

FUNCTIONAL AND RADIOLOGICAL OUTCOMES OF CANNULATED CANCELLOUS SCREW FIXATION VERSUS FEMORAL NECK SYSTEM FOR FEMORAL NECK FRACTURES – AN OBSERVATIONAL STUDY

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ABSTRACT

Background: Femoral neck fractures are associated with complications such as non-union, fixation failure, femoral neck shortening, and poor functional outcomes. Stable internal fixation is the preferred treatment in younger adults. The Femoral Neck System (FNS) has recently been introduced to improve biomechanical stability compared with conventional Cannulated Cancellous Screws (CCS).

Aim: To compare the functional and radiological outcomes of femoral neck fractures treated with CCS and FNS.

Materials and Methods: A prospective observational comparative study was conducted on 30 patients (15 CCS and 15 FNS) aged 18–50 years. Patients were followed for six months. Functional outcome was assessed using the Harris Hip Score (HHS), while radiological healing was evaluated using the Radiographic Union Score for Hip (RUSH). Time to union and postoperative complications were compared.

Results: The FNS group achieved significantly earlier fracture union (14 vs. 16 weeks; $p=0.03$), higher Harris Hip Scores ($p=0.04$), better radiological healing, and fewer implant-related complications than the CCS group.

Conclusion: Both implants produced satisfactory outcomes; however, the Femoral Neck System demonstrated superior functional recovery, earlier fracture union, improved radiological healing, and fewer complications.

KEYWORDS: Femoral neck fracture, Femoral Neck System, Cannulated cancellous screw, Harris Hip Score, RUSH score.

INTRODUCTION

Femoral neck fractures remain one of the most challenging injuries in orthopaedic trauma because of their high risk of non-union, avascular necrosis, fixation failure, and femoral neck shortening (1). In younger adults, preservation of the native femoral head through anatomical reduction and stable internal fixation remains the preferred treatment (2).

Cannulated cancellous screw fixation has long been considered the standard method because it is minimally invasive and provides satisfactory compression across the fracture site. However, its limited resistance to rotational and shear forces may result in fixation failure, particularly in displaced fractures (3). The Femoral Neck System is a fixed-angle implant designed to improve biomechanical stability while allowing controlled fracture compression (4).

Recent studies have demonstrated superior radiological and functional outcomes with the Femoral Neck System compared with cannulated cancellous screws (5–7). Therefore, the present study compared the functional and radiological outcomes of both fixation methods using Harris Hip Score, Radiographic Union Score for Hip (RUSH), fracture union time, and postoperative complications.

MATERIALS AND METHODS

A prospective observational comparative study was conducted in the Department of Orthopaedics, Sree Balaji Medical College and Hospital, Chennai, over an 18-month period. Thirty patients aged 18–50 years with intracapsular femoral neck fractures were included and equally divided into CCS ($n=15$) and FNS ($n=15$) groups.

Patients with pathological fractures, previous hip surgery, severe osteoporosis, delayed presentation (>48 hours), or neurological disorders were excluded. Demographic details, mechanism of injury, fracture classification, and operative details were recorded.

Closed reduction under fluoroscopic guidance was followed by fixation using either CCS or FNS. A standardized postoperative rehabilitation protocol was followed.

Patients were reviewed at 6 weeks, 3 months, and 6 months. Functional outcome was assessed using the Harris Hip Score (HHS), radiological healing using the RUSH score, and fracture union time and complications were recorded. Statistical analysis was performed using the independent t-test and Chi-square test, with $p < 0.05$ considered statistically significant.

RESULTS

A total of 30 patients completed the study. Baseline demographic characteristics were comparable between the two groups.

