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Original Research Article

Evaluation of Radiological and Functional Outcomes of Femoral Neck Fractures Treated with Cannulated Cancellous Screws: An Observational Study

Muniraj Meena[1], Seema Meena[2], Pradeep Khinchi[3], Harish Kumar Jain[4]

[1]MS (Orthopaedics), Assistant Professor, Department of Orthopaedics, Jhalawar Medical College, Jhalawar (Raj.) India

[2]MD Paediatric, Assistant Professor, Department of Paediatrics, Jhalawar Medical College, Jhalawar (Raj.) India

[3]MS (Orthopaedics), Assistant Professor, Department of Orthopaedics, JLN Medical College Ajmer (Raj.)

[4]Senior Professor and HOD Department of Orthopaedics, Jhalawar Medical College, Jhalawar (Raj.) India

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Corresponding author: Dr. Muniraj Meena

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Abstract

Background: Fracture neck of femur is a common orthopaedic injury and remains difficult to manage because of the risk of complications such as non-union and avascular necrosis. These fractures are frequently associated with high-energy trauma in younger adults. Cannulated cancellous screw fixation is widely used for internal fixation as it allows stable fixation and preservation of the femoral head. Objective- To evaluate the radiological and functional outcomes of fracture neck of femur treated with cannulated cancellous screws.

Materials and Methods: This prospective hospital-based observational study was conducted in the Department of Orthopaedics in Rajasthan from August 2020 to May 2022. A total of 25 patients aged 18–60 years with fracture neck of femur were included. All patients underwent closed reduction and internal fixation using three cannulated cancellous screws under fluoroscopic guidance, and were followed for eight months. Functional outcome was assessed using the Harris Hip Score at 24 weeks.

Results: Most patients were in the 31–40 years age group (36%) and males constituted 64% of the study population. Road traffic accidents were the most common mode of injury (52%). Transcervical fractures were the most frequent anatomical type (56%) and Garden Type II fractures were the most common (44%). Fracture union was observed most commonly at 12 weeks (40%) with an average union time of 16 weeks. Functional outcome at 24 weeks showed excellent results in 72% of patients, good in 12%, fair in 8%, and poor in 8%. Most patients were able to ambulate without support (88%).

Conclusion: Cannulated cancellous screw fixation provides satisfactory radiological union and functional outcome in fracture neck of femur.

Keywords: Femoral Neck Fracture; Cannulated Cancellous Screws; Internal Fixation; Fracture Union; Functional Outcome.

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Introduction

Femoral neck fracture (FNF) is a common injury encountered in orthopaedic practice and represents a significant public health concern, accounting for nearly 50% of all hip fractures. [1] These fractures are particularly challenging to manage because of the unique anatomical and biological characteristics of the femoral neck. The femoral head receives a relatively tenuous blood supply, and the intra-synovial location of the fracture creates an unfavorable biological environment for healing. Biomechanical factors further complicate management, as many femoral neck fractures in younger individuals are associated with high Pauwels angle patterns that generate substantial shear forces across the fracture site and increase the risk of complications such as non-union and avascular necrosis. [2] The management of femoral neck fractures in young adults remains challenging because of the higher incidence of complications and the absence of strong prospective clinical

evidence guiding treatment decisions. [3] Young and active individuals are generally not ideal candidates for arthroplasty, as preservation of the native hip joint is essential for maintaining long-term function and activity levels. [4] Therefore, internal fixation aimed at achieving anatomical reduction and stable fixation remains the preferred treatment approach.

