e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2024; 16(4); 300-304

Original Research Article

A Study Comparing Cannulated Cancellous Screws (CCS) versus Dynamic Hip Screw (DHS) in Femoral Neck Fractures in Productive Age Group

Anand Kumar[1], Rakesh Kumar Pal[2], Arun Kumar[3]

[1]Senior Resident, Department of Orthopaedics, SKMCH, Muzaffarpur, Bihar, India

[2]Senior Resident, Department of Orthopaedics, SKMCH, Muzaffarpur, Bihar, India

[3]Associate Professor (Unit Head) Department of Orthopaedics, SKMCH, Muzaffarpur, Bihar, India

Received: 15-01-2024 / Revised: 24-02-2024 Accepted: 21-03-2024
Corresponding Author: Dr. Rakesh kumar Pal
Conflict of interest: Nil

Abstract

Aim: The aim of the present study was comparing cannulated cancellous screws (CCS) versus dynamic hip screw (DHS) in femoral neck fractures in productive age group.

Methods: This study was conducted in the Department of Orthopaedics, SKMCH, Muzaffarpur, Bihar, India. 100 cases satisfying the inclusion criteria admitted in SKMCH, Muzaffarpur, Bihar, India were included clinically and radiologically. 50 patients were operated with CCS and 50 with dynamic hip screw (DHS).

Results: Most of the patients belonged to the age group 41-60 years and there were more male as compared to females. Majority of the patients had duration of fracture ≤ 14 days in the present study. In age group, 20-40 years, satisfactory outcome was noted in 10 patients and 8 patients respectively in DHS group and CS group. In age group 41-60 years, total 26 patients of DHS group and 10 patients of CS group found with satisfactory outcome. In 20 male patients of DHS group and 7 male patients of CS group, outcome was satisfactory. Among female patients, outcome was satisfactory in 20 patients of DHS group while in 12 patients of CS group. In group ≤14 days duration of fracture, outcome was satisfactory in 19 (82.61%) patients and 9 (40.91%) patients of DHS group and CS group. In group >14 days duration of fracture, outcome was found satisfactory in 10 patients of DHS group while in 6 patients of CS group.

Conclusion: The present study showed that DHS group had significantly higher proportion of satisfactory outcome as compared to CS group in cases of femur neck fractures. Most of the patients were between 41-60 years of age but difference of satisfactory outcome between DHS group and CS group was not significant. Regarding male patients, significantly higher rate of satisfactory outcome was noted in DHS group as compared to CS group.

Keywords: cannulated cancellous screws, dynamic hip screw, femoral neck fractures

Introduction

Femoral neck fracture (FNF) is a common injury in orthopedics that has remained unresolved. In terms of economic burden, hip fracture is one of the 20 most expensive diagnoses in the United States, with approximately 20 billion dollars spent on its management, and it is estimated that there will be approximately 300,000 cases of hip fractures annually in the United States by the year 2030. [1] Several classification systems for the proper treatment of FNF have been introduced, and they include the Pauwels, Garden, and AO/OTA (Arbeitsgemeinschaft für Osteosynthesefragen/ Orthopaedic Trauma Association) classification systems. [2-4] In the Pauwels classification, FNFs are categorized into three grades according to fracture orientation based on degree of verticality. Pauwels grade I FNFs have fracture angles <30°, grade II FNFs have fracture angles between 30° and 50°, and grade III FNFs have fracture angles >50°. In this grading system, fractures with vertically oriented fracture lines are considered more unstable and have a higher associated risk of failure than horizontal fractures as they are affected by a greater shearing force. [5]

The dynamic hip screw (DHS) technique, which uses a fixed-angle device, and the cannulated cancellous screw (CCS) technique are the two main fixation techniques for FNFs. Several biomechanical studies compared the DHS and CCS techniques for vertically oriented FNFs (i.e., Pauwels types II and III FNFs) and reported a higher fixation strength with the DHS technique than with the CCS technique. This supports the notion that fractures with a higher "shear angle" are more unstable and

therefore have a higher rate of nonunion or other complications such as osteonecrosis of the femoral head (ONFH). [6,7]

Hip fractures are linked to a number of problems, such as hospital-acquired infections, avascular necrosis, non-union, metal work failure and death. [8] The significance of highly effective surgical treatments in order to reduce relevant complications of FNF is admanant. [9] FNF can be treated in a variety of ways. According to earlier research, implant failure is related to FNF that occur after surgery. [10] For patients who are not dislocated or who are young, multiple cannulated screws (CS) and dynamic hip screws (DHS) are frequently employed. In non-displaced intracapsular fractures, CS was frequently utilized because it has excellent biomedical features like anti-rotation and is less intrusive. [11] For the purpose of fracture fixation, DHS was able to retain the anatomical reduction and neck-shaft angle. [12]

The aim of the present study was compare cannulated cancellous screws (CCS) versus dynamic hip screw (DHS) in femoral neck fractures in productive age group.