Table 1. Baseline Characteristics

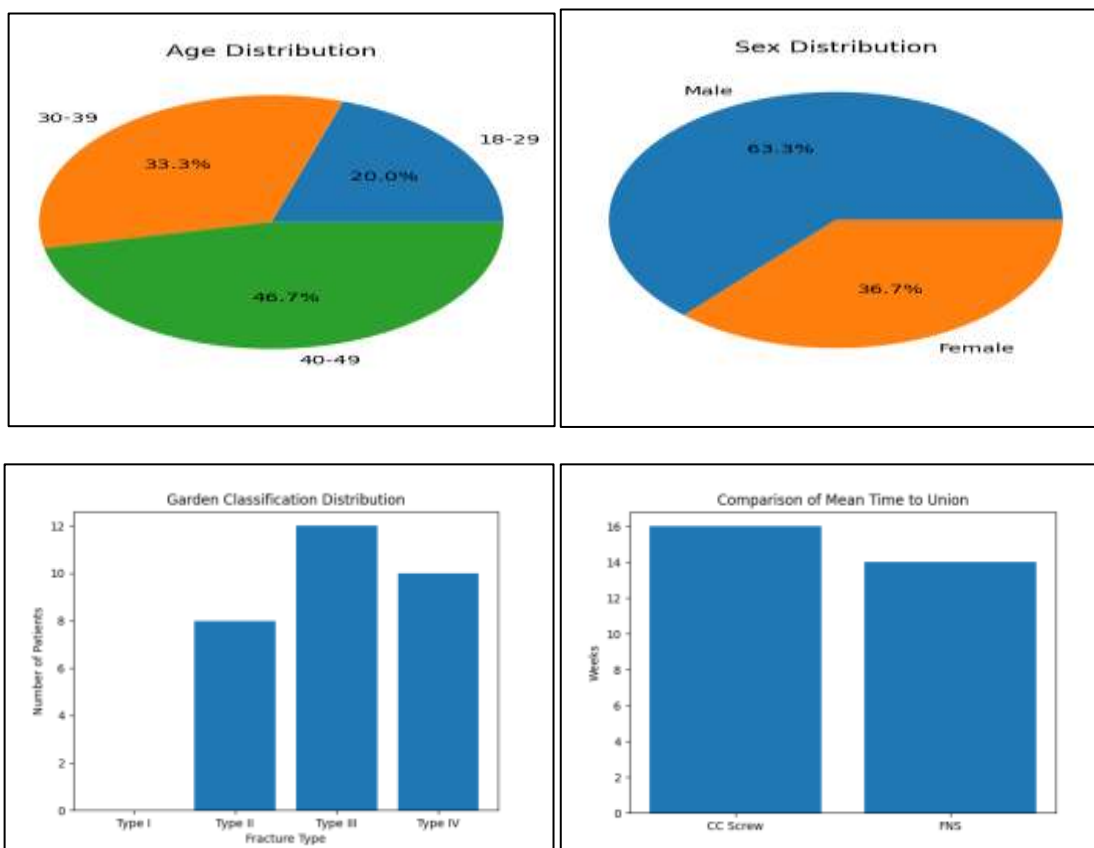
Variable	CCS (n=15)	FNS (n=15)	p-value
Mean age (years)	36.4 ± 8.2	34.8 ± 7.9	0.56
Male	11	12	0.67
Female	4	3	
Road Traffic Accident	5	4	0.69
Fall	10	11	
Garden II	2	3	0.81
Garden III	7	6	
Garden IV	6	6	

