Aswan University Medical Journal, volume 5 / No.1/ March 2025 (1- 8) Online ISSN: **2735-3117**

ORIGINAL ARTICLE

What is the difference in intraoperative complications between using cannulated screws and dynamic hip screws for fixation of femoral neck fracture?

Hesham Hamed Refae, Ahmed Mohammed Abdelwahab*, Mohamed Salman, Ebeed Yasin.

Orthopedics and Traumatology Department, Faculty of Medicine- Aswan University

ABSTRACT

Keyword: Dynamic Hip Screw, Cannulated Screw, Neck of Femur.

* **Corresponding author**: Ahmed Mohammed Abdelwahab Mosa
Mobile: 01125212787
E-mail: ahmedcamp753@gmail.com

Background: Operative treatment of a femoral neck fracture necessitates meticulous technique since intraoperative excessive image exposure and blood loss can significantly impact union and the overall outcome. **objectives:** The work aimed to evaluate and compare the intraoperative compactions between the cannulated screws and dynamic hip screws for fixation of the femoral neck fracture. **Subjects and methods:** Thirty patients with femoral neck fractures were enrolled in this prospective study and divided into two groups. Cannulated screw fixation for group A and dynamic hip screw fixation for group B. We compared the two groups regarding intraoperative complications: C-arm exposure, blood loss, and implant failure. **Results:** The intraoperative blood loss was (160 ± 47.06 ml) in the cannulated screws and (440 ± 188.22 ml) in the dynamic hip screw (p-value <0.001). The C-arm exposure time was significantly higher in the canned fixation group (30 ± 9.26 seconds) compared to the dynamic hip screw group (20.3 ± 11.41 seconds). **Conclusion:** the Cannulated fixation recorded more intraoperative image exposure but lesser operative time than Dynamic hip screws during fixation of the neck of femur fracture

INTRODUCTION

Femoral neck fractures are common and severe injuries, particularly in young people.[1] The treatment of these fractures involves the use of dynamic hip screws (DHS) and cannulated screws (CS) for fixation. Both surgical techniques have their complications. [2] Percutaneous CS is a minimally invasive technique that reduces surgical time and blood loss and preserves soft tissue. [3] However, the DHS provides better fracture stability while resulting in more blood loss and surgical exposure .[4] Despite their widespread usage, orthopedic surgeons continue to argue the differences between cannulated screws and DHS. While both procedures seek to provide secure fixation and encourage healing, there are differences in the rates of problems for each group: avascular necrosis, implant failure, non-union, and the requirement for revision surgery. [5]

Previous studies noted that CS results in less intraoperative blood loss due to its minimally invasive nature, which preserves surrounding soft tissue. Conversely, DHS procedures often require extensive surgical exposure, increasing blood loss. Additionally, DHS may necessitate longer operative time, and CS may

have longer C-arm exposure during surgery for optimal visualization, potentially increasing radiation exposure for both the patient and surgical team. [1, 6]

We hypothesize that the DHS had more blood loss and operative time functional recovery than CS, while CS had higher C arm exposure. In this study, we compare the CS and DHS during the fixation of fracture NOF regarding operative times, surgical blood loss, and implant failure during the surgery.

PATIENT AND METHOD:

Thirty patients with NOF fractures are included in this prospective, comparative study, and treated at the orthopedic department of Aswan University Hospital from March 2023 to April 2024. The patients were divided into two groups: Group A treated by CS, and Group B treated by DHS. Each group included 15 patients. The study included patients with recent (less than 30-day) NOF fractures, including all types of garden classifications [7], between the ages of 16 and 60. We excluded patients with associated head or acetabulum fractures, pathological fractures, AVN of the head of the femur, or previous hip operations.

Surgical Techniques

The patients laid supine on a radiolucent orthopedic traction table. Spinal anesthesia is performed for all patients. The non-displaced fractures (Garden type I) are fixed without manipulation, while displaced fractures are reduced by external rotation, abduction, longitudinal traction, internal rotation, and adduction. [7, 8]

Cannulated screw (CS) Group:

We use the cannulated screws as a percutaneous procedure. Through small (2–3) skin incisions made on the lateral side of the thigh, three guide wires arranged in an inverted triangle configuration, with one wire in the superior position and the other two wires in the posterior-inferior and anterior-inferior positions, are inserted through the neck and head up to the subchondral bone. Use the image intensifier to confirm the wire's location. To find the screw length, measure the depth of the guide wire. [8 -11] A cannulated drill bit with a 3.6 mm diameter to allow for the screws' core diameter, then the CS with its washer is inserted across the guide wire and delivered to the subchondral bone to achieve compression across the fracture site. Remove the guiding wires. Confirm the ultimate placement of the screws and fracture reduction using the image intensifier, then the wound is closed. [11]