Materials and Methods

This study was conducted in the Department of Orthopaedics, SKMCH, Muzaffarpur, Bihar, India. 100 cases satisfying the inclusion criteria admitted in SKMCH, Muzaffarpur, Bihar, India for one year were included clinically and radiologically. 50 patients were operated with CCS and 50 with dynamic hip screw (DHS). No specific criterion was taken into consideration for selection of patients and their respective implants. The follow up period was for a year, Patients were followed up at 2 weeks, 6 weeks, 3 months and 3 monthly till 1 year. Functional outcome was evaluated by using Harris hip scoring.

Exclusion criteria were pathological fracture patients, underage and overage (i.e.<18 and >60 years) patients were excluded from this study. All other patients after taking properly informed consent and in the age group of 20-60 years were included in this study.

After taking Ethical clearance from the institutional ethical committee all the patients selected for the study were examined according to protocol, associated injuries noted and clinical and laboratory investigations carried out in order to get fitness for surgery. Associated co-morbidities, mechanism of injury, duration of injury, time delay between injury and surgery were noted. The collected data was evaluated using appropriate statistical methods and presented in various tabular and graphical formats accordingly. MS Excel was used as statistics software to perform all the statistical analysis in this study.

Results

Table 1: Baseline characteristics

Age groups in years	CCS	DHS
20-40	15	17
41-60	35	33
Gender		
Male	26	27
Female	24	23
Duration of fracture		
≤ 14 days	38	37
>14 days	12	13

Most of the patients belonged to the age group 41-60 years and there were more male as compared to females. Majority of the patients had duration of fracture ≤ 14 days in the present study.

Table 2: Stratification of outcome in relation to age groups, gender and duration of fracture

Group	Outcome		Total	P value
	Satisfactory	Unsatisfactory		
Age group 20-40 years				
DHS	10	2	12	0.022
CS	8	12	20	
Age group 41-60 years				
DHS	26	10	36	0.080
CS	16	16	32	
Gender				
Male				
DHS	20	6	26	0.005

CS	7	20	27	
Female				
DHS	20	4	24	0.220
CS	12	11	23	
Duration of fracture				
≤14 days				
DHS	30	8	38	0.007
CS	10	27	37	
>14 days				
DHS	10	2	12	0.288
CS	6	7	13	

In age group, 20-40 years, satisfactory outcome was noted in 10 patients and 8 patients respectively in DHS group and CS group. In age group 41-60 years, total 26 patients of DHS group and 10 patients of CS group found with satisfactory outcome. In 20 male patients of DHS group and 7 male patients of CS group, outcome was satisfactory. Among female patients, outcome was satisfactory in 20 patients of DHS group while in 12 patients of CS group. In group ≤14 days duration of fracture, outcome was satisfactory in 19 (82.61%) patients and 9 (40.91%) patients of DHS group and CS group. In group >14 days duration of fracture, outcome was found satisfactory in 10 patients of DHS group while in 6 patients of CS group.

Discussion

Fracture healing in femoral neck is different from long bone fractures because of elongated position of femoral neck within capsule, its precarious blood supply and absence of cambium layer of periosteum and the fracture neck of femur heals without external callus formation. Also being intracapsular it is bathed in synovial fluid containing angiogenic inhibiting factors resulting in washing away of fracture hematoma. It is combination of all these factors which result in complications like non-union, segmental collapse and avascular necrosis of femoral head. There are other factors like severity of injury, amount of displacement, duration of injury and delay between injury and surgery, anatomical reduction, type of fixator, smoking etc which are important prognostic indicators. Garden classification is the most commonly used classification system for femoral neck fractures where the fractures are divided into 4 groups according to the degree of displacement and fracture fragments and it can be used as guidance for treatment options and surgical implants. [13]

In type I fracture the impaction allows a significant amount of stability at the fracture site and the union following the fixation with multiple cannulated screws is nearly 100%. [14,15] Most of the patients belonged to the age group 41-60 years and there were more male as compared to females. In study of Ahmad et al [16] total 90 patients of fracture of femur of neck were selected and age range was 15-55 years. Out of 90 patients, males were 83.3% while females were 16.7%. In another study by Niemann et al [17] total 31 patients with fracture of femur of neck were selected, 16 patients were females and rest were males and mean age was 62.81 ± 15.05 years.

