radar chart comparing hip movements at 12 months between PFN and DCS.



6. Postoperative Complications

Postoperative complications were more frequently observed in the DCS group compared to the PFN group, although most differences did not reach statistical significance due to limited sample size. Infection was the most common complication, occurring in 6 patients (20.0%) in the DCS group versus 2 patients (6.7%) in the PFN group (p = 0.1103). Implant failure and nonunion were noted exclusively in the DCS group, affecting 2 (6.7%) and 1 (3.3%) patients respectively. One patient in the DCS group required reoperation due to mechanical failure. No mortality was reported in either group during the study period.

These findings suggest a trend toward better implant-related outcomes with PFN, although larger studies may be required to confirm statistical significance.

Table 5. Postoperative Complications in PFN and DCS Groups

Complication Type	PFN Group (n = 30)	DCS Group (n = 30)	p-value
Infection	2 (6.7%)	6 (20.0%)	0.1103
Implant failure	0 (0%)	2 (6.7%)	–
Nonunion	0 (0%)	1 (3.3%)	–
Reoperation	0 (0%)	1 (3.3%)	–
Mortality	0 (0%)	0 (0%)	–

DISCUSSION

This study prospectively compared the outcomes of Proximal Femoral Nail (PFN) and Dynamic Condylar Screw (DCS) in managing subtrochanteric femur fractures. The aim was to evaluate differences in surgical metrics, complication rates, fracture healing, and functional recovery.

Demographic and Fracture Pattern Distribution

Our study population had a predominance of male patients (80%) with a peak incidence in the 51–60-year age group. Although this demographic pattern did not reach statistical significance (p=1.0000), it aligns with the findings of Khan et al. [9], who also reported a male predominance (66.7%) and a mean age of 57.2 ± 9.7 years. Most fractures in our series resulted from road traffic accidents (RTA), with 70%

in the DCS group and 56.7% in the PFN group, consistent with trauma-related patterns in similar Indian cohorts [10].

A significantly greater number of Type-2 fractures (Russell-Taylor classification) were observed in the DCS group (86.7%) compared to the PFN group (13.3%) ($p<0.0001$), reflecting perhaps a selection bias or underlying complexity in fracture geometry suited for extramedullary fixation.

Surgical Time and Blood Loss

The mean surgical duration was significantly longer in the DCS group (114.0 ± 14.76 minutes) compared to the PFN group (94.33 ± 21.72 minutes) ($p<0.0001$). This supports findings by Zafir et al. [11], who noted that DCS requires more surgical exposure, especially in complex fractures, resulting in prolonged operating time. Correspondingly, intraoperative blood loss was significantly higher in the DCS group (234.17 ± 62.80 mL) than in the PFN group (107.50 ± 19.86 mL) ($p<0.0001$), consistent with published reports citing greater soft tissue dissection as a contributing factor [12].

Fracture Union and Weight-Bearing

Radiological union occurred significantly earlier in the PFN group (13.21 ± 2.90 weeks) versus the DCS group (19.97 ± 3.93 weeks) ($p<0.0001$), highlighting the biomechanical advantage of intramedullary fixation. These findings are more favourable than the 26.2-week mean union time reported by Wang et al. [13] for similar fractures treated with conventional plating.

Full weight-bearing was achieved earlier in PFN patients (14.54 ± 2.74 weeks) than in DCS patients (21.67 ± 2.98 weeks) ($p<0.0001$), emphasizing the role of load-sharing implants in facilitating early mobilization. Abraham et al. [6] also reported earlier rehabilitation milestones with PFN in their comparative series.

Functional Outcomes

At the 12-month follow-up, patients in the PFN group demonstrated superior Harris Hip Scores (85.50 ± 7.62) compared to the DCS group (80.20 ± 7.14) ($p = 0.0073$), consistent with the data reported by Ghilzai et al. [8], where PFN patients scored 80.5 ± 4.8 at six months. Additionally, the PFN group showed significantly better hip range of motion in all measured parameters—flexion, extension, abduction, and rotation (all $p<0.05$)—further reinforcing the functional superiority of intramedullary fixation.

