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Comparative Study of Dynamic Hip Screw vs Multiple Cancellous Screw in Fracture Neck of Femur in Young Adults

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Abstract

Fracture neck of femur is a complex injury that predominantly affects young adults. Surgical management options include the use of dynamic hip screw (DHS) or multiple cancellous screw (MCS) fixation techniques. However, the optimal choice between these two approaches remains a subject of debate. This study aims to compare the effectiveness and outcomes of using DHS versus MCS in young adults with fracture neck of femur. The study design was a comprehensive comparative analysis involving a thorough evaluation of medical records, patient demographics, surgical technique, and post-operative data collected over a specific period. Several clinical outcomes, including surgical time, perioperative blood loss, functional recovery, implant failure rates, and patient satisfaction ratings, were considered in the analysis. Results demonstrated that both DHS and MCS techniques yielded satisfactory outcomes in young adults with fracture neck of femur. However, certain differences were observed. The DHS technique exhibited advantages in terms of biomechanical stability and load sharing capacity, which can promote early mobilization and enhanced recovery. On the other hand, the MCS approach offered an alternative procedure that is less invasive, demands shorter surgical time, and presents minimal risk of avascular necrosis. A comparison of functional recovery indicated that patients treated with DHS achieved improved ambulation and quality of life compared to those treated with MCS. However, both techniques yielded similar rates of implant failure and overall patient satisfaction. These findings suggest that the optimal choice between DHS and MCS should be tailored to the individual patient, considering factors such as age, fracture pattern, bone quality, and surgeon expertise.

Keywords: Dynamic hip screw; Cancellous screws; Neck of femur fracture.

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INTRODUCTION

Intracapsular fractures of the femoral neck have always been a major challenge for orthopedic surgeons and in many respects, especially in the younger population, remain unresolved fractures in terms of treatment and outcome.[1] Due to its high incidence. Energy trauma is on the rise, as is the incidence of femoral neck fractures in young adults.[2] This number is projected to increase to 2.5

million by 2025 and 4.5 million by 2050, assuming no age-specific increase. Dynamic hip screws with derotation screws or CC screws are used in surgery to reduce and stabilize fractures in young adults. This allows early patient mobilization and reduces many of the risks associated with conservative treatment. Currently available options for stabilizing femoral neck fractures include cannulated cancellous screw or sliding hip screw fixation. The most common complications in the treatment of intracapsular femoral neck fractures arenonunion and avascular necrosis.[3-5] The global incidence of femoral neck fractures has continued to increase since an estimated 1.3 million hip fractures. Fractures are considered vascular disorders of bone blood flow.[6-9] The degree of vascular injury is thought to directly correlate with fracture displacement, which affects fracture healing and causes complications. Therefore, intracapsular femoral neck fractures are considered an orthopaedic emergency[10] and are treated with rigid internal fixation aimed at improving blood flow to the femoral head and preventing non-union and vascular necrosis can be reduced. In 1980, a simple, less traumatic method of fixation by parallel placement of multiple cannulated screws for intracapsular hip fractures to increase the accuracy of fixation and reduce the incidence of complications.[11] Cannulated cancellous screw internal fixation after good anatomic reduction has the advantages of less blood loss, shorter operative time, less need for blood transfusions, and shorter hospital stay.[10] The use of the sliding hip screw has several important advantages like improved biomechanical stability, prevention of femoral neck shortening and screw migration. Disadvantages of using sliding hip screws to fix femoral neck fractures include the potential for rotational misalignment of the femoral head during screw insertion.[11] However, this drawback is overcome by inserting a counter rotating screw prior to placing the Richard screw.

MATERIALS AND METHODS

This study included 40 patients with a history of trauma and a diagnosed femoral neck fracture. After a thorough patient evaluation, all patients who met the inclusion criteria were enrolled in the study after receiving written informed consent. A routine preoperative profile was established for each patient along with pre anesthetic controls. Follow-up radiographs were obtained at each scheduled follow-up visit at 6 weeks, 3 months, 6 months, and 12 months. Patients were mobilized without weight for 3 months with the help of storage and walkers. Local examinations for tenderness, instability, deformity and hip motion were assessed. Radiographs were taken at each follow-up visit to assess the progress of fracture healing and implant placement. Informed, voluntary, written consent was obtained from each patient. This consent was given in addition to the consent normally obtained for the treatment and surgery of patients with femoral neck fractures. After a detailed medical history and a complete general physical and systemic examination, the patient underwent appropriate examinations. Complete data were collected on a specially designed case report form.