Early surgical intervention has traditionally been recommended to improve outcomes. Many surgeons advocate reduction and fixation within 24 hours of injury, while some studies suggest that fixation within 6 hours. [5] Early treatment has also been associated with fewer inpatient medical and surgical adverse events. [6] However, surgical delay may sometimes occur due to associated injuries or comorbid conditions. Emergency reduction and fixation are believed to decrease vascular insult and potentially reduce the risk of avascular necrosis. [7] Some studies have shown that delays of more than 48 hours do not significantly influence the incidence of avascular necrosis but may increase the probability of non-union. [8,9] Although high-level evidence regarding the optimal timing of surgery is limited, most orthopaedic surgeons favor operative fixation within the first 24 hours following injury. In addition to timing, the quality of fracture reduction has been emphasized as a critical factor influencing outcomes. [10]

Treatment recommendations for femoral neck fractures depend on both patient age and fracture characteristics. [11] Various fixation methods have been described to achieve anatomical reduction and stable fixation, including compression screws, locked plates, dynamic condylar screws, and sliding hip screws. [12-14] Despite advancements in fixation techniques, complications such as non-union and fixation failure continue to occur, with reported rates ranging from 10% to 30%. [15]

Fixation with three cannulated cancellous screws (CCS) has remained a widely accepted method for the management of femoral neck fractures. [16,17] This technique provides stable fixation with minimal soft-tissue disruption and helps preserve the femoral head. However, debate continues regarding the optimal configuration of screws and the long-term functional outcomes associated with this method. [18,19]

Therefore, the present study was conducted to analyze the radiological and functional outcome of fracture neck of femur treated with cannulated cancellous screws.

Materials and Methods

The present study was a prospective, hospital-based observational study conducted in the Department of Orthopaedics at, Rajasthan, India. The study was carried out over a period from August 2020 to May 2022. Patients admitted to the orthopaedic ward of SRG Hospital during the study period and fulfilling the inclusion criteria were enrolled in the study. We have included 25 patients diagnosed with fracture neck of femur who underwent surgical fixation with cannulated cancellous screws.

Patients aged between 18 and 60 years with fracture neck of femur of less than three weeks duration and without associated fractures were included in the study. All types of femoral neck fractures (Garden types I–IV) were considered for inclusion. Patients with pathological fracture neck femur, open fractures, injuries older than three weeks, or any other associated bony injury in the ipsilateral limb were excluded from the study.

All patients underwent closed reduction and internal fixation using cannulated cancellous screws under fluoroscopic guidance. Reduction was attempted using standard closed reduction techniques such as the Leadbetter and Whitman methods. A satisfactory reduction was considered when the medial cortex of the femoral neck provided adequate support to the femoral head fragment with acceptable alignment on both anteroposterior and lateral radiographs. Varus malalignment was considered unacceptable. Reduction quality was assessed using the Garden alignment index, and an alignment within 155° to 180° on both anteroposterior and lateral views was considered acceptable.

Following satisfactory reduction, fixation was performed with three 6.5-mm cannulated cancellous screws inserted over guidewires in a parallel configuration under image intensifier control. Guidewires were positioned to obtain appropriate cortical support in the femoral neck while avoiding penetration of the articular surface. Screw length was measured using a depth gauge and selected approximately 5 mm shorter than the guidewire length before insertion.

Postoperatively, patients received intravenous antibiotics for three days followed by oral antibiotics as required. Analgesics were administered according to patient need. Quadriceps strengthening exercises were initiated from the first postoperative day within pain tolerance.

Patients were discharged with instructions for non-weight-bearing ambulation and regular physiotherapy. Sutures were removed at two weeks. Partial weight bearing was allowed after 6–8 weeks depending on clinical and radiological evaluation, and full weight bearing was permitted once radiological union was achieved.

Patients were followed regularly every two weeks for the first month and subsequently every four weeks up to eight months. Radiological union and

complications such as infection, screw pullout, non-union, avascular necrosis, and screw penetration were recorded. Functional outcome was assessed using the Harris Hip Score at 24 weeks.

