

# A Comparative Study Of The Management Of Fracture Neck Femur By Dynamic Hip Compression Screw With Derotation Screw Versus Three Cancellous Screws

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**Abstract:** Background: Intracapsular fractures of neck femur have always presented a great challenge to orthopaedics surgeons and remain in many ways the unsolved fracture as far as treatment and results are concerned.

Methods: Cases included in this study are transcervical and subcapital fracture neck femur in patients less than 60 yrs of age managed in Sir JJ Hospital, Mumbai -08.

Results: Fracture type, anatomical reduction and proper implant selection are the most important factor affecting the outcome of management of fracture neck femur whereas age, time interval, method of reduction, and capsulotomy play a less important role.

Conclusion: Dynamic Hip Screw (DHS) is a better implant in management of most of the cases of fracture neck femur. High subcapital fractures are an exception to this rule.

Keywords: Fracture neck femur, transcervical/ subcapital fracture, cannulated cancellous screw, dynamic hip screw, avascular necrosis, non union.

## THESIS SUMMARY

### Introduction

Fractures of the femoral neck are devastating injuries that most often affects the elderly and have a tremendous impact on the health Care system and society in general. The worldwide incidence of femoral neck fractures has continued to increase. From an estimated 1.3 million hip fractures in 1990. This number is predicted to rise to 2.5 million by 2025 and 4.5 million by 2050, assuming there is no age specific increase. Amongst these the fractures occurring in young patients are particularly troublesome. The fracture is regarded as a vascular injury to the bone's blood supply [3-8]. The degree of vascular compromise is thought to directly correlate with the displacement of the fracture which affects fracture union and leading to complications. Hence intracapsular fracture neck of femur is regarded as an orthopaedic emergency [9] and needs to be reduced with rigid internal fixation which is believed to improve the circulation of femoral head and prevent the non union and avascular necrosis.

Internal fixation with cannulated cancellous screws after good anatomical reduction has the advantages of decreased blood loss and

operative time, lower transfusion requirements and decreased length of hospital stay [9].

Richards et al has quoted basic advantages of using sliding hip screws in terms of strength greater than multiple cancellous screws, minimization of risk of subsequent subtrochanteric fracture secondary to a stress riser effect, and placement of compression across the fracture at the time of reduction. Disadvantages of the sliding hip screw for femoral neck fracture stabilization include a larger surgical exposure and the potential to create rotational malalignment of the femoral head at the time of screw insertion [10].

However inspite of available modalities and techniques there is high rate of complications particularly in young patients suffering from fracture neck femur.

We have undertaken this comparative study to assess the outcome of both fixation modalities as well as factors influencing the results of these fixations in our population and attempt to fill in the lacunae in our understanding of management of fracture neck femur.

## Methods

Cases included in this study are transcervical and subcapital fracture neck femur in patients less than 60 yrs of age. The cases studied for this dissertation were managed in Sir J J Group of Hospitals, Mumbai-08. The ethical clearance for this study has been obtained from this institutions ethical Committee.

The total number of cases studied were 62

The total patients were divided into two subgroups

1. Patients treated with multiple cancellous screws (31)
2. Patients treated with dynamic hip screw and derotation screw (31).

All the patients were followed up with radiological and functional assesment.

## Discussion

**Age, sex and laterality of fracture:** We have found no studies suggesting the role of these variables in the outcome of fracture treatment. In our study as well, we have not found these factors to play any role in the outcome of fracture treatment.

**Modality of treatment:** On assessment of patients on follow up with Harris hip score, we found excellent result in 61.3 % of our patients managed with DHS while only 25.8 % of patients managed with CC screw showed excellent result. On the other hand 9.7 % patients managed with CC screw showed poor results while none of the patients managed with DHS showed poor result. This difference is statistically significant with p value of 0.024 as calculated by Chi-square test. Also overall Harris hip score of patients managed with DHS was higher as compared to the score in patients managed with CC screw. We have found DHS not only to be more stable but also allows better compression across the fracture, allowing early mobilization and early union. There was no complication of non-union in patients managed with DHS while 3 patients managed with CC screw progressed to non-union. Average time for union in our study was 14 weeks for patients managed with DHS while it was 18 weeks for patients managed with CC screw. We recommend use of DHS with derotation screw for managing all the patients of fracture neck femur i/v/o early mobilization, early union and reduced risk of non-union.

**Fracture type:** Pauwel's type-3 femoral neck fractures are problematic to treat, with non-union rates higher than those reported for historical controls. In one of the studies on Pauwel's type III fractures [11] non-union rate of 16% was reported with cannulated screws and 8 % with fixed angle device and supports the theory that these type-3 fractures experience shear and may demonstrate a higher rate of varus, shortening, and non-union. In our study, 8 patients had Pauwel's type III fracture of which 5 patients were managed with DHS while 3 patients were managed with CC screw. Complications like delayed union and varus were seen in patients managed with CC screw. However no patients with type III fracture ended up in non-union. Biomechanically, it has been shown that a sliding hip screw device is stronger than three parallel cancellous screws for the treatment of Pauwel's type III intracapsular neck femur fractures. Stability and the quality of reduction appeared to influence the rates of adverse outcomes in our series. We recommend use of DHS with derotation screw in Pauwel's type III fractures as adequate

compression is achieved intraoperatively by placing 5 mm shorter lag screw in inferior quadrant of the neck and placing the derotation screw wider apart in superior quadrant. We have found limitation of this construct in high subcapital fracture where DHS threads won't have enough purchase in femoral head [12].

