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Comparison of the functional outcome of DHS versus cannulated cancellous screws in pauwels type II and III fracture neck femur in young adults

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Abstract

Fracture neck of femur remains the unsolved fracture even in modern orthopaedics. It is an enigma to orthopaedic surgeons and curse for an individual with complications like avascular necrosis and nonunion. No clear difference exists with regards to the clinical results of patients treated with Cannulated screws or Dynamic hip screw fixation. 43 patients with fracture neck of femur were treated with either multiple cannulated cancellous screws (CCS) or dynamic hip screw (DHS) at Department of Orthopaedics, Hamidia hospital, Bhopal. Patients were called for follow up radiologically and clinical examination post operatively. Functional results were calculated with Modified Merle d'aubigne and postel method. Statistical analysis was done using p value. Fracture type, anatomical reduction and proper implant selection are the most important factor affecting the outcome of management of fracture neck femur. Patients treated with DHS had better Modified Merle d'aubigne score and earlier union. Average blood loss and mean operating time was higher in patients fixed with DHS. Dynamic Hip Screw (DHS) is a better implant in management of fracture neck femur in young adults in pauwels type II and III but complication rate does not depend on implant selection.

Keywords: Fracture neck femur, canulated cancellous screw, dynamic hip screw, avascular necrosis, nonunion

1. Introduction

Fracture neck of femur remains the unsolved fracture^[1], even in modern orthopaedics. It is an enigma to orthopaedic surgeons and curse for an individual as it is a potentially devastating injury difficult to manage^[2]. Fracture neck of femur in young adults are uncommon and only 2-3% of all intracapsular hip fractures occur in people younger than 50 years^[3]. There is lack of consensus in treating the young patients^[4]. Research and publication results of fixation of fracture neck femur in young patients are mixed^[5-10]. Femoral neck fractures in young adults are associated with higher incidences of femoral head osteonecrosis and nonunion. Reoperation and salvage procedures such as osteotomy have high failure rates and arthroplasty procedures are not ideal given the young age and higher levels of activity^[11]. Achieving an anatomic reduction and stable fixation are imperative, other factors such as timing of surgery, role of capsulotomy and method of fixation remain debatable^[12].

Femoral neck fractures with a vertical orientation have been associated with an increased risk of failure as they are both axial and rotation unstable and associated with higher rates of nonunion compared to the more horizontally oriented fractures sparking debate over the most effective internal fixation device^[13]. Biomechanical studies have indicated that fixed angle Dynamic hip screw constructs are stronger than multiple cannulated screws especially in high energy vertically oriented femoral neck fractures^[14, 15]. However there is limited clinical evidence to suggest superiority of either implant in terms of avascular necrosis, non-union and need for revision surgery. The aim of this study is to identify the superior implant out of Dynamic hip screw and multiple cannulated screws for such fractures.

2. Materials and Methods

This study was a prospective study from August 2013 to November 2015. 43 patients with fracture neck of femur treated with either multiple cannulated screws (MCS) or dynamic hip screw (DHS) were enrolled in the study during the given time frame. The patients treated with CCS were grouped into GROUP 1 and those with DHS fixation into GROUP 2. The patients were alternately divided into these groups. The patients were explained about the nature of injury and the complication of surgery and its outcome.

2.1 Inclusion criteria-

1. Patients with age between 15 and 60 years of age.
2. Recent history of trauma.
3. Patients willing to undergo surgery.
4. No associated fracture in both lower limbs.
5. Type II and III as per Pauwels classification.

2.2 Exclusion criteria-

1. 1 Patients with age less than 15 years or more than 60 years.
2. Neglected fracture neck of femur.
3. Patient not willing to undergo surgery.
4. Pathological fractures.

5. Pauwels type I.

3. Observations and Results

In this prospective randomized study 43 patients who had fracture neck femur pauwels type II or III, were treated. The longest duration of follow up was 18 months and the shortest duration was 7 months. The average duration of follow up was 10.5 months. Male to female ratio was 34 to 9. Majority of the patients were treated within 3 to 7 days. The average injury to surgery interval was 6.2 days. This was due to the late referral or late presentation to our tertiary care centre. Only 1 patient was operated on the same day. The union time was 13.5 weeks in DHS Group and 16 weeks in CCS Group. Average age was 27.2 years in DHS group and average age in CCS group was 30.4 years. In DHS group 10 patients had pauwels type II and 11 had type III whereas 13 were type II and nine were type III in CCS group. AVN was found in 1 patients in DHS group and 3 in CCS Group in which implant removal was done and hemiarthroplasty was done in 2 cases. Nonunion was detected in 2 case in DHS Group and 3 in the CCS group. One patient with DHS had superficial infection that responded to intravenous antibiotics.