Data collection steps are as follows: Medical history with verbal communication with patient and companion, Local and systemic clinical examination, Basic radiological examination, Diagnosis: clinical and his radiographic examination, Initial examination , Clinical examination and radiographic Assessment and Postoperative Complications. Data were first collected in a customized format and then transferred to Microsoft Excel for analysis. Values were calculated using IBM SPSS version 22.0.0.0 statistical software. A paired 't' test was used to perform comparisons of means within groups at different time intervals. A comparison of the proportions is based on Fisher's Exact tests of association between two sample proportions and two nonparametric variables were performed using Pearson's chi-square test.

Inclusion criteria

- Patients with age between 16 and 60 years of age
- Patient presenting within 3 weeks
- Closed fractures

Exclusion criteria includes

- Neglected fracture neck of femur (>3 weeks)
- Pathological fractures
- Patient not willing to give consent

CASE 1

Fig. 1: Pre-operative

Fig. 2: Post-operative

Fig. 3: 1 Month Post-operative

Fig. 4: 3 Month Post-operative

CASE 2

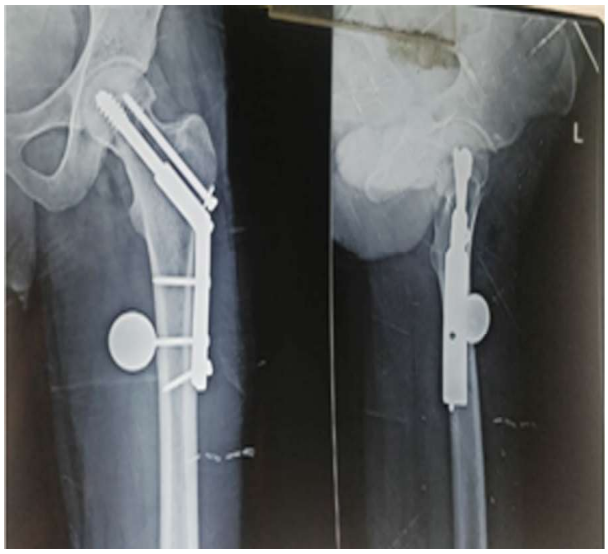

Fig. 5: 6 Month Post-operative

Fig. 6: Pre-operative

Fig. 7: Post-operative

Fig. 9: 3 Months Post-operative

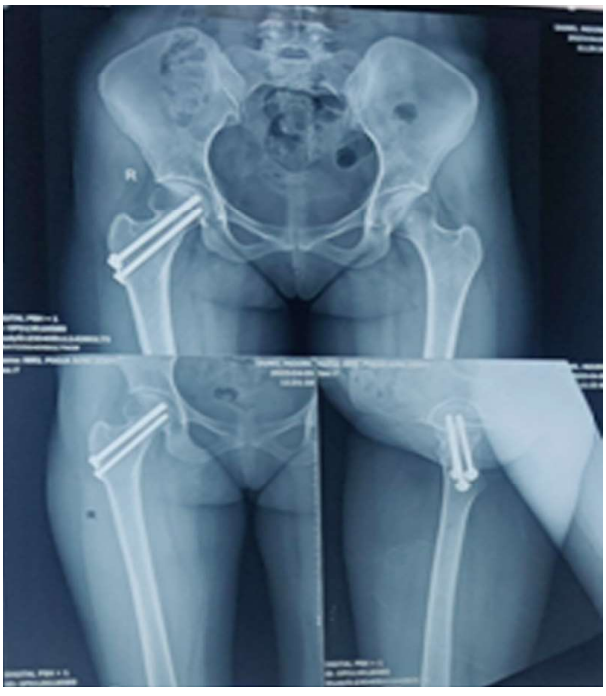

Fig. 11: 1 Year

Fig. 8: 1 Month

Fig. 10: 6 Months Post-operative

RESULTS

There were 20 (50%) patients in CC screw group (Group 1) and 20 (50%) patients in DHS Screw (Group 2). In ***Group 1***, there were 5 (25%) females and 15 (75%) males. In ***Group 2***, there were 5 (25%) females and 15 (75%) males. In both the groups, majority of the patients were males. There was no statistically significant association between sex and the groups (P=1.000), which shows that groups are independent of sex.