Dynamic Hip Screws (DHS) Group:

A lateral incision is made in the lateral side of the thigh from the greater trochanter, extending 8-10 cm, distally the iliotibial band is incised, and the vastus laterals muscle is retracted to expose the lateral aspect of the femur. Under fluoroscopic guidance, a guide wire is inserted through the lateral cortex of the femur, aiming towards the femoral head center, and then the cannulated reamer over this guide wire creates a pathway for the lag screw [9]. The lag screw is inserted over the wire centrally within the femoral head to provide optimal fixation, then the plate is placed over the lag screw at the lateral aspect of the femur with 4 cortical screws. Then an anti-rotational screw is added superior and parallel to the lag screw. Then the wound is sutured in layers. [11]

Postoperative follow up:

The following intra-operative data were recorded: surgical time; the amount of blood lost; durations of image exposure; CS or DHS lag misplacement; wire breakage; and fracture mal reduction.

Statistical Analysis

We used IBM Inc.'s SPSS v28 (Armonk, NY, USA) for data analysis. To compare the quantitative variable means and standard deviations (SDs) between the two groups, an unpaired Student's t-test was employed. Qualitative variables were reported in terms of frequency and percentage (%). Fisher's exact test or the Chi-square test were used to analyze the data when appropriate. If the two-tailed P value was less than 0.05, the result was designated as statistically significant.

RESULTS

This comparative prospective study involved 30 patients with femur neck fractures who were split into two

groups: group (A) received treatment with Cs and group (B) received treatment with DHS. Regarding the Preoperative Data: The mean age was (37.9 ± 13.84) years in the cannulated screw group and (36.6 ± 11.61) years in the DHS group (Fig. 1). There were 10 (66.67%) males and 5 (33.33%) females in the cannulated screw group, compared to 13 (86.67%) males and 2 (13.33%) females in the DHS group (Fig 2). Smoking status was similar between the two groups, with 7 (46.67%) smokers in the cannulated screw group and 6 (40%) smokers in the DHS group. These differences were not statistically significant. Most patients in both groups had no comorbidities (73.33%) in the CS group and (86.67%) in the DHS group (Fig. 3). Regarding the time interval from fracture to surgery, it was 46.4 ± 33.29 hours in the CS group and 59.3 ± 77.49 hours in the DHS group. These differences were not statistically significant. Regarding the type of fracture in the CS group, there were 5 (33.33%) of Garden type I, 4 (26.67%) of Garden II, and 6 (40%) of Garden III. Within the DHS group, there are 1 (6.67%) garden I, 8 (53.33%) garden II, 4 (26.67%) garden III, and 2 (13.33%) garden type Vl. (Fig 4)

