

## Comparative evaluation of results of fixations intertrochanteric fracture of neck of femur type 3, 4 and 5 with bone graft and without bone graft

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### Abstract

Most commonly in elder patients due to trivial trauma. Especially more common in females. Osteoporosis remains the most important factor contributing to hip fractures. In the young population these fractures are result of high energy trauma. We compared outcome of intertrochanteric fracture of neck of femur type 3, 4 and 5 treated with bone graft and without bone graft. However introduction of bone grafting in patients with fracture IT failed to show any benefit in rate of union at fracture site. Bone grafting along with fixation does not have any added benefit in terms of degree of collapse when compared with the group without bone grafting.

**Keywords:** Intertrochanteric, Femur, Evan's classification

### Introduction

Incidence of IT fractures increases with ageing femoral neck fractures occurs most commonly in elder patients due to trivial trauma. Especially more common in females.<sup>(6)</sup> Osteoporosis remains the most important factor contributing to hip fractures. In the young population these fractures are result of high energy trauma and associated with other injuries. In the young population these fractures are result of high energy trauma and associated with other injuries. In the young population these are more common in males. Evan's classification and AO/OTA classification of femur it fracture remains in wide use. it is based on number of fragments and displacements.<sup>(1,2)</sup> Evan's classified it fracture in type 1, 2(stable fracture) and type 3, 4 and 5(unstable fracture). Over a period of time there had been many developments in methods of fixation of it fracture. at each stage of a development. an attempt was made to overcome the problem. However till date we are not able to guarantee the achievement and maintenance of the ultimate goals fracture healing in anatomical position. The older generation implants like fixed angle nail plate device didn't allowed to desirable controlled collapse of the cancellous bone of metaphyseal region of femur which is require for union. In pursuit of solving this problem the sliding device were invented. This device allowed the controlled collapse at the fracture interphase and allowed union at the same time helped and maintaining the alignment of femoral head/neck with the shaft. however they couldn't prevent the massive collapse which occurred in osteoporotic bones or unstable fracture. Recent time has seen many efforts to overcome this problem intramedullary device, lateral cortex preservation trochanteric support place where used with varying success to prevent collapse.

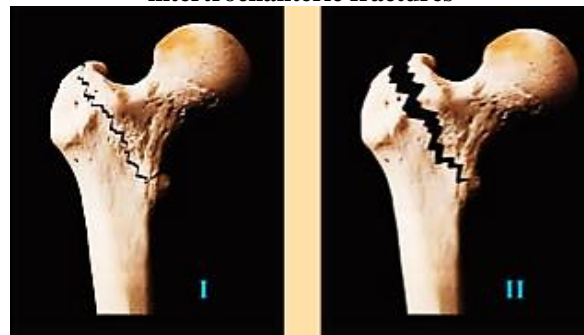
Cancellous bone grafting is gold standard treatment for non-union and also helps in union of diaphyseal fracture with gap. We hypothesize that addition of

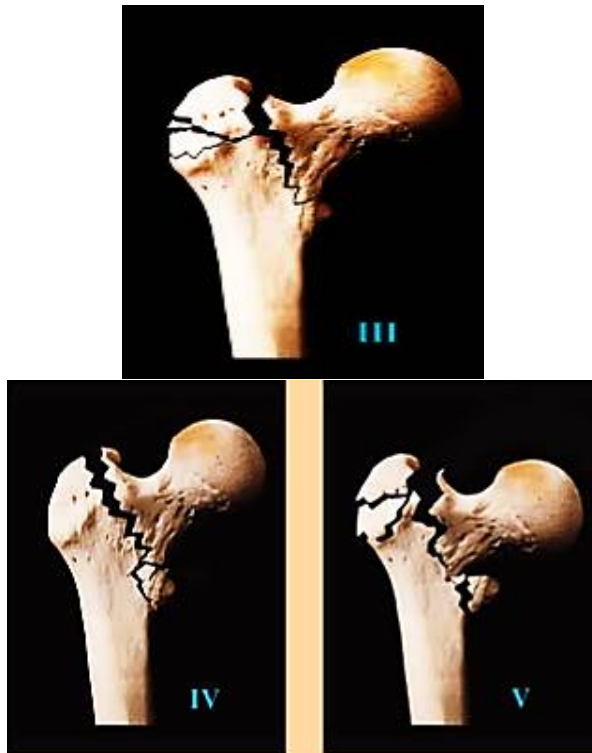
cancellous bone grafting with formal fixation of trochanteric fractures can help in achieving early union of these fractures and thus will prevent collapse with will otherwise occur in due course of time. In this retrospective study, we tried to study advantages of adding bone graft to formal fixation. the standard method of treatment is fixation of fracture fragments of femoral neck by DHS or sliding hip screw either by open or closed technique through lateral approach.<sup>(6)</sup> In this study the fixation is carried out by using DHS by closed technique in one group and DHS with cancellous bone graft from iliac crest by open technique in other group.

