

## Case Series

# Comparison outcome in management of femoral neck fracture using multiple cancellous screws with and without fibular graft

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### ABSTRACT

Multiple cancellous cannulated screw is preferred method in fresh cases of fracture neck of femur in young patients. Fibular strut graft is sometimes used along with multiple cancellous cannulated screws to enhance union and early restoration of function. We conducted a retrospective study to patients aged between 20-50 years old with femoral neck fracture treated with multiple cancellous screws either with or without fibular graft between the period of January 2016 to January 2018. We obtained total of six patients (five males and one female) with femoral neck fracture treated with multiple cancellous screws either with or without fibular graft. All fractures were garden type II-IV fresh femoral neck fractures. The functional outcome based on Harris hip score was excellent for all patients. The mean time of full weight bearing was  $16\pm 8$  weeks in both multiple cancellous screws without fibular group and multiple cancellous screws with fibular group. The mean time of union was also  $16\pm 8$  weeks in both groups. There is no complication such as non-union, avascular necrosis of femoral head and/or broken fibular graft in both the groups occurrences. Fixation with cancellous screws and fibular strut grafts for femoral neck fractures is cost effective and technically less demanding and associated with good outcomes. There is no added advantage of non-vascularized fibular grafting with multiple hip screw fixation in fresh femoral neck fractures in young adults over multiple hip screw fixation alone.

**Keywords:** Femoral neck fracture, Multiple cancellous hip screw, Fibular graft

### INTRODUCTION

Femoral neck fractures are intracapsular fractures that occur in the region from just above the intertrochanteric region to just below the articular surface of the femoral head.<sup>1</sup> As the number of femoral neck fractures continues to increase in the United States (with an estimated 458,000 to 1,037,000 femoral neck fractures per year by 2050 in patients 45 years old or older), orthopaedic surgeons will be called on to help deal with this impending public health crisis.<sup>2</sup> Despite tremendous development in the implant design, imaging method, and surgical technique, the fractured neck of femur still poses a formidable challenge to the modern orthopaedic surgeons. The incidence of complications like avascular

necrosis of head of femur is reported to remain as high as 15-33% and that of non-union is 10-30%.<sup>3</sup>

There is a bimodal distribution of femoral neck fractures, with the majority occurring in the geriatric population from low energy falls, and a smaller number occurring in younger individuals from high-energy mechanisms. Although most hip fractures occur in the geriatric population, more and more young patients are surviving motor vehicle accidents and presenting with high-energy injuries about the hip. The approach to treatment is different in these two groups, in that an attempt is made to reduce and fix almost all femoral neck fractures in young adults, while most displaced fractures in elderly patients are treated with arthroplasty.<sup>4,5</sup>

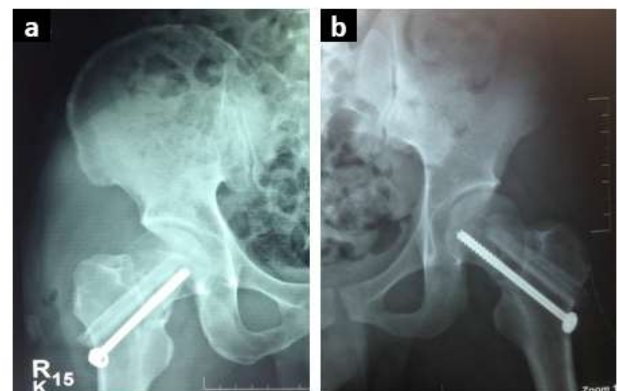
In young patients, the incident of avascular necrosis associated with femoral neck fracture is 20-90%.<sup>6</sup> Various osteo-synthetic fixation procedures with multiple cancellous cannulated screw, valgus osteotomy and fixation with double angle barrel/blade plate, dynamic hip screw, displacement osteotomies, muscle pedicle grafts, and free fibular graft (vascularized or non-vascularized) with internal fixation are available.<sup>7</sup> Osteosynthesis with partially threaded multiple cancellous cannulated screw is preferred method in fresh cases of fracture neck of femur in young patients with screws placed in upright or inverted triangle pattern. Sometimes, fibular strut graft is used along with multiple cancellous cannulated screws to enhance union and early restoration of function. As insertion of fibular strut graft offers advantage of stability, osteo-inductive and osteoconductive properties thus enhancing union, it also prevents avascular necrosis and collapse of head of femur. Moreover it is technically easy to harvest the graft.<sup>8</sup> We conducted a retrospective study of patients with femoral neck fractures in our centre treated with multiple cancellous screws with or without fibular graft.

