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## Original article

## Comparative study of multiple cancellous screws versus sliding hip screws in femoral neck fractures of young adults

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## ABSTRACT

**Purpose:** Both cannulated cancellous screw (CCS) and sliding hip screw (SHS) are used in femoral neck fracture fixations, but which is superior is yet to be determined. This study was aimed to compare the clinicoradiological outcome of femoral neck fracture treated with SHS or CCS in young adults.

**Methods:** Adults (16–60 years) with femoral neck fracture were divided into Group 1 fixed with SHS and Group 2 fixed with three CCS after closed reduction. Pain relief, functional recovery and postoperative radiographs at 6 weeks, 3 months, 6 months and then yearly for upto 4 years were analyzed.

**Results:** Group 1 ( $n = 40$ ) achieved radiological union at mean of 7.6 months, with the union rate of 87.5% ( $n = 35$ ), avascular necrosis (AVN) rate of 7.5% ( $n = 3$ ) and mean Harris Hip Score (HHS) of 86.15 at the end of 4 years. In Group 2 ( $n = 45$ ) these parameters were union at 7.1 months, union rate of 82.22% ( $n = 37$ ), AVN rate of 6.67% ( $n = 3$ ) and HHS of 88.65. Comparative results were statistically insignificant.

**Conclusion:** There is no significant difference in clinicoradiological outcome between the two implants.

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## Introduction

Femoral neck fracture has always been 'the unsolved fracture' as far as treatment and results are concerned.<sup>1</sup> Most femoral neck fractures occur in elderly individuals where much attention has been focused, while the same fracture in young adults has been less considered. A fracture of the femoral neck in a young adult differs from the same fracture in an older patient in many respects. They account for only 2%–3% in young population where they usually result from high energy trauma<sup>2</sup> and hence are more difficult to treat and are associated with more complications like nonunion and osteonecrosis.<sup>3</sup>

Treatment options include arthroplasty in older individuals but for young patients anatomical reduction and internal fixation have to be relied upon. Mostly cannulated cancellous screws (CCS) or a sliding hip screw (SHS) are used for osteosynthesis of these fractures. Fixation with both CCS and SHS has achieved good results, but which method is superior is yet to be determined. There has been a paucity of randomized trials directly comparing SHS (along

with a derotation screw) and three CCS in femoral neck fractures at any level. Also to date no studies have compared the two implants with respect to the anatomical type of femoral neck fractures separately. To fill this lacuna in the present knowledge, this study was aimed to compare the clinicoradiological outcome of femoral neck fracture treated with SHS or CCS in young adults.

## Materials and methods

A prospective comparative study was done in our department to evaluate the results of fixation of femoral neck fracture for four year duration from June 2010 to December 2014. The study was conducted after taking clearance from the review board of our institution and university. All patients with a fracture of the femoral neck sustained within the last 3 weeks, as diagnosed on a plain radiograph of the pelvis with both hips in anteroposterior view, falling in the age group of 16–60 years were taken as cases. The exclusion criteria were patients with polytrauma, life threatening injuries or with other injuries in the same limb. The patients were divided into two groups by a simple randomization method. Group 1 was designated as the SHS group and Group 2 as the CCS group and the implant for fixation was accordingly decided.

After taking appropriate consent from the patients, investigations required for anesthesia for the contemplated surgical

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procedure were done to assess their fitness. The delay between trauma and surgery was noted. All patients received intravenous ceftriaxone (1 g) and gentamicin sulfate (80 mg) before the procedure and for at least 72 h postoperatively. Under regional anesthesia or general anesthesia the procedure was carried out on a standard orthopedic fracture table in supine position. Closed reduction was achieved under fluoroscopic control. Only the fractures treated by closed reduction were included. Fractures requiring open reduction were excluded from the study. Fixation with SHS was done through standard lateral approach using a Richard's screw and 4 hole 135° angled barrel plate which was fixed to the proximal femoral shaft with cortical screws. A 6.5 mm cannulated cancellous partially threaded derotation screw was inserted superiorly before reaming for the SHS. Fixation with CCS was done using three 6.5 mm partially threaded screws inserted parallel in an inverted triangle configuration through small stab incisions or using a small lateral incision. Intraoperative blood loss, operative time and incision size were noted in both the groups. Under the supervision of physiotherapists, toe-touch weight bearing mobilization was started using crutches or walker on the second or third day postoperatively in both the groups and the patients were followed up at 6 weeks, 3 months, 6 months and then yearly for up to four years after the operation to note the clinicoradiological outcome.