### Classification

Type	Description
1	2-part non-displaced
2	2-part displaced
3	3-part fracture with separate greater trochanter fragment
4	3-part fracture with separate lesser trochanter fragment
5	4-part fracture

**Picture 1: Showing Evan's classification for intertrochanteric fractures**





### Aims and Objectives

Comparative evaluation of results of fixation of intertrochanteric fracture of femoral neck type 3, 4 and 5 with and without bone graft.

1. To evaluate and compare success and failure rates over variable period of follow up.
2. To assess and compare radiological union at 3 months, 6 months and 1 year.
3. To measure and compare degree at 3 months, 6 months and 1 year.

### Materials and Method

**Study design:** Retrospective observation study.

**Study setting:** The study was conducted in a tertiary care teaching institute in a metropolitan city.

**Study population:** The present study was conducted among the patients who were having fracture of femoral neck type 3, 4, 5.

**Study period:** 1 year, from June 2015 to November 2016.

**Sample size:** 30 patients of type 3, 4 and 5 of fracture random selection operated with DHS with bone grafting and 30 controls were randomly selected who were having type 3, 4 and 5 of femoral neck fracture operated in same period with DHS without bone grafting.

**Inclusion criteria:**

1. age > 55 year
2. either sex
3. patient with fracture neck femur type 3, 4 and 5

**Exclusion criteria:**

1. age < 55 years
2. patient with fracture neck femur type 1 and 2

Informed consents were taken. X-rays of patient were taken at interval of 3 months, 6 months and 1 year. These X-rays were compared. The patient was operated by 2 methods.

1. close reduction and internal fixation of extra capsular femoral neck fracture by DHS without bone grafting
2. open reduction and internal fixation of extra capsular femoral neck fracture by DHS with cancellous bone grafting from iliac crest

Results were compared in terms of degree of collapse which is calculated by calculating lateral protrusion of screw from lateral margin of femur shaft and in terms of union which was calculated on X-rays at 3, 6 and 12 months.

**Instrument used:** We used sliding plate with Richard screw. Consisting of cannulated lag screw from 19 mm or 29 mm threaded distal portion of 12.7 mm diameter and a proximal non-threaded portion (shaft) of 8.7 mm diameter. Richard screw comes in different lengths measuring from 50-110 mm. A 3.2 mm guide wire is used from which Richard screw can be passed. The lag screw is inserted into bone passing through barrel at which it can slide. There is a groove along with length of Richard screw, which guides direction of key in the barrel. This prevents the rotation. The side plate was available in 2-20 holes, which accommodate 4.5 mm cortical bone screws. Usually 4 or 5 hole plate were used.

**Picture 2: Showing Richard screw with sliding plate**



### Results

Success and failure rate over variable period of follow-up in fixation without bone grafting in terms of union at fracture site.

Period	Union seen	Union not seen
3 months	26(86.7%)	4(13.3%)
6 months	30(100%)	0(0.0%)
1 year	30(100%)	0(0.0%)

Union was not seen in 4 out of 30 patients at 3 months and seen in all patients at 6 months and 1 year.

Success and failure rate over variable period of follow-up in fixation with bone grafting in terms of union at fracture site.

Period	Union seen	Union not seen
3 months	25(83.3%)	5(16.7%)
6 months	29(96.7%)	1(3.3%)
1 year	29(96.7%)	1(3.3%)

Union was not seen in 5 patients at 3 months and non-union in one patient at 1 year.