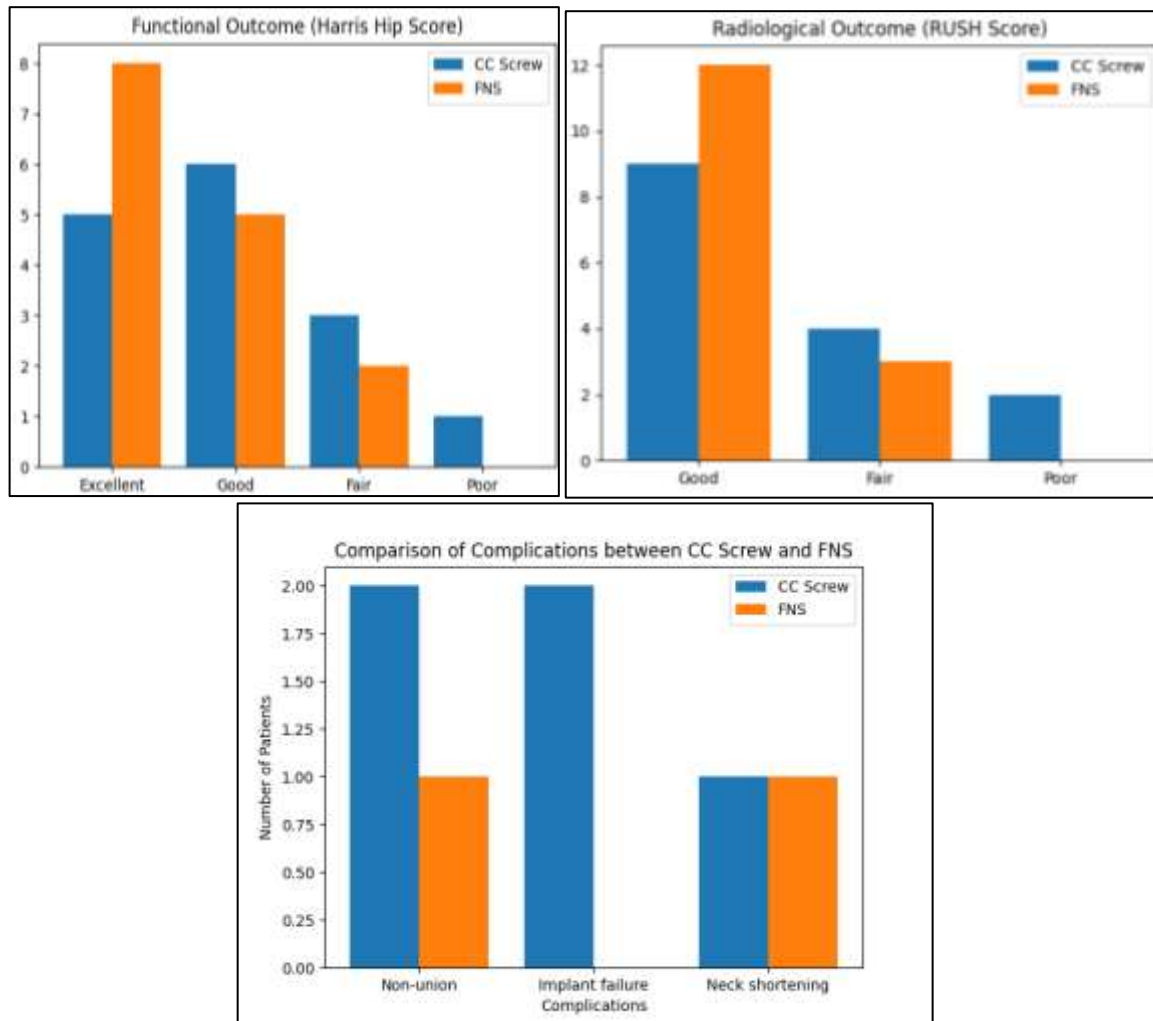
Table 2. Functional and Radiological Outcomes

Outcome	CCS	FNS	p-value
Union time (weeks)	16.0 ± 2.1	14.0 ± 1.8	0.03
Mean RUSH score	24.1 ± 2.4	27.0 ± 1.8	0.02
Excellent HHS	5	8	
Good HHS	6	5	
Fair HHS	3	2	
Poor HHS	1	0	0.04

Table 3. Postoperative Complications

Complication	CCS	FNS
Non-union	2	1
Implant failure	2	0
Femoral neck shortening	1	1
Total complications	5	2





The Femoral Neck System achieved significantly earlier fracture union, higher functional scores, better radiological healing, and fewer postoperative complications compared with cannulated cancellous screw fixation.

DISCUSSION

The management of intracapsular femoral neck fractures remains a significant challenge in orthopaedic practice because of the unique vascular anatomy of the femoral head and the high risk of complications such as non-union, avascular necrosis, femoral neck shortening, and implant failure. The primary objective of treatment in young adults is preservation of the native femoral head through anatomical reduction and stable internal fixation. Although cannulated cancellous screw (CCS) fixation has traditionally been considered the standard treatment, the Femoral Neck System (FNS) has emerged as a promising alternative because of its superior biomechanical stability and angular fixation. The present study compared the functional and radiological outcomes of these two fixation methods in patients with intracapsular femoral neck fractures.