In ***Group 1***, in 10 (50%) patients leftside was involved and in 10 (50%) patients' right side was involved. In ***Group 2***, in 13 (65%) patients left side was involved and in 7 (35%) patients' rightside was involved. In ***Group 1*** both the sides were equally involved, while in ***Group 2*** left side was moreinvolved. There was no statistically significant association between side involved and the groups (P=0.357), which shows that groups are

independent of side involved.

In ***Group 1***, in 3 (15%) patients, basic cervical fractures were seen, in 9 (45%) patients, subcapital fractures were seen and in 8 (40%) patients, trans cervical fractures were seen. In ***Group 2***, in 2 (10%) patients, basic cervical fractures were seen, in 10 (50%) patients, subcapital fractures were seen and in 8 (40%) patients, trans cervical fractures were seen. There was no statistically significant association between anatomical classification of fractures and the groups (P=0.881), which shows that groups are independent of the anatomical classification of fractures. In ***Group 1***, Grade 1 fracture was seen in 10 (50%) patients, Grade 2 fracture in 8(40%) patients and Grade 3 fracture in 2 (10%) patients. In ***Group 2***, Grade1 fracture was seen in 2 (10%) patients, Grade 2 fracture in 11 (55%) patients and Grade 3 fracture in 7 (35%) patients. There was a statistically significant association between Pawel's classification of fractures and the groups (P=0.014), which shows that groups are dependent on the Pawel's classification of fractures. Grade 1 fracture was more common in ***Group 1*** and Grade 2 and 3 fractures were more common in ***Group 2***.

In ***Group 1***, At 6 weeks, at 3 months and at 6 months, all 20 patients were evaluated, while at 12 months, 16 patients were evaluated. At 12 months 4 patients had developed AVN. In ***Group 2***, At 6 weeks, at 3 months and at 6 months, all 20 patients were evaluated, while at 12 months, 19 patients were evaluated. At 12 months only 1 patient had eveloped AVN.

In ***Group 1***, the mean Harris Hip Score at 6 weeks was 65.10 ± 3.26, at 3 months it was 75.35± 5.49, at 6 months it was 79.45 ± 6.44 and at 12 months it was 84.69 ± 4.51. There was a significant improvement in mean Harris Hip Score at 3 months compared to 6 weeks (P=0.001), at 6 months compared to 3 months (P=0.001) and at 12 months compared to 6 months (P=0.001). In Group 1 there was a significant improvement in mean Harris Hip Score till 12 months from 6 weeks. In Group 2, the mean Harris Hip Score at 6 weeks was 73.10±4.67, at 3 months it was 82.05± 3.97, at 6 months it was 86.75 ± 3.13 and at 12 months it was 90.68 ± 2.54. There was a significant improvement in mean Harris Hip Score at 3 months compared to 6 weeks (P=0.001), at 6 months compared to 3 months (P=0.001) and at 12 months compared to 6 months (P=0.001). In ***Group 2*** there was a significant improvement in mean Harris Hip Score till 12 months from 6 weeks.

At ***6 weeks:*** The mean Harris Hip Score in Group 1 was 65.10± 3.26 and in Group 2 it was 73.10±4.67. The mean Harris Hip score at 6 weeks was significantly higher in Group 2 as compared to Group1 (P=0.001).

At ***3 months:*** The mean Harris Hip Score in Group 1 was 75.35 ± 5.49 and in Group 2 it was 82.05±3.97. The mean Harris Hip score at 3 months was significantly higher in Group 2 as compared to Group1 (P=0.001).

At ***6 months:*** The mean Harris Hip Score in Group 1 was 79.45 ± 6.44 and in Group 2 it was 86.75±3.13. The mean Harris Hip score at 6 months was significantly higher in Group 2 as compared to Group1 (P=0.001).

At ***12 months:*** The mean Harris Hip Score in Group 1 was 84.69 ± 4.51 and in Group 2 it was 90.68±2.54. The mean Harris Hip score at 12 months was significantly higher in Group 2 as compared to Group 1 (P=0.001).

The mean Harris Hip Score at all follow-ups (time intervals) was significantly higher in Group 2 compared to ***Group 1***.

In Group 11 (5%) patient had excellent outcome, 11 (55%) patients had good out come and 4 (20%) patients had fair outcome. 4 (20%) patients had developed avascularnecrosis.