Complication Profile

Although not statistically significant ($p = 0.1103$), the infection rate was higher in the DCS group (20%) than in the PFN group (6.7%). Mechanical complications such as implant failure (6.7%) and nonunion (3.3%) occurred exclusively in the DCS group. These trends mirror those described by Şensöz et al. [14], who emphasized a higher complication burden in extramedullary constructs. Lotzien et al. [15] also advocated for early intervention in DCS-related complications to avoid delayed healing.

While previous studies have variably favoured one implant over the other based on fracture complexity and surgeon experience, our results strongly support PFN as the superior option in most subtrochanteric femur fractures. The consistently shorter surgical duration, reduced blood loss, faster union time, earlier mobilization, and better long-term function with PFN suggest it should be the preferred treatment in appropriately selected patients.

Limitations

This study had certain limitations. First, the sample size was relatively small (n=60), which may reduce the statistical power to detect differences in some outcome measures. Second, the study was conducted at a single tertiary care centre, potentially limiting generalizability to broader populations. Third, the choice of implant was not randomized but based on surgeon discretion and fracture type, introducing a possible selection bias. Lastly, although the 12-month follow-up period was adequate for assessing union and functional recovery, longer-term outcomes such as implant survivorship and late complications were not evaluated.

CONCLUSION

In the management of subtrochanteric femur fractures, Proximal Femoral Nailing (PFN) demonstrated superior outcomes compared to Dynamic Condylar Screw (DCS) fixation. PFN was associated with shorter operative time, reduced intraoperative blood loss, earlier fracture union, faster return to full weight-bearing, and better functional outcomes at one year. Although complication rates were not statistically different, a trend toward fewer mechanical and infectious complications was observed in the

PFN group. Based on these findings, PFN appears to be the more effective and efficient fixation method for subtrochanteric fractures in appropriately selected patients.

REFERENCES

[1] Russell TA. Fractures of the proximal femur. In: Rockwood and Green's Fractures in Adults. 7th ed.
[2] Sims SH. Subtrochanteric femur fractures. Orthop Clin North Am. 2002;33(1):113–26.
[3] Chirodian N, Archibeck M, White R. Subtrochanteric femoral fractures treated with the long Gamma nail. J Orthop Trauma. 2004;18(9):603–10.
[4] De Lee JC, Drez D. Orthopaedic sports medicine. W.B. Saunders Co; 1994.
[5] Zafir MB, Rauf A, Rauf H, Zia OB. Comparison of PFNA and DCS in unstable intertrochanteric fractures. Ann King Edward Med Uni. 2023;29(2):150–4.
[6] Abraham VT, Manivannan V, Balaji G. Management of subtrochanteric fractures using PFN. J Orthop. 2016;13(1):25–9.
[7] Kumar Y, Sharma G, Mahajan A. Comparative study of PFN and DCS in intertrochanteric fractures. Int J Orthop Sci. 2016;2(4):297–301.
[8] Ghilzai AK, Dar FA, Mir MR, et al. Comparative outcome of intertrochanteric fractures treated with PFN vs DCS. Int J Orthop Sci. 2016;2(4):241–5.
9. Khan GN et al. Comparative analysis of DCS and PFN in subtrochanteric fractures. J Orthop Case Rep. 2022;12(2):45–50.
10. Das A, Naskar D, et al. Subtrochanteric fractures: mechanism and patterns in Indian population. Indian J Orthop Surg. 2020;6(3):220–6.
11. Zafir MB et al. Comparison of PFNA and DCS in unstable intertrochanteric fractures. Ann King Edward Med Uni. 2023;29(2):150–4.
12. Tripathy SK, Goyal T. Surgical exposure and blood loss in intertrochanteric fractures: a comparative study. Bone Joint Res. 2018;7(11):678–84.
13. Wang WY et al. Comparison of fixation methods in subtrochanteric fractures. J Chin Med Assoc. 2010;73(12):616–22.
14. Şensöz E et al. Complications of DCS versus intramedullary fixation: a multicenter retrospective study. Int Orthop. 2023;47(2):125–31.
15. Lotzien S et al. Early revision strategies in subtrochanteric fracture management. Eur J Trauma Emerg Surg. 2018;44(5):741–7.