In the present study, fracture union was achieved in both groups; however, patients treated with the Femoral Neck System demonstrated significantly earlier fracture union than those treated with cannulated cancellous screws (14 weeks versus 16 weeks, $p=0.03$). The earlier union observed with FNS may be attributed to its fixed-angle construct, improved rotational stability, and controlled dynamic compression, which reduce micromotion at the fracture site and promote biological healing. These findings are comparable with those reported by Jiang et al. (5) and Zhou et al. (6), who demonstrated significantly faster fracture healing and lower fixation failure rates with the Femoral Neck System. Similarly, Wang et al. (1) reported that FNS provided superior mechanical stability and improved fracture union compared with conventional screw fixation.

Functional recovery assessed using the Harris Hip Score was also superior in the FNS group. More than half of the patients treated with FNS achieved an excellent functional outcome, whereas only one-third of patients in the CCS group attained excellent results. Improved hip function following FNS fixation has been consistently reported in previous comparative studies by Li et al. (2), Zhang et al. (4), and Yan et al. (7). The better functional outcome observed in the present study is likely due to improved maintenance of fracture reduction, preservation of femoral neck length, earlier rehabilitation, and reduced implant-related complications. Stable fixation enables earlier mobilization and restoration of hip biomechanics, ultimately resulting in improved postoperative function.

Radiological evaluation using the Radiographic Union Score for Hip (RUSH) demonstrated better healing in patients treated with the Femoral Neck System. Higher RUSH scores in the FNS group indicate improved cortical bridging and trabecular continuity during fracture healing. The enhanced radiological outcomes observed in the present study are consistent with the findings of Wang et al. (9) and Chen et al. (10), who reported superior maintenance of fracture

alignment and earlier radiological union following FNS fixation. The angular stability provided by the implant minimizes varus collapse and rotational displacement, thereby promoting more predictable fracture healing.

Postoperative complications were more frequent in the CCS group, with non-union and implant failure occurring more commonly than in the FNS group. Although femoral neck shortening was observed in both groups, the overall complication rate remained lower following FNS fixation. Similar observations have been reported in recent systematic reviews and comparative clinical studies, which demonstrated reduced fixation failure, lower reoperation rates, and improved implant survival with the Femoral Neck System (5,6,12,13). These findings support the biomechanical advantages of FNS, particularly in displaced and vertically oriented femoral neck fractures where shear forces are considerable.

The present study has certain limitations. The sample size was relatively small, and the follow-up period was limited to six months. Long-term complications such as avascular necrosis and post-traumatic osteoarthritis could not be adequately assessed. Furthermore, treatment allocation was observational rather than randomized, which may have introduced selection bias. Larger multicentre randomized controlled trials with longer follow-up are required to further validate these findings and establish the long-term clinical superiority of the Femoral Neck System.

Overall, the findings of the present study indicate that although both fixation methods provide satisfactory clinical outcomes, the Femoral Neck System offers earlier fracture union, superior functional recovery, better radiological healing, and fewer postoperative complications compared with cannulated cancellous screw fixation. These results support the increasing use of the Femoral Neck System as an effective treatment option for intracapsular femoral neck fractures, particularly in young adults and patients with unstable fracture patterns.

CONCLUSION

Both Cannulated Cancellous Screw fixation and the Femoral Neck System produced satisfactory outcomes in intracapsular femoral neck fractures. However, the Femoral Neck System demonstrated earlier fracture union, superior functional recovery, improved radiological healing, and fewer postoperative complications. It represents a reliable fixation option, particularly for unstable fracture patterns.

Case illustration

CC screw

Case 1

Age: 32/Male

Mode of injury: fall from height

Side of injury: right side neck of femur

Surgery method: cancellous screw fixation.

Gardens classification : type 3





6 months follow up



Hip flexion



Hip extension



Hip abduction



Hip adduction



Hip inversion



Hip eversion



Case illustration

Femoral neck system

CASE 1

Age: 34/M

Mode of injury: RTA

Side of injury: Right hip
 Surgery method: Femoral neck system
 Gardens classification : type 2



Pre op



post op



3 months follow up



6 months follow up



Hip flexion



hip extension



Hip adduction



hip abduction



Inversion

eversion



Squat

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