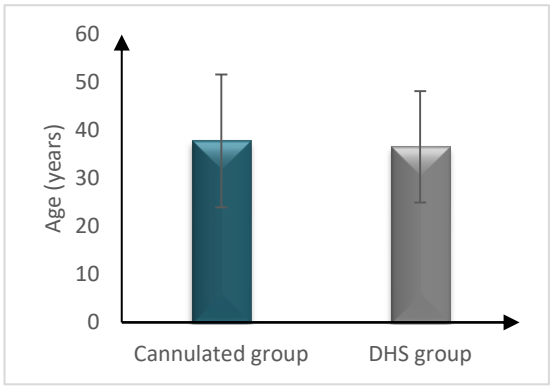


Figure 1: Age in the studied groups

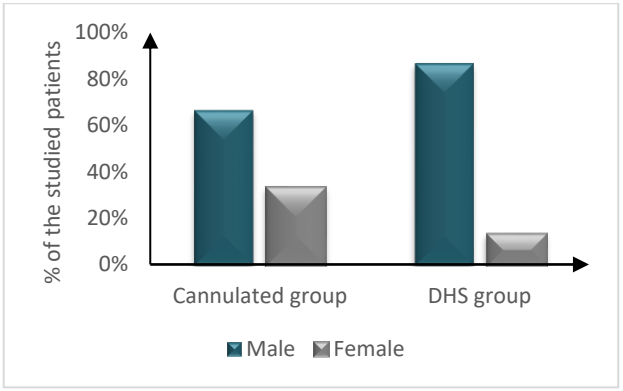


Figure 2: Sex in the studied groups

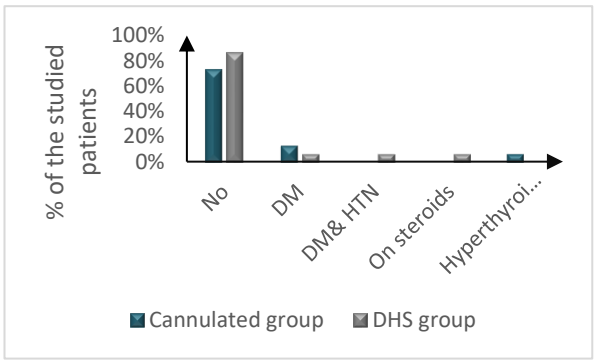


Figure 3: Comorbidities in the studied groups

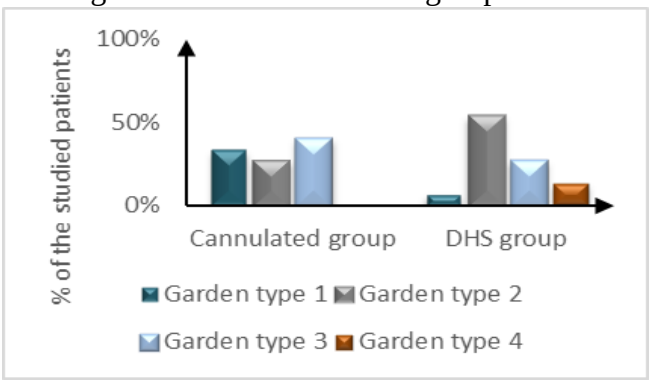


Figure 4: Type of fracture in the studied groups

Regarding intraoperative data, the operative time was 1.1 ± 0.32 hours at the CS and 1.3±0.56 hours in the DHS, while the blood loss was 160 ± 47.06 ml in the CS and 440 ± 188.22 ml in the DHs. This is a significant difference as the p-value <0.001 (Fig 5). The C-arm exposure time was significantly higher in the CS group (30 ± 9.26 seconds) compared to the DHS group (20.3 ± 11.41 seconds). (fig 6) (table 1). Neither the DHS group nor the CS group experienced wire breakage, fracture mal-reduction, or screw or DHS lag misplacement.

Figures 1 and 2 presented illustrative fracture NOF fixed with DHS and CS respectively. (figure:1,2)

Table 1: Comparison between the two studied groups regarding intraoperative data:

Parameter	**Cannulated Screws (n=15)**	**Dynamic Hip Screws (n=15)**	**P Value**
Operation Time	1.1 ± 0.32	1.3 ± 0.56	0.170

Parameter	Cannulated Screws (n=15)	Dynamic Hip Screws (n=15)	P Value
(Hours)			
Blood Loss (ml)	160 ± 47.06	440 ± 188.22	**<0.001***
C-arm Exposure (Sec)	30 ± 9.26	20.3 ± 11.41	**0.017***