Fig 1: Preoperative and postoperative X-rays of patient with DHS fixation with union at 13 weeks



Fig 2: Preoperative and postoperative X-rays of patient with CCS fixation.

Results in both groups

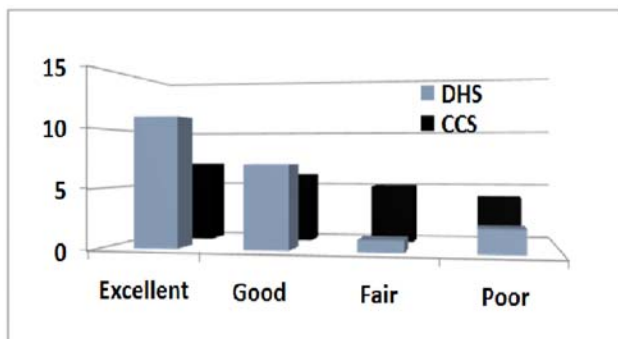


Fig 3: results on basis of Modified Merle d'Aubigne score in both groups

In DHS Group 85.7% of patients had excellent results (score of 18) or good results (score of 15 to 17) as per Modified Merle d'Aubigne score¹⁰ as shown in figure 3. In CCS Group 59% patients had excellent results or good results.

4. Discussion

The treatment of fracture neck femur has been debated for many years. It is still called as the unsolved fracture¹. The main aim in the treatment of a femoral neck fracture is to facilitate the patients return to his normal activities as soon as possible. Internal fixation of these fractures is more important than arthroplasties today because the patients native bone tissue is preserved and low costs are achieved^[17]. Various types of internal fixation devices are reported for stabilization of these fractures in young adults but there is inconsistent evidence in literature with regards to optimal fixation technique. Most authors agree that the best position is anatomical reduction or in slight valgus. It is important to prevent complications like nonunion and AVN. Hence is recommended to fix these fractures in anatomical position.

The present study showed that age was an important factor while side or sex affected do not affect the final outcome and found no studies to suggest the role of these variables. According to Tolga Kaplan *et al*^[17], physiological age rather than the chronological age is more important in deciding the modality of treatment. The quality of bone decides the strength of the implant and rate of cutout or failure.

Advocates of early surgery suggest that prompt reduction leads to unkinking of the proximal femoral vessels, thus leading to decompression and restoring the blood flow^[18]. In present study the average duration was 6.2 days. Most studies recommend treatment within 72 hours. But larger studies are needed to substantiate these facts.

On assessment of patients at follow up with Modified Merle d'Aubigne score we found excellent results in 85.7% of cases with DHS fixation as compared to 59% in CCS Group as compared to the following studies where DHS showed better results than CCS fixation (table 1). The results were significant statistically with p value. 048 when patients with excellent and good results were compared with those having poor or fair results. Other studies have either used the Modified Merle d'Aubigne score or Harris hip score. According to Azhar Lakhani *et al*^[19], DHS showed better results due better compression across the fracture site and leading to early mobilization and better results. Baitner *et al*^[15], in a biomechanical study showed that specimens stabilized using a sliding hip screw showed less inferior femoral head displacement, less shearing displacement and a

much greater load to failure than did those stabilized with multiple cancellous lag screws.

The average blood loss during CCS fixation in present study was 92 ml and in DHS fixation was 206 ml which was statistically significant ($p < .05$). Tolga Kaplan *et al*^[17], and Azhar Lakhani *et al*^[19], also reported higher blood loss in the DHS group. Swiontkowski and Winquist⁷ and Madsen F *et al*^[20], reported similar results.

The present study showed a difference in groups regarding the duration of surgery which was statistically significant. In case of CCS the average duration of surgery was 55.6 min and in case of DHS fixation was 86 min with p value $< .05$. This was comparable to earlier studies by Tolga Kaplan *et al*^[17]. And Azhar Lakhani *et al*^[19]. Thus CCS fixation also shortens the anesthesia time and prevents the possible complications of anesthesia and also decreases the rate of infection.

The average union time in present study in CCS fixation was 16 weeks and in case of DHS was 13.5 weeks which is comparable to earlier studies (table 2).

Table 1: Patients with excellent results shown in various studies.