Statistical Analysis: The collected data were compiled and entered into Microsoft Excel and analyzed using appropriate descriptive statistical methods. Continuous variables such as age and time of union were expressed as mean values where applicable, while categorical variables were presented as frequencies and percentages. Descriptive statistics were used to summarize demographic characteristics, fracture patterns, timing of surgery, radiological union, functional outcomes, and postoperative complications. The functional outcome was assessed using the Harris Hip Score at 24 weeks and categorized into excellent, good, fair, and poor outcomes based on standard scoring criteria. The results were presented in the form of tables and figures to facilitate interpretation of radiological and functional outcomes following fixation of fracture neck of femur with cannulated cancellous screws.

Results

[Table 1] In the present study, most patients were in the 31–40 years age group (36%), followed by 41–50 years (32%). Males constituted the majority of cases (64%). Road traffic accidents were the most common mode of injury (52%), followed by slip and fall (40%). The right side was more frequently affected (56%) compared to the left side (44%).

[Table 2] In the present study, the most common anatomical type of fracture was transcervical fracture, observed in 14 patients (56%), and followed by subcapital fractures in 8 patients (32%) and basicervical fractures in 3 patients (12%). According to Garden classification, the majority of patients had Garden Type II fractures (44%), followed by Garden Type III fractures (32%), Garden Type IV fractures (16%), and Garden Type I fractures (8%).

[Table 3] In the present study, the majority of patients underwent surgery within 12–24 hours of injury (72%), while 20% were operated within 12 hours and 8% after 24 hours. Regarding fracture union, most patients achieved union at 12 weeks (40%), followed by 20 weeks (24%) and 16 weeks (20%). Two patients (8%) showed union at 24 weeks, while non-union was observed in 2 patients (8%) up to 28 weeks of follow-up.

[Table 4] In the present study, most patients reported occasional pain at 24 weeks (52%), while 28% had no pain. The majority of patients were able to walk without support (88%) and climb stairs without assistance (80%). Functional outcome assessment at 24 weeks showed excellent results in 72% of patients, while good, fair, and poor outcomes were observed in 12%, 8%, and 8% of patients respectively. [Figure- 1] In the present study, most patients did not develop any complications (84%). Superficial infection was observed in 1 patient (4%), while 1 patient (4%) had superficial infection with screw pullout. Screw pullout associated with non-union was observed in 2 patients (8%).

Table 1: Demographic and Injury Characteristics of Study Population (n = 25)

Variable	Category	Number (n)	Percentage (%)
Age (years)	18–30	5	20
	31–40	9	36
	41–50	8	32
	51–60	3	12
Sex	Male	16	64
	Female	9	36
Mode of Injury	Road traffic accident	13	52
	Slip and fall	10	40
	Fall from height	2	8
Side Affected	Right	14	56
	Left	11	44

Table 2: Anatomical and Garden Classification of Femoral Neck Fractures (n = 25)

Variable	Category	Number (n)	Percentage (%)
Anatomical Classification	Transcervical	14	56
	Subcapital	8	32
	Basicervical	3	12
Garden Classification	Garden Type I	2	8
	Garden Type II	11	44
	Garden Type III	8	32
	Garden Type IV	4	16

Table 3: Timing of Surgery and Time of Fracture Union (n = 25)

Variable	Category	Number (n)	Percentage (%)
Time of Surgery	< 12 hours	5	20
	12–24 hours	18	72
	> 24 hours	2	8
Time of Union	12 weeks	10	40
	16 weeks	5	20
	20 weeks	6	24
	24 weeks	2	8
	Non-union till 28 weeks	2	8

Table 4: Functional Outcome Parameters at 24 Weeks (n = 25)

At 24 weeks	Category	Number (n)	Percentage (%)
Pain	No pain	7	28
	Occasional pain	13	52
	Mild pain	4	16
	Moderate pain	1	4
Ambulation	Without support	22	88
	With support	3	12
Stair Climbing	Without support	20	80
	Using railing	4	16
	Unable to climb stairs	1	4
Functional Outcome	Excellent	18	72
	Good	3	12
	Fair	2	8
	Poor	2	8