**Time interval between injury and surgery:** Advocates of early surgery suggest that the main advantages of prompt reduction of a displaced femoral neck fracture are unkinking of the vessels and performance of an intracapsular decompression to remove the hematoma that increases intracapsular pressure [13,14,15]. This improves and restores blood flow to the femoral head, minimizing the risk of femoral head osteonecrosis. In our study majority of our patients were treated within twenty-four hours after the injury. However, the exact time to treatment is difficult to ascertain. In our study however higher risk of non-union was seen in patients managed with CC screw who underwent surgery more than 72 hrs after trauma. The probable reason is that when surgery is delayed for more than 72 hrs there is resorption at fracture ends and compression across the fracture site is poor, more so with CC screw as compared to DHS. [16]

**Method of reduction (open vs. closed):** In our study only 13 % (8 patients) required open reduction of which 1 patient developed Avascular Necrosis. Hence we do not consider open reduction as a risk factor for AVN.

**Role of Capsulotomy:** The role of capsulotomy in the treatment of femoral neck fractures remains controversial, and the practice varies by trauma program, region, and country. Clinical studies [17-21] have shown that decompressing the intracapsular hematoma by means of a capsulotomy or aspiration reduces the intracapsular pressure. This decrease in the intracapsular pressure results in improved blood flow to the femoral head and may reduce femoral head Ischemia [17-23]. In our study the difference in the rate of osteonecrosis between those who had and those who had not received a capsulotomy was small; however, our sample size was too small for us to make definitive conclusions about the value of capsulotomy. Capsulotomy was not done in patients managed with DHS as reaming for lag screw placement was considered to decompress the femoral head.

**Post-operative radiological reduction:** Portzmann RR et al [24] and Lee ch et al [25] and several others have found increased complications like non-union and AVN in patients with non-anatomical post operative reduction. Complications like non-union, AVN, shortening and post operative poor functional outcome were seen more commonly in patients who were fixed in malalignment. Hence it is recommended by us to reduce the fractures anatomically or in valgus impacted position.

**Positioning of Lag screw and type of barrel:** Screw position [26] can be assessed with implant-cortical bone purchase by evaluating the distance from the implant to the cortex. Baumgaertner et al. [27] proposed what has become the well-known concept of the tip-apex distance (TAD). In our study the exact distance was not measured due to variable magnification of available x-rays and lack of proper scaling of the x rays and hence the stability of reduction and the relation of TAD with the outcome could not be commented. Similarly, we have found that placement of DHS lag screw in the inferior quadrant along the calcar and use of long barrel plate increases the stability of fixation and hence is

recommended by us. We have also found Dynamic Hip Screw with derotation screw to have greater ability to compress across the fracture site as compared to Canulated Cancellous screw. However, further biomechanical studies are recommended for confirmation.

Duration of surgery and blood loss: Average duration of surgery in patients managed with CC screw was 50 mins while that in DHS group was 90 mins. Incision for CC screw group was smaller as compared to DHS group. Average blood loss for CC group was 50 cc while that of DHS group was 150 cc.

Complications: In this study, the risk factors for fracture non-union after internal fixation of intracapsular femoral neck fractures, we found that a displaced fracture, borderline and unacceptable reduction, and more centralized screw position were risk factors for non-union and implant failure. The factors that have been most consistently found to be predictive of non-union after fixation of intracapsular femoral neck fractures are poor reduction and fracture displacement. Age and sex are not risk factors for non-union in most studies, including our study. Fracture site, fracture level, and bone density were not found to be related. Of the 3 patients managed with CC screw that went into non-union, 2 patients were fixed in borderline retroversion and 1 was fixed in varus. [28] In our study we have achieved union rate of 100 percent with DHS while it is 90 % in patients managed with CC screw. High rate of union in DHS group was due to significant compression and impaction achieved across the fracture site.

Avascular Necrosis : AVN was seen in 6 cases (9.7 %) in our series. Of this 4 cases were managed with DHS while 2 patients were managed with CC screw. Of the patients who developed AVN, none of the patients required further surgical management in the form of hip replacement till follow-up. Further collapse was prevented in these patients with the use of bisphosphonates. Union was confirmed radiologically by corticalization across the fracture site in AP and lateral views and filling of earlier bone defects with remodelling of bone.

Minor complications like superficial infection and bursitis were encountered but these complications were managed with oral/ IV medications. None of these minor complications were found to affect the overall functional outcome.

### Clinical Message

The aim of this study was to study various factors related to the anatomical and functional outcome in the management of fracture neck femur. With the increasing incidence of fracture neck femur in young adults this study aims in providing precise management protocols and thereby reducing the incidence of complications in young patients.

Anatomical reduction is of prime importance for any fracture neck femur to unite. All cases of fracture neck femur in patients less than 60 years of age should be managed with DHS with Derotation screw with the exception of high subcapital fracture which should be managed with Canulated cancellous screws.

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