SERIES	CCS (%)	DHS (%)
Tolga Kaplan <i>et al</i> ¹⁷	85	91
Azhar Lakhani <i>et al</i> ¹⁹	25.8	61.3
S Kumar <i>et al</i> ⁴	82.5	
Carlos <i>et al</i> ¹⁸		63
Stephan <i>et al</i> ²²	70	75
Present	59	85.7

Table 2: Average union time various studies in weeks

SERIES	CCS (in weeks)	DHS (in weeks)
Tolga Kaplan <i>et al</i> ¹⁷	16	16
Azhar Lakhani <i>et al</i> ¹⁹	18	14
S Kumar <i>et al</i> ⁴	16	
Present	16	13.5

The rates of complications in fracture neck femur are variable in various studies but rate is very high even with anatomical reduction and early fixation.

Nonunion: The rate of nonunion in present study was 13.6% in case of CCS and 9.5% in case of DHS group which is comparable to other studies (table 3). However the results were not statistically significant ($p = .67$). S Kumar *et al*⁴ reported that the risk factors for nonunion include delay in surgery, posterior comminution, early loss of reduction and convergent screw fixation.

AVN: It was seen in 13.6% patients with CCS fixation and 4.8% cases with DHS fixation which compared favourably with other groups. The results did not reveal significant difference with p value^[32]. The rate of AVN depends on the quality of reduction and not on implant selection. The rate of osteonecrosis in the present study is less than that reported in the literature, but this could go up once the patient follow-up increases. This argument is supported by the observations of Asnis and Wanek-Sgaglione L^[21], who described avascular necrosis in 11% of their patients at 2 years increasing to 22% at 8 years. The occurrence of AVN did not affect the functional outcome in our series. Of the patients with osteonecrosis only one patient had symptoms severe enough to demand an operative intervention. This has been the phenomenon in other studies

5. Conclusion

The results of present study support the hypothesis that DHS is a better implant than CC screws in management of fracture

neck femur in young adults in pauwels type II and III in terms of functional outcome but complication rate does not depend

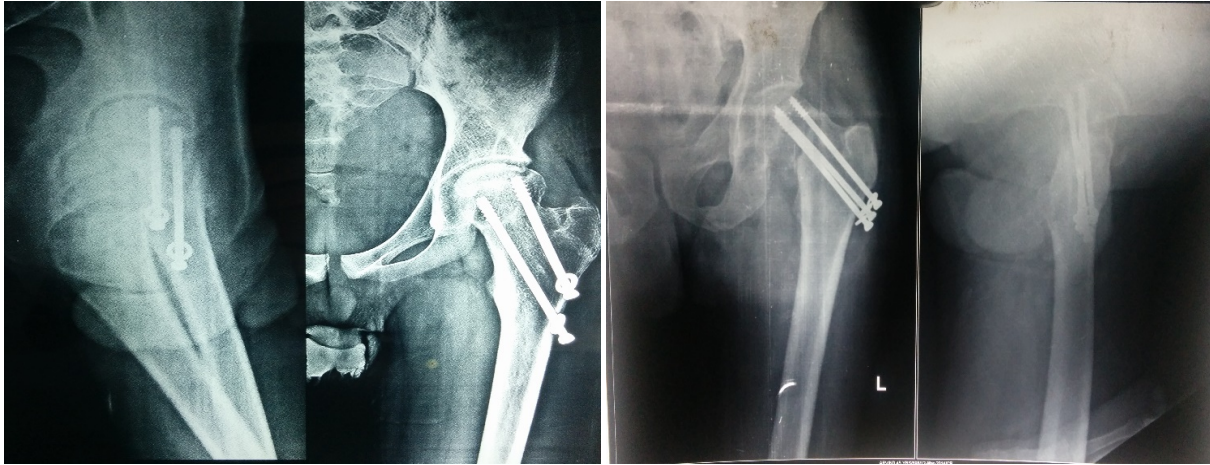


Fig 7: AVN and Nonunion seen in our follow up patients

Table 3: Complication rates in various studies

SERIES	AVN (%)		NON UNION (%)	
	CCS	DHS	CCS	DHS
Tolga Kaplan <i>et al</i> ¹⁷	18	30	9	3
Azhar Lakhani <i>et al</i> ¹⁹	6.4	12.9	10	0
S Kumar <i>et al</i> ⁴	5		17.5	
Carlos <i>et al</i> ¹⁸		16		3
Stephan <i>et al</i> ²²	7	12	3	10
Present	13.6	14.8	13.6	9.5

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