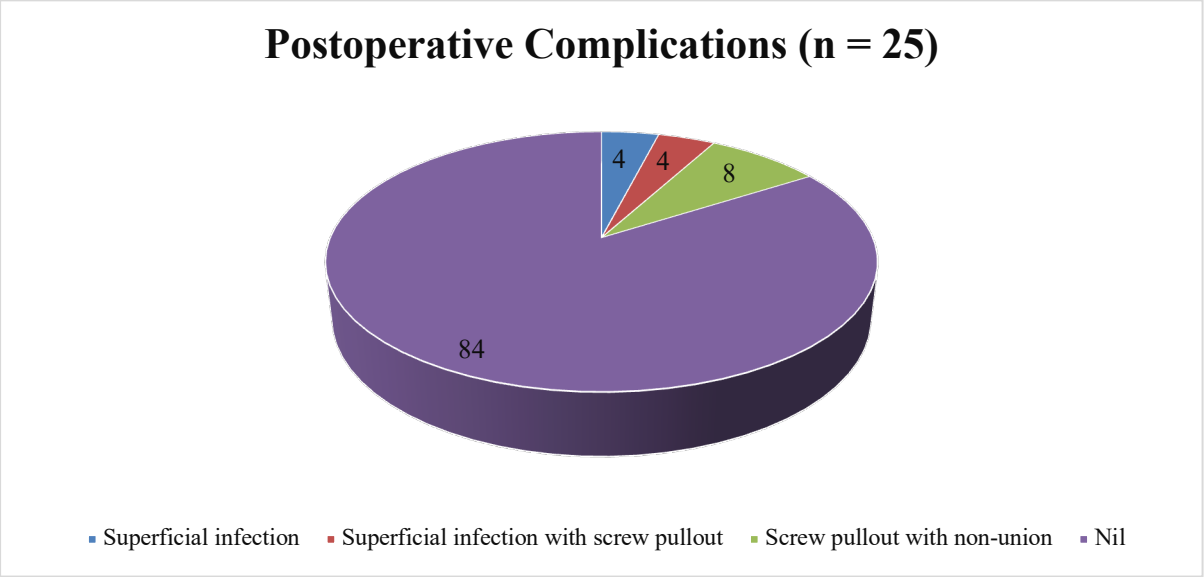

Figure 1: Distribution of Postoperative Complications (n = 25)

Discussion

Fracture neck of femur is a common orthopaedic injury and its management continues to be challenging due to the risk of complications such as non-union and avascular necrosis of the femoral head. These fractures in younger adults are usually associated with high-energy trauma such as road traffic accidents. Over the years, the treatment of femoral neck fractures has evolved considerably. Earlier methods such as closed reduction and immobilization using hip spica cast (Whitman abduction plaster) were associated with high rates of complications including non-union, avascular necrosis, bed sores, and respiratory problems. These limitations led to the development of various methods of internal fixation.

With advancements in implant design and surgical techniques, cannulated cancellous screws have become a widely accepted method of fixation for femoral neck fractures in adults. In the present

study, fractures were more commonly observed in patients aged 31–50 years, accounting for 68% of cases. These findings are comparable with the study conducted by Abhimanyu Singh et al [20], in which the majority of cases (66%) belonged to the 31–50 years age group. This indicates that femoral neck fractures in adults are commonly seen in the economically productive age group, often due to high-energy trauma.

Males constituted majority of patients in the present study (64%). This finding is comparable with the studies conducted by Christopher Koo Chee Han et al [21] and Vijay V et al [22], which also reported male predominance with 73% and 72% of cases respectively. The higher incidence among males may be attributed to increased outdoor activities and greater exposure to high-energy trauma.

Road traffic accidents were the most common cause in the present study in 52% of cases, followed by falls in 48% of cases. These findings are comparable with the study by Abhimanyu Singh et al [20], in which road traffic accidents accounted for 70% of cases and falls for 30%. This suggests that high-energy trauma remains an important cause of femoral neck fractures in younger adults.