### CASE SERIES

We performed a retrospective study to patients aged between 20-50 years old with femoral neck fracture treated with multiple cancellous screws either with or without fibular graft in our centre between the period of January 2016 to January 2018. Patients with diabetes mellitus, infection around surgical site, evidence of sequelae of septic arthritis or avascular necrosis or previous history of any surgery around affected joint, polytrauma and fractures those requiring open reduction were excluded from the study. The subjects were then divided into two group: group A femoral neck fracture patients underwent multiple cancellous screw without fibular graft, and group B femoral neck fracture patients underwent multiple cancellous screw with fibular graft. The data collected included sex, fracture type according to garden's classification, functional outcome based on Harris hip score, the time needed to achieve weight bearing and union, and complications.

In the two years period, we obtained total of six patients (five males and one female) with femoral neck fracture treated with multiple cancellous screws either with or without fibular graft. The average age of patients was 25-45 years in both groups. There were three patients who had femoral neck fracture treated with multiple cancellous screw without fibular graft (group A), and three patients with femoral neck fracture treated multiple cancellous screw with fibular graft. Each patient was subjected to detailed clinical and radiological examination along with routine haematological investigations. All fractures were garden type II-IV fresh femoral neck fractures and the onset was less than two weeks prior to admission to the emergency unit in our centre. The distribution of cases according to garden's classification can be seen in (Table 1).

Pre-operatively all patients were applied with above knee skin traction till the operation to alleviate pain and overcome muscle spasm. Pre-operatively informed written consent of the patient was taken duly in all the cases. All operations were done on fracture table. The fractures were reduced by standard technique of closed methods. Reduction was confirmed with the help of C-arm image intensifier with anteroposterior and lateral views, based on the Garden's alignment index. An angle of 160-180° in both views was considered satisfactory reduction. In group A cases after closed reduction, internal fixation was done either percutaneously or through small incision laterally with 3 partially threaded 16/32x6.5 mm cannulated or non-cannulated cancellous screws out of them at least one was placed along the calcar and other along the posterior cortex. In cases of group B two teams were deployed. One surgical team prepared the tunnel in proximal femur for the fibular strut grafts using a 10 mm cannulated reamer. The other team harvested the fibular graft from the ipsilateral leg using the standard posterolateral approach. The standard lateral approach was used and after securing reduction with multiple 2 mm K-wires, channel for fibula graft was prepared in central or superior part of head and neck. The fracture was fixed with two 6.5 mm partially threaded cannulated or non-cannulated cancellous screws in the previously mentioned fashion and then fibular graft was duly impacted (Figure 1).



**Figure 1: Imaging after managed with (a) multiple cancellous screws alone and (b) multiple cancellous screws with fibular graft.**

Six weeks after wards they were allowed quadriceps and knee range of motion exercises up to eight weeks and later on hip abductor strengthening exercises in supine position. Partial or full weight bearing was allowed only on the basis of radiological presence of bridging trabeculae. Initial follow up were done at six weeks interval till the bony union and 3 monthly thereafter. Hip pain, range of hip motion, walking capacity, evidence of bone union, presence of avascular necrosis, graft incorporation, and position of the screws/graft were evaluated. Functional outcomes were evaluated using the Harris hip score which can be seen in (Table 2).

**Table 1: Distribution of cases according to fracture type Garden's classification in group A and group B.**

Garden type	Group A		Group B		Total	
	Number	%	Number	%	Number	%
<b>I</b>	0	0	0	0	0	0
<b>II</b>	0	0	1	33.33	1	16.67
<b>III</b>	3	100	2	66.67	5	83.33
<b>IV</b>	0	0	0	0	0	0

**Table 2: Comparison of functional outcome based on Harris hip score in group A and group B.**

Functional outcome	Group A				Group B			
	Type II	Type III	Total	%	Type II	Type III	Total	%
	n	n	n		n	n	n	
<b>Excellent</b>	0	3	3	100	1	2	3	100
<b>Good</b>	0	0	0	0	0	0	0	0
<b>Fair</b>	0	0	0	0	0	0	0	0
<b>Poor</b>	0	0	0	0	0	0	0	0
<b>Failure</b>	0	0	0	0	0	0	0	0

The mean time of partial weight bearing was 11±5 weeks in group A, and 12±4 weeks in group B. The mean time of full weight bearing was 16±8 weeks in group A and 16±8 weeks in group B and the mean time of union was 16±8 weeks in group A and 16±8 weeks in group B (Table 3).