In ***Group 2***, 10 (50%) patients had excellent outcome and 9 (45%) patients had good outcome. 1 (5%) patient had developed avascularnecrosis. There was a statistically significant association between outcome and the groups (P=0.004), which shows that the groups are dependent on the outcome. Excellent outcome was higher in ***Group 2***, while prevalence of good outcome was higher in ***Group 1***. A vascular necrosis was higher in ***Group 1*** compared to ***Group 2***.

In ***Group1***, 16(80%) patients had no complications, and 4(20%) patients had avascularnecrosis. In ***Group 2***, 19 (95%) patients had no complications, and1 (5%) patient had a vascularnecrosis. The proportional comparison no favascularnecrosiss was found to be statistically not significant (P=1.00).

DISCUSSION

Femoral neck fractures are difficult fractures. In younger patients, it is primarily an orthopedic emergency caused by high energy trauma such as car accidents.[12,13] Implants used for internal fixation of intra capsular femoral neck fractures can be divided into three categories: multiple cancellous screws, fixed angle devices that allow sliding/ compression, and sliding/compression devices. Disallowed fixed angle device. Multiple cancellous

screws improve bone preservation, anti-rotation, and blood supply preservation of the femoral head compared to fixed angle fixation. However, angle fixation devices may have better resistance to varus deformation and micromotion than traditional inverted triangular screws. Therefore, the present study was conducted to compare and evaluate the radiological and functional outcomes of both fixation modalities and these post fixation complications. From the age of 16 to the age of 50 he enrolled 40 patients who came to the hospital within 3 weeks of the injury and had a closed fracture. These patients were evenly divided into two groups of 20 patients each. Patients in group 1 (n=20) received fracture fixation with cancellous screws and patients in group 2 (n=20) received fracture fixation with dynamic hip screw fixation. In group 1, most patients belonged to her age group of 21-30 years, and in group 2, most patients belonged to her age group of 31-40 years. The average age of patients in Group 1 is 34.10 ± 11.53 years and 37.30 ± 10.14 years in group 2. The difference was found to be statistically insignificant. Both groups were comparable with respect to patient age. According to the study of Singh *et al*.[14], the mean age of patients in the DHS group was 27.2 years and the mean age of patients in the CCS group was 30.4%. Patil *et al*.[15] in this study, the mean age of the patient in the DHS group was 46.38 ± 3.03 years and in the cavernous screw group he was 38.38 ± 2.33 years. The mean age of Singh *et al.*[14] was lower than that of Patil *et al*.[15], while the mean age of study participants was lower. Study participants are older than the average age in our study. In the Londhe *et al*.[14] study, the mean age of the patient was her 35.5 years, which is comparable to the mean age of our study patients. In both groups, 25% were female and 75% were male. In our study, men outnumbered women. Singh *et al*.[14] had 34 males and 9 females. Londhe et al.[16] The study was 67% male and 33% female. Patil *et al*.[15] found 37.5% females and 62.5% males in the DHS group and 12.5% females and 87.5% males in the MCCS group. All of these studies have found men to be overweight, which supports our findings. In Group 1, left sided involvement was observed in 50% of patients and right sided involvement was observed in 50% of patients. In Group 2, left sided involvement was observed in 65% of patients and right sided involvement was observed in 35% of patients. In group 2, the left side was more involved than the right side, and group 1 was comparable. In the Londhe *et al*.[16] study, left sided involvement was observed in 43.54% of him and right sided involvement in 56.45% of him. In their study, the prevalence of right sided involvement was higher than left sided involvement, which is inconsistent with our findings. According to anatomic classification, in group 1, 15% of his patients had underlying neck fractures, 45% had subhead fractures, and 40% had transneck fractures. In group 2, 10% of patients had underlying neck fractures, 50% had subhead fractures, and 40% had transneck fractures. There was no significant correlation between group and anatomical classification of fractures. Both groups were comparable with respect to anatomical classification of fractures. According to the Pauwel classification, in group 1, 50% of patients had grade 1 fractures, 40% had grade 2 fractures, and 10% had grade 3 fractures. In group 2, 50% of patients had grade 1 fractures, 40% had grade 2 fractures, and 10% had grade 3 fractures. There was a significant correlation between group and Pauwel's fracture classification. Grade 2 and 3 fractures are more common in group 2, while grade 1 fractures are more common in group 1. Londhe *et al*.[16] found that 64.5% of his fractures were Powell type II, 22.5% were Powell type I, and 13% were Powell type III. In their study, most patients had a Powell type I fracture, followed by a type II fracture, which is similar to ours. Follow-up examinations of these patients were performed after 6 weeks, 3 months, 6 months, and 12 months.