Garden's classification was used for operative evaluation of fracture patterns in the present study. The most common type of fracture was Garden Type II in 44% of cases, followed by Garden Type III fractures in 32% of patients. These findings are similar to the study conducted by Abhimanyu Singh et al [20], where Garden Type II fractures constituted the majority in 50% of cases.

The functional outcome in the present study was assessed using the Harris Hip Score at 24 weeks of follow-up, reported excellent outcomes in 72% of patients, good outcomes in 12%, fair outcomes in 8%, and poor outcomes in 8% of patients. These findings are comparable with the study by Vijay V et al [22], which reported excellent outcomes in 72% of patients, good outcomes in 16%, fair outcomes in 8%, and poor outcomes in 4% of cases. This suggests that fixation with cannulated cancellous screws can provide satisfactory functional recovery in the majority of patients.

The average duration of fracture union in the present study was approximately 16 weeks. Most patients achieved radiological union at 12 weeks (40%). Two patients showed non-union at 28 weeks. These findings are comparable with the study by Abhimanyu Singh et al [20], in which the majority of patients (56.66%) achieved union within 12 weeks.

Early fracture union may be attributed to stable fixation and proper reduction achieved during surgery. The time interval between injury and surgical intervention is considered an important factor influencing fracture healing. In the present study, most patients (72%) were operated within 12–24 hours of injury. Among patients who underwent surgery within 24 hours, no cases of non-union were observed, whereas two cases of non-union were seen in patients who were operated after 24 hours. This observation suggests that early surgical fixation may contribute to improved fracture healing and reduced complications.

Postoperative complications observed in the present study included superficial infection and screw pullout. Superficial infection was observed in 2 patients (8%) and was managed with debridement and appropriate antibiotic therapy based on culture sensitivity. Screw pullout was observed in 3 patients (12%), which was comparable with the study conducted by Abhimanyu Singh et al [20], where screw back-out was reported in 13.33% of cases. Non-union was observed in 2 patients (8%), which is comparable with the study by Vijay V et al [22], where non-union was reported in 4% of cases.

In cases with screw pullout and delayed union, appropriate secondary procedures were performed. One patient underwent screw removal after signs of union were observed at 24 weeks. In two patients where union was not achieved by 28 weeks, further management included valgus osteotomy with fixation using double angle dynamic hip screw in one case and hemiarthroplasty in another case.

Overall, most patients in the present study were able to return to their daily activities with minimal discomfort following fixation with cannulated cancellous screws. Further studies with larger sample sizes and longer follow-up periods are recommended to evaluate long-term functional outcomes and complications associated with this method of fixation.

Conclusion

Based on findings of the study, fixation of fracture neck of femur using cannulated cancellous screws provided satisfactory radiological and functional outcomes in the majority of patients. Most patients achieved fracture union within 12–20 weeks and demonstrated good functional recovery at 24 weeks, with a large proportion of patients able to ambulate and climb stairs without support. The overall functional outcome assessed using the Harris Hip Score was excellent or good in the majority of cases.

The complication rate was relatively low, with only a small proportion of patients developing superficial infection, screw pullout, or non-union. Thus, cannulated cancellous screw fixation is an effective method for the management of fracture

neck of femur in adult patients, providing stable fixation, satisfactory fracture union, and good functional recovery when appropriate surgical technique and postoperative rehabilitation are followed.