**Table 3: Comparison of time of union and weight bearing in group A and group B.**

	Group A (n=3) (weeks)	Group B (n=3) (weeks)
<b>Partial weight bearing</b>	11±5	12±4
<b>Full weight bearing</b>	16±8	16±8
<b>Union</b>	16±8	16±8

**Table 4: Comparison of complication in group A and group B.**

Complication	Group A (n=3)		Group B (n=3)	
<b>Non union</b>	0	0	0	0
<b>AVN of head of femur</b>	0	0	0	0
<b>Non-union with fibula fracture</b>	0	0	0	0

There is no complication such as non-union, avascular necrosis of femoral head and/or broken fibular graft in both the groups occurrences (Table 4). Three patients developed incisional pain at fibula donor site and two patients developed initial extensor hallucis weakness which resolved within three months of surgery. None of

the patients developed ankle instability and peroneal nerve injury.

## DISCUSSION

Displaced femoral neck fractures often accompany comminution of the posteromedial cortex of the femoral neck, which is an important risk factor of non-union due to the loss of the buttressing effect against lateral rotation and insecure fixation.<sup>9</sup> In Garden grade III and IV, comminution of the posteromedial cortex has been observed in 70% of cases. This has been important cause of unstable or insecure fixation, that results in subsequent loss of reduction and non-union. A cancellous screw with a single fibular graft has been reported with excellent results in patients below the age of 50 years.<sup>8</sup> Free fibular grafting has been widely studied as a method to introduce both structural support and a graft framework due to osteoconductive and osteo-inductive properties, in a femoral neck fracture.<sup>10,11</sup>

Harris hip score of 4 patients in group A and patients in group B had excellent results and 2 patients in group A and group B had good results. Our study is comparable with Tripathy et al, who showed union in 15 patients with 24 months follow up with fibular grafting and multiple hip screws.<sup>12</sup> Nagi et al reported a series of 26 cases (10 fresh and 16 old) treated by open reduction and one cancellous screw with free fibular graft followed by single hip spica to all his patients.<sup>13</sup> Kumar et al reported 40 cases of femoral neck fracture treated with multiple cannulated screws in younger patients with union in 31 patients.<sup>8</sup> The osseous union, in our study was achieved at 16±8 weeks in group A and 16±8 weeks in group B. In our series all fractures were displaced, Garden type III, 73.33% in group A, 78.57% in group B and Garden IV, 26.66% in group A and 21.4% in group B. There is no

non-union or implant failure case between group A or group B. With respect to morbidity associated with fibular graft donor site in our study three patient developed incisional pain and resolved within three months of surgery So, functional outcome in two different procedures evaluated by Harris Hip Score and compared taking different variables into considerations e.g. sex, anatomical basis classification, obliquity of fracture classification (Pauwel's), displacement of fracture classification (Garden's) showed no statistically significant difference. There was no statistically significant difference on comparing the results of group A and group B in osseous union, weight bearing, and non-union and avascular necrosis of head of femur in both groups.

## CONCLUSION

There is no added advantage of non-vascularized fibular grafting with multiple hip screw fixation in fresh femoral neck fractures in young adults over multiple hip screw fixation alone. It is unnecessary to increase donor site morbidity, operative time and intra-operative blood loss. Because of no difference between the results of both, it all depends on the decision making of the surgeon who can choose the procedure according to patient.

Fixation with cancellous screws and fibular strut grafts for femoral neck fractures is cost effective and technically less demanding and associated with good outcomes. The femoral head is preserved; this can be converted to bipolar or total hip replacement if needed in future. The limitations of this study were the small sample size, the short follow-up duration, and the fact that it was non-randomised. Large, multicentre, randomised studies with longer follow-up are required to confirm our findings.

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