In group 1, the mean Harris Hip Score was 65.10 ± 3.26 at 6 weeks and 65.10 ± 3.26 at 3 months. 75.35 ± 5.49, 79.45 ± 6.44 at 6 months, 84.69 ± 4.51 at 12 months. There was significant improvement in mean Harris Hip Scores at 3 months vs. 6 weeks, 6 months vs. 3 months, and 12 months vs. 6 months.

In group 2, the mean Harris Hip Score was 73.10 ± 4.67 at 6 weeks and 73.10 ± 4.67 at 3 months. 82.05 ± 3.97, 86.75 ± 3.13 at 6 months, 90.68 ± 2.54 at 12 months. Mean Harris Hip scores significantly improved at 3 months vs. 6 weeks, 6 months vs. 3 months, and 12 months vs. 6 months.

When the mean Harris hip scores were compared between the two groups, we found that the mean Harris hip scores were significantly higher in group 2 patients than in group 1 patients at each follow-up. Functional scores are better in Group 2. Group 1.

In group 1, the Harris Hip Score was excellent in 5%, good in 55%, fair in 20%, and 20% of patients developed avascular necrosis, so no evaluation was performed. In group 2, the Harris Hip Score was 50% excellent, 45% good, and 5% of patients developed avascular necrosis, so no evaluation was performed. There was a significant correlation between group and performance on the Harris Hip

Score. Most Group 2 patients have excellent Harris Hip Score grades, whereas most Group 1 patients have good Harris Hip Score grades. According to a study by Londhe *et al*[16], HHS scores were excellent (61.3%), good (29%), and fair (9.7%) in the DHS group. On the other hand, CCS was excellent (25.8%), good (48.4%), fair (16.1%) and poor (9.7%). Another study by Patil *et al*.[71] HHS scores in the DHS group were excellent (75%), good (18.7%), fair (6.2%), and poor (0%), while in the MCCS group, the HHS score was excellent. (56.2%), good (25%) and bad (18.7%). The superior results were higher in the DHS group than in the CCS group, corroborating our findings.

In a study by Al-Kelabi *et al*. HHS scores for the MCS group were excellent (26.1%), good (39.1%), fair (8.7%) and poor (26.1%), whereas HHS scores for the DHS group were excellent (26.1%) and good (43.5%) was fair (8.7%), and poor (21.7%), with no statistically significant association between group and Harris hip score performance. This contrasts with the results of our study.

Avascular necrosis was the only complication in our study. In group 1, 20% of patients had avascular necrosis, whereas in group 2 only 5% of patients had avascular necrosis. The prevalence of avascular necrosis was higher in group 1, but no significant proportional difference was found between the two groups. The Patil *et al*.[15] study observed 6.25% DHS group AVN, 18.75% infections, and 6.25% nonunion. In contrast, in the MCCS group, AVN was observed in 18.75%, nonunion in 12.5%, screw backout in 12.5%, and varus in 12.5% of patients. The complication rate was higher in the cancellous screw group than in the DHS group. in Gupta *et al*. This study reported an AVN of 7.5% in the sliding femoral screw and 6.7% in the cancellous screw group, showing no significant difference between them, supporting the findings of our study.

A limitation of this study is that due to the small sample size, no complications such as screw reinsertion or non-union were observed, except for avascular necrosis. Despite the limitations, the results obtained in our study are comparable to the available literature. Randomized controlled trials comparing DHS with cancellous screw fixation in the treatment of femoral neck fractures are limited. Therefore, we suggest that more randomized controlled trials with large sample sizes and long-term follow-up will provide more detailed insight into the functional and clinical consequences of these two fixations.

CONCLUSION

In conclusion, the study compared the outcomes of femoral neck fractures treated with cannulated cancellous screws (Group 1) and dynamic hip screws (Group 2). Group 2 showed superior functional scores, fewer complications, and lower rates of avascular necrosis compared to Group 1. Despite limitations, this research contributes valuable insights into the treatment of intracapsular femoral neck fractures, suggesting that dynamic hip screws may be a more favorable option. Further randomized controlled trials with larger sample sizes are recommended for a comprehensive understanding of these fixation methods and their long-term effects.

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