Majority of the patients had duration of fracture ≤ 14 days in the present study. In age group, 20-40 years, satisfactory outcome was noted in 10 patients and 8 patients respectively in DHS group and CS group. In age group 41-60 years, total 26 patients of DHS group and 10 patients of CS group found with satisfactory outcome. In 20 male patients of DHS group and 7 male patients of CS group, outcome was satisfactory. Among female patients, outcome was satisfactory in 20 patients of DHS group while in 12 patients of CS group. In group ≤14 days duration of fracture, outcome was satisfactory in 19 (82.61%) patients and 9 (40.91%) patients of DHS group and CS group. In group >14 days duration of fracture, outcome was found satisfactory in 10 patients of DHS group while in 6 patients of CS group. In study Arfee et al [18] DHS was found to give superior results than CCS fixation in femoral neck fractures. Azhar Lakhani et al [19] showed excellent results in only 25.8% of CCS cases and 61.3% of DHS cases. In study of Singh et al [20] total 43 patients with fracture of neck of femur were recruited. In DHS Group outcome was satisfactory in 85.7% patients and in CCS Group was 59%. In study of Tolga et al [21] in DHS group and CCS group, outcome was satisfactory in 91% patients and 85% patients respectively. In study of Kumar et al [22] 40 patients of fracture of femur of neck were managed with Multiple Cannulated Screws, outcome was found satisfactory in 82.5% patients. In study of Carlos et al [23] total 96 patients of fracture of femur of neck managed with DHS, outcome was found satisfactory in 63% patients. In another study of Stephen et al [24] DHS group and CSS group, outcome was satisfactory in 75% and 70% patients respectively. In a study of Nitharwal et al [25], among the 30 patients of DHS group and 30 patients of CS group, satisfactory outcome was noted in 86.66% patients and 83.33% patients. So DHS group has slightly higher proportion of satisfactory outcome than CS group.

Conclusion

The present study showed that DHS group had significantly higher proportion of satisfactory outcome as compared to CS group in cases of femur neck fractures. Most of the patients were between 41-60 years of age but difference of satisfactory outcome between DHS group and CS group was not significant. Regarding male patients, significantly higher rate of satisfactory outcome was noted in DHS group as compared to CS group.