Clinical outcome was assessed in the terms of pain relief and functional recovery using the Harris Hip Score (HHS). Radiological union was assessed using plain radiographs of the pelvis in an anteroposterior view with hips in 15°–20° internal rotation and lateral frog-leg views of the involved hip. Radiographically visible trabeculations across the fracture line were considered as union, whereas no radiographically visible trabeculations across the fracture line, or redisplacement of the fracture or progressive displacement requiring a second operation were considered nonunion. When sound bony union was achieved as ensured by the radiograph, full weight bearing was allowed. Complications were recorded like infection, implant failure in the form of breakage of the implant, loosening or migration of the implant, nonunion and avascular necrosis (AVN). Any patient requiring a second procedure in the form of revision surgery, osteotomy or arthroplasty were included only upto the follow-up for the primary procedure. Data of the patients who died postoperatively or were lost to follow-up were included upto the last follow-up available. Statistical test was performed using the SPSS version 15.0 software.

## Results

The total number of patients included in this study was 85. Forty patients belonged to Group 1 and 45 to Group 2. Various clinicoradiological parameters are shown in Table 1. Around 90% of the patients had fractures due to high energy trauma like fall from height or stairs or motor vehicle accidents and 10% had a trivial trauma like slip on floor.

The intraoperative parameters including mean blood loss, incision size and operative time were found to be statistically significant between the two groups. Radiological union was achieved at a mean of 7.6 months in Group 1 and 7.1 months in Group 2 (Figs. 1 and 2). There was no statistically significant difference between the two groups in mean delay between trauma and surgery, postoperative Garden alignment index, and union rate (Table 1). Additionally there was no significant difference in the functional outcome between the two groups taking into account the HHS at each postoperative visit at 6 weeks, 3 months, 6 months, 1 year, 2 years and 4 years.

Considering postoperative complications (Fig. 3, Table 2), two patients in Group 1 but none in Group 2 had infection. Both patients

**Table 1**  
Various clinicoradiological parameters in Group 1 and Group 2.

Parameters	Group 1	Group 2	p value
Number of patients	40	45	
Mean age (years)	40.7 (16–60)	39.3 (16–60)	
Male: female	23:17	32:13	
Fracture type			
Subcapital	12 (30%)	13 (28.9%)	
Transcervical	20 (50%)	25 (55.6%)	
BASICERVICAL	8 (20%)	7 (15.5%)	
Garden's classification			
Type 1	0	1 (22.2%)	
Type 2	2 (5%)	2 (44.4%)	
Type 3	23 (57.5%)	28 (62.2%)	
Type 4	15 (37.5%)	14 (31.2%)	
Mean preoperative delay (d)	4.5 (8 h–17 d)	2.5 (6 h–9 d)	=0.104
Mean intraoperative blood loss (ml)	200 (100–400)	67.4 (30–150)	<0.001
Mean operative time (min)	111 (45–240)	61.6 (30–120)	<0.001
Average incision size (cm)	12.6 (8–20)	3.9 (2.5–5.5)	<0.001
Average follow-up (months)	40.7 (1.5–48)	39.3 (1.5–48)	
Mean Garden alignment index			
Anteroposterior	165°	167°	=0.451
Lateral	166°	165°	=0.689
Radiological union (months)	7.6	7.1	=0.652
Union rate	87.5% (n = 35)	82.22% (n = 37)	=0.09
Mean Harris Hip Score (at 48 months)	86.15	88.65	=0.46

had a late infection and implants were removed at 1 year. One attained union but other showed nonunion and excision arthroplasty was performed in this patient. Implant related complications, backing-out of screws, screw bending, or screw cut-out were found in 5 patients in Group 1 and 4 patients in Group 2. Three patients in Group 1 had backing-out of derotation screw but attained union after which it was removed and 2 patients had Richard screw cut-out through the neck and one was treated with hemiarthroplasty. During second surgery the head was found completely hollow and non salvageable due to the Richard screw cut-out at 6 weeks and the other was the same patient who had persistent infection for which excision arthroplasty was performed at 1 year. In Group 2, two patients had CCS backing-out but attained union. At an average of 9 months one patient had CCS backing-out with nonunion for which valgus osteotomy and fixation with angled blade plate were carried out at 6 months, but this procedure also failed and later hemiarthroplasty was performed at 1 year. One patient had CCS backing-out, CCS bending, nonunion and AVN but was lost to follow-up at 1 year. One patient in Group 2 died due to some reasons not related to the surgery before 6 months of postoperative period. Three patients showed radiologically visible changes of AVN in Group 1 at an average of 24 months duration and 3 in Group 2 at an average of 12 months. All differences were insignificant statistically ( $p = 0.809$ ). In Group 1 all AVN patients were managed conservatively. Two patients in Group 2 who had AVN along with nonunion were lost to follow-up at 12 months and the third was managed conservatively.

## Discussion

Results after fixation of femoral neck fractures primarily depend upon age of the patient, amount of displacement, adequacy of reduction and adequacy of internal fixation. Determination of chronological and physiological age of the patient is important to formulate a treatment plan. Internal fixation is favored than arthroplasty in young patients considering the need for revision of arthroplasty in their lifetime and also preservation of the native bone.<sup>4,5</sup>

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