Bibliography

1. Medda S, Snoap T, Carroll EA. Treatment of young femoral neck fractures. J Orthop Trauma. 2019;33 Suppl 1:S1-S6.
2. Robinson CM, McQueen MM, Christie J. Hip fractures in adults younger than 50 years of age: epidemiology and results. Clin Orthop Relat Res. 1995;(312):238-246.
3. Collinge CA, Mir H, Reddix R. Fracture morphology of high shear angle "vertical" femoral neck fractures in young adult patients. J Orthop Trauma. 2014;28(5):270-275.
4. Manninger J, Kazár G, Fekete G, Fekete K, Frenyo S, Gyarfas F, et al. Significance of urgent (within 6 h) internal fixation in the management of fractures of the neck of the femur. Injury. 1989;20(2):101-105.
5. Samuel AM, Russo GS, Lukasiewicz AM, Webb ML, Bohl DD, Basques BA, et al. Surgical treatment of femoral neck fractures after 24 hours in patients between the ages of 18 and 49 is associated with poor inpatient outcomes: an analysis of 1361 patients in the National Trauma Data Bank. J Orthop Trauma. 2016;30(2):89-94.
6. Kregor PJ. The effect of femoral neck fractures on femoral head blood flow. Orthopedics. 1996;19(12):1031-1036.
7. Upadhyay A, Jain P, Mishra P, Maini L, Gautum VK, Dhaon BK. Delayed internal fixation of fractures of the neck of the femur in young adults: a prospective, randomised study comparing closed and open reduction. J Bone Joint Surg Br. 2004;86(7):1035-1040.
8. Papakostidis C, Panagiotopoulos A, Piccioli A, Giannoudis PV. Timing of internal fixation of femoral neck fractures: a systematic review and meta-analysis of the final outcome. Injury. 2015;46(3):459-466.
9. Slobogean GP, Sprague SA, Scott T, McKee M, Bhandari M. Management of young femoral neck fractures: is there a consensus? Injury. 2015;46(3):435-440.
10. Lowe JA, Crist BD, Bhandari M, Ferguson TA. Optimal treatment of femoral neck fractures according to patient's physiologic age: an evidence-based review. Orthop Clin North Am. 2010;41(2):157-166.
11. Schmidt AH, Asnis SE, Haidukewych GI, Koval KJ, Thorngren KG. Femoral neck fractures. Instr Course Lect. 2005;54:417-445.
12. Ly TV, Swiontkowski MF. Management of femoral neck fractures in young adults. Instr Course Lect. 2009;58:69-81.
13. Swiontkowski MF. Current concepts review: intracapsular fractures of the hip. J Bone Joint Surg Am. 1994;76(1):129-138.
14. Estrada LS, Volgas DA, Stannard JP, Alonso JE. Fixation failure in femoral neck fractures. Clin Orthop Relat Res. 2002;(399):110-118.
15. Selvan VT, Oakley MJ, Rangan A, Al-Lami MK. Optimum configuration of cannulated hip screws for the fixation of intracapsular hip fractures: a biomechanical study. Injury. 2004;35(2):136-141.
16. Yang JJ, Lin LC, Chao KH, et al. Risk factors for nonunion in patients with intracapsular femoral neck fractures treated with three cannulated screws placed in either a triangle or an inverted triangle configuration. J Bone Joint Surg Am. 2013;95(1):61-69.
17. Jamil W, Allami M, Choudhury MZ, Mann C, Bagga T, Roberts A. Do orthopaedic surgeons need a policy on the removal of metalwork? A descriptive national survey of practicing surgeons in the United Kingdom. Injury. 2008;39(3):362-367.
18. Hanson B, van der Werken C, Stengel D. Surgeons' beliefs and perceptions about removal of orthopaedic implants. BMC Musculoskelet Disord. 2008;9:73.
19. Hafez MA, Templeton PA. Subtrochanteric femoral fracture following removal of screw for slipped capital femoral epiphysis. Injury. 2004;35(9):953.
20. Abhimanyu S, Nagakumar JS. A study on the functional outcome of fracture neck of femur managed with cannulated screw. Int J Orthop Sci. 2019;5(1):318-323.
21. Khoo C, Haseeb A, Singh VA. Cannulated screw fixation for femoral neck fractures: a 5-year experience in a single institution. Malays Orthop J. 2014;8(2):14-21.
22. Vijay V, Srivastava NCannulated cancellous screws fixation in intracapsular fracture neck femur: a study with an emphasis on result of osteosynthesis. Int J Res Orthop 2016;2:181-8.