References

1. Kazley J., Bagchi K. StatPearls. StatPearls Publishing; Treasure Island, FL, USA: 2020. Femoral Neck Fractures.
2. Bartonícek J. Pauwels' classification of femoral neck fractures: correct interpretation of the original. Journal of orthopaedic trauma. 2001 Jun 1;15(5):358-60.
3. Meinberg EG, Agel J, Roberts CS, Karam MD, Kellam JF. Fracture and dislocation classification compendium—2018. Journal of orthopaedic trauma. 2018 Jan 1;32:S1-0.
4. Pauwels F. Gesammelte abhandlungen zur funktionellen anatomie des bewegung sapparates. Springer-Verlag; 2013 Nov 9.
5. Singh M, Sonkar D, Verma R, Shukla J, Gaur S. Comparison of the functional outcome of DHS versus cannulated cancellous screws in pauwels type II and III fracture neck femur in young adults. Int. J. Orthop. Sci. 2017;3:745-9.
6. Aminian A, Gao F, Fedoriw WW, Zhang LQ, Kalainov DM, Merk BR. Vertically oriented femoral neck fractures: mechanical analysis of four fixation techniques. Journal of orthopaedic trauma. 2007 Sep 1;21(8):544-8.
7. Baitner AC, Maurer SG, Hickey DG, Jazrawi LM, Kummer FJ, Jamal J, Goldman S, Koval KJ. Vertical shear fractures of the femoral neck a biomechanical study. Clinical Orthopaedics and Related Research®. 1999 Oct 1;367:300-5
8. Li L, Zhao X, Yang X, Tang X, Liu M. Dynamic hip screws versus cannulated screws for femoral neck fractures: a systematic review and meta-analysis. Journal of Orthopaedic Surgery and Research. 2020 Dec;15:1-9.
9. Cullen SE, Sephton B, Malik I, Aldarragi A, Crossdale M, O'Connor M. A comparative study of dynamic hip screw versus multiple cannulated compression screw fixation in undisplaced intracapsular neck of femur fractures. Cureus. 2022 Nov;14(11).
10. Tai TW, Lien FC, Lee PY, Jou IM, Lin CJ, Huang YH. Using a cannulated screw as a drill guide and sleeve: a simple technique for multiple-screw fixation for intracapsular femoral neck fracture. Orthopedics. 2010 Aug 11;33(8).
11. Zhang LL, Zhang Y, Ma X, Liu Y. Multiple cannulated screws vs. dynamic hip screws for femoral neck fractures: A meta-analysis. Der Orthopade. 2017 Nov 1;46(11):954-62.
12. Brandt E, Verdonschot N, Van Vugt A, Van Kampen A. Biomechanical analysis of the sliding hip screw, cannulated screws and Targon® FN in intracapsular hip fractures in cadaver femora. Injury. 2011 Feb 1;42(2):183-7.
13. Garden RS. Low-angle fixation in fractures of the femoral neck. J Bone Joint Surg. 1961; 43B:647-63.
14. Luice RS, Fuller, Stephen, Burdick DC, Johnston RM. Early prediction of avascular necrosis of the femoral head following femoral neck fractures. Clinic Orthopaed. 1981;16:207-14.
15. Parker MJ, Banajee A. Surgical approaches and ancillary techniques for internal fixation of intracapsular proximal femoral fractures. Cochrane Database Syst Rev. 2005;18:2.
16. Ahmad T, Khan AS, Ali W, Ahmed W, Younas M, Shah L. Radiological Outcome of Fracture of Neck of Femur Treated with Two versus Three Cannulated Screws Fixation in Adults. PJMHS. 2022;16(03):1181-83
17. Niemann M, Braun KF, Ahmad SS, Stöckle U, Märdian S, Graef F. Comparing perioperative outcome measures of the dynamic hip screw and the femoral neck system. Medicina. 2022 Feb 26;58(3):352.
18. Arfee S, Arfee A, Arfee AA. Cannulated cancellous screws versus dynamic hip screw in femoral neck fractures: a comparison in productive age group at tertiary care hospital of North India. Int J Res Orthop 2021;7:44-7.
19. Lakhani AA, Mahajan N, Sonawane DV. A Comparative Study of the Management Of Fracture Neck Femur By Dynamic Hip Compression Screw With Derotation Screw Versus Three Cancellous Screws. J Medic Thes. 2014;2:5-8.
20. Singh M, Sonkar D, Verma R, Shukla J, Gaur S. Comparison of the functional outcome of DHS versus cannulated cancellous screws in pauwels type II and III fracture neck femur in young adults. Int. J. Orthop. Sci. 2017;3:745-9.
21. Tolga Kaplan, Akesen B, Demirağ B, Bilgen S, Durak K. 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; 18(1):65-70.
22. S Kumar, D Bagchi. Fractures Of The Neck Of The Femur- Treated With Multiple Cannulated Screws In Younger Patients –A Study Of 40 Cases. The Internet Journal of Orthopedic Surgery. 2009; 18(1).
23. Carlos Roberto Schwartsmann, Lucas Senger Jacobus, Leandro de Freitas Spinelli, Leonardo Carbonera Boschin, Ramiro Zilles Gonçalves,

Anthony Kerbes Yépez, Rodrigo Py Gonçalves Barreto, and Marcelo Faria Silva Dynamic Hip Screw for the Treatment of Femoral Neck Fractures: A Prospective Study with 96 Patients ISRN Orthopedics, Article ID 257871, 2014, 7.
24. Stephen T. Gardner, Michael J. Weaver, Sett Jerabek, Edward Rodriguez, Mark Varhas, Mitchell B. Harris. Predictors of early failure in young patients with displaced femoral neck fractures. The Harvard Orthopaedic Journal. 20 13, 15.
25. Nitharwal ML, Kumar S, Harshwal RK, Jain MP, Mehra AK. A Prospective comparative study of outcome of surgical management of basicervical fractures of femur with dynamic hip screw (DHS) with derotation screw and multiple cannulated cancellous (CC) screw. International Journal of Contemporary Medical Research 2016;3(7):2119-2122.