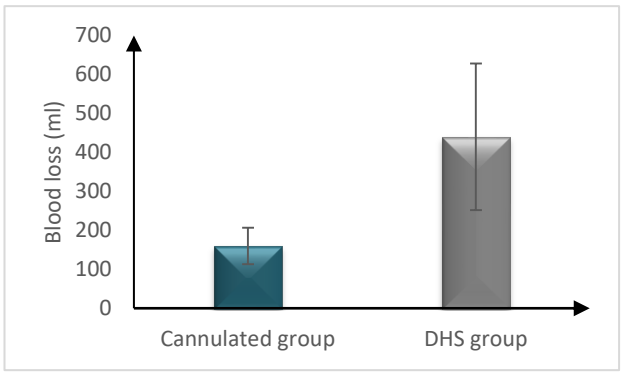


Figure 5: Blood loss in the studied groups

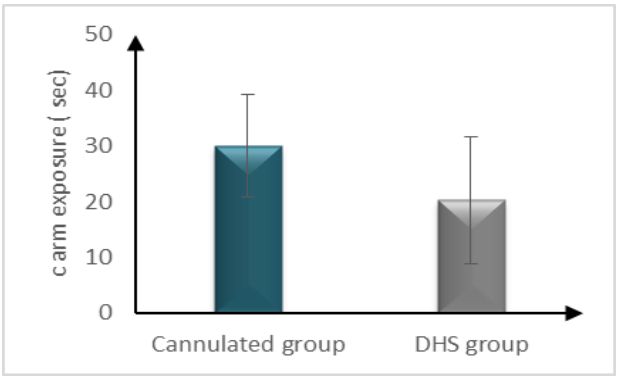
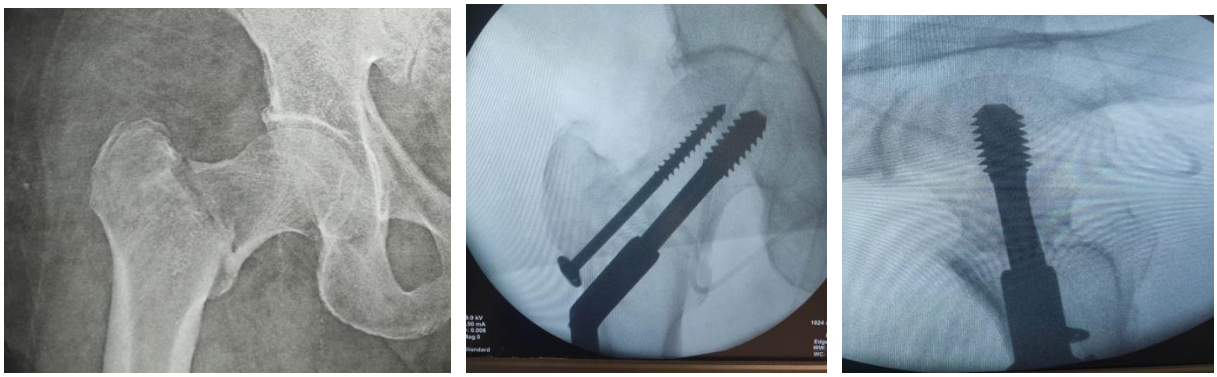


Figure6: C arm exposure in the studied groups

Case 1 :



(A) (B) (C)

(D)

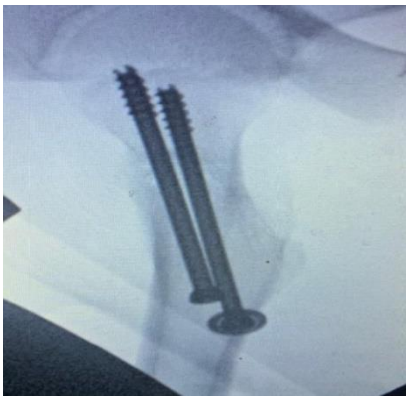
(E)

Figure (7), 45year Male patient, with a motor car accident, (A): x-ray shows neck of femur fracture with Garden type II, (B) &(C) intraoperative image with the fracture fixed by DHS with Anti rotational screw, (D) & (E) shows the 1 year follow up with the fracture full union without complications.

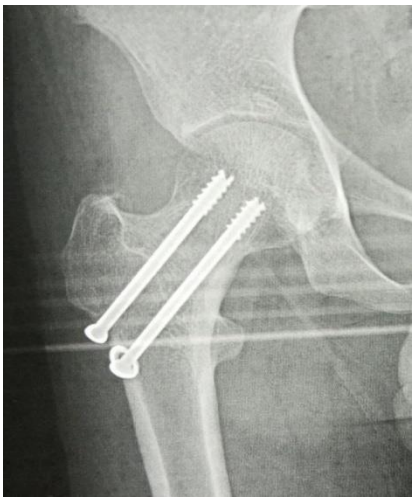
Case 2:

(A)

(B)



(C)



(D)

(E)

(F)

Figure (8), 16 year Male patient, with a motor car accident, (A): x ray shows NOF fracture with Garden type II ,(B) &(C) intraoperative image with the fracture fixed by CS with, (D) & (E) shows the 1 year follow up with the fracture full union without complications, (F) shows the NOF after the Screws removal with no signs of any complications.

DISCUSSION

Femoral neck fractures are prevalent in orthopedics, with a 0.04% incidence in young adult patients. [8] CS and DHS are the most used for young patients, with CS providing better biomedical properties and DHS maintaining neck-shaft angle and anatomical reduction.[9] The CS tends to have advantages in lower blood loss and shorter operative time, but they require more C-arm exposure. while DHS offers more stable fixation but at the cost of higher blood loss and longer operative time. [1,6]

This prospective study involved 30 patients with femur neck fractures and was divided into two groups: Group A managed with CS and Group B managed with DHS to compare the intraoperative complications between the two groups. The demographics, age, sex, and comorbidities were insignificantly different between the two studied groups. Siavashi et al. in their study. They reported that there is no statistically significant difference between the two groups.[9]

Regarding the operation time, it was insignificantly different between both groups, as in the Cs it was 1.1 ± 0.32 hours and in the DHS it was 1.3 ± 0.56 hours. Similarly, Al-Kelabi et al. reported in their study that there was no significant difference between the DHS and CS groups as regards operative ($p > 0.05$).[1] However, Widhalm et al. reported that the use of the DHS was associated with a 13-minute longer surgery.[10] Regarding the duration of C-arm exposure, it was significantly longer in the CS group compared to the DHS group ($P = 0.017$). However, Kaplan et al., reported that the percutaneous CS fixation method has higher image exposure. [7]

In our study, the CS group has lesser blood loss than the DHS group ($P<0.001$). In agreement, Kaplan et al. and Al-Kelabi et al, reported that intraoperative blood loss in the CS group was lesser than in the DHS group ($p<0.001$). [1,7] Al-Kelabi et al, reported that Minimally Invasive Techniques and Using Hemostatic Agents help to decrease soft tissue damage and control bleeding more effectively, leading to a decrease in the associated blood loss.[7]

Limitation of the study:

The limitations of our study are: (1) a small Sample Size and so subsequent investigations should incorporate a larger sample size to bolster the statistical strength of the results, also Multicentric studies should be performed to collect information from various demographics and surgical specialties. (2) Short Follow-Up Duration: Longer follow-up is often necessary to fully evaluate the long-term complications and functional outcomes associated with each fixation method. (3) Selection Bias: Certain patient characteristics should influence the choice of fixation method, such as fracture type, age, and comorbidities.

CONCLUSION:

Both DHS and CS fixation methods are viable options for the management of femoral neck fractures in adults. However, CS fixation has less blood loss and less operative time, but it has more image exposure. Further research with larger sample sizes is warranted to validate these findings.

Disclosure; No Conflict of interest

Funding: None.

Authors contribution:
Hesham Hamed Refae: data analysis, writing, and reviewing the manuscript
Ahmed Mohammed Abdelwahab: performing operations, collecting data and writing the manuscript
Mohamed Salman Mahmoud: data analysis, writing, and reviewing the manuscript
Ebeed Yasin Ibrahim: writing the manuscript, reviewing the manuscript.

REFERENCES

1. Al-Kelabi, A. E., & Mahmoud, M. S. "Dynamic hip and cannulated screws in fixation of adults femoral neck fracture: A comparative study." Int J Med Res Health Sci, 2018, 7(3), 135-142.

2. Bhandari, M., Devereaux, P. J., Swiontkowski, M. F., Tornetta, P., Obremskey, W., Koval, K. J., & Nork, S. Internal fixation compared with arthroplasty for displaced fractures of the femoral neck. The Journal of Bone and Joint Surgery, American Volume, 2003, 85(9), 1673-1681.

3. Freitas, A., et al. "Analysis on the mechanical resistance of fixation of femoral neck fractures in synthetic bone, using the dynamic hip system and an anti-rotation screw." Revista Brasileira de Ortopedia, 2014, 49(6), 586-592.

4. Heetveld, M. J., Rogmark, C., Frihagen, F., & Keating, J. "Internal fixation versus arthroplasty for displaced femoral neck fractures: what is the evidence?" The Journal of Orthopaedic Trauma, 2005,19(6), 403-412.

5. Khan, M.A., et al. "Comparison of dynamic hip screw and cannulated screws for the treatment of femoral neck fractures: A systematic review." Injury, 2017,48(2), 295-301.

6. Li, L., et al. "Dynamic hip screws versus cannulated screws for femoral neck fractures: a systematic review and meta-analysis." Journal of Orthopaedic Surgery and Research, 2020,15(1), Article 352.

7- Kaplan, Tolga, et al. "Comparative results of percutaneous cannulated screws, dynamic compression type plate and screw for the treatment of femoral neck fractures." Turkish Journal of Trauma & Emergency Surgery, 2012, vol. 18, no. 1, pp. 65-70.

8- Zhang, B., Chiu, K. Y., & Wang, M. Hip arthroplasty for failed internal fixation of intertrochanteric fractures. Journal of Orthopaedic Surgery, 2017,25(1),

9- Siavashi, B., Aalirezaei, A., Moosavi, M. et al. A comparative study between multiple cannulated screws and dynamic hip screw for fixation of femoral neck fracture in adults. International Orthopaedics (SICOT), 2015, 39, 2069–2071 (2015).

10- Widhalm HK, Arnhold R, Beiglböck H, Munteanu A, Lang NW, Hajdu S. A Comparison of Dynamic Hip Screw and Two Cannulated Screws in the Treatment of Undisplaced Intracapsular Neck Fractures—Two-Year Follow-Up of 453 Patients. Journal of Clinical Medicine. 2019; 8(10):1670.

11- Hoshino, C. M., Christian, M. W., O'Toole, R. V., & Manson, T. T. "Fixation of displaced femoral neck fractures in young adults: Fixed-angle devices or Pauwel screws?" Injury, 2016, 47(8), 1676–1684