Rate of radiological union at 3 months.

Fixation	Union		Total
	Not seen	Seen	
Without bone graft	4(13.3%)	26(86.7%)	30(100%)
With bone graft	5(16.7%)	25(83.3%)	30(100%)
Total	9(15%)	51(85%)	60(100%)

There is no significant association between bone union and fracture fixation with or without bone grafting after 3 months of surgery.

Rate of radiological union at 6 months.

Fixation	Union		Total
	Not seen	Seen	
Without bone graft	0(0%)	30(100%)	30(100%)
With bone graft	1(3.3%)	29(96.7%)	30(100%)
Total	1(1.7%)	59(98.3%)	60(100%)

There is no significant association between bone union and fracture fixation with or without bone grafting after 6 months of surgery.

Rate of radiological union at 1 year.

Fixation	Union		Total
	Not seen	Seen	
Without bone graft	0(0%)	30(100%)	30(100%)
With bone graft	1(3.3%)	29(96.7%)	30(100%)
Total	1(1.7%)	59(98.3%)	60(100%)

There is no significant association between bone union and fracture fixation with or without bone grafting after 1 year of surgery.

Period	Fixation	No of patients	Mean	Standard deviation	Degree of freedom	T value	Significant value
3 months	Without bone grafting	30	6.17	1.877	58	-0.594	0.555
	With bone grafting	30	6.43	1.591			
6 months	Without bone grafting	30	6.30	1.860	58	-0.653	0.516
	With bone grafting	30	6.60	1.694			
1 year	Without bone grafting	30	6.30	1.860	58	-0.653	0.516
	With bone grafting	30	6.60	1.694			

By using mean, standard deviation and t test, there is no significant association between degree of collapse and fracture fixation with or without bone grafting over period 3 months, 6 months and 1 year follow-up.

Picture 3: Showing Arrow which indicates degree of collapse



**Picture 4 and 5 showing postoperative AP and Lateral radiograph showing Arrow which indicates bonegraft**



### Discussion

It fracture is one of the common fracture in old age due to osteoporosis. The study of muscular anatomy in an intertrochanteric fracture reveals that, with combination, the ILIOPSOAS tends to displace the lesser trochanter and neighbouring posteromedial cortex proximally and anteromedially. Also, the adductor play a pivotal role in virus position in these fractures as neither their origin nor insertion is disrupted. Biomechanical studies have proven that these factors leads to high bone stress and increased mechanical failure. In evans type 3, 4 and 5 it fracture, the fracture line is partially intra articular and partially extra articular, with medial communication leading to instability as well. these types had large posteromedial fragment with lesser trochanter which had constant pull of Iliopsoas. These two factors are probably responsible for non-union and implant failure in most of cases.<sup>(5)</sup> Thus we believe that primary nonunion occurs in unstable communicated fracture with loss of medial support and in fracture pattern were the fracture line is partly intra-articular and partly extra-articular.<sup>(7)</sup> Mariano and Rand in study of 20 patients of fixation failures found that 19 out of 20 non-unions occurred in patients who had unstable fractures with loss of medial Calcar continuity.

Current evidence suggests that functional impairment persists even years after surgical fixation of proximal femur fractures. Haentjens et al, in a prospective study, compared to outcome of IT hip fractures with femoral neck fractures mortality rates were found to be higher in the IT group at 1 year. In another study, Kristensen et al compared to outcome of IT and femoral neck fractures. The authors noted that the basic mobility scores were lower for the IT hip fracture group. Altered biomechanics is mostly due to uncontrolled telescoping of lag screw in dis. This causes shortening which causes short abductor lever arm, leads to alteration in biomechanics, nonunion of intertrochanteric fractures is uncommon as these fractures tends to occur through well vascularized cancellous bone. When non-union does occur, it is usually in patients with unfavourable fractures patterns, poor bone quality, or suboptimal position of internal fixation devices. Diagnosis od primary intertrochanteric non-union is made at least 15weeks after fracture, there is radiological evidence of a fracture line, with no callus or with callus that dose not bridge the fracture site. Uncontrolled collapse and union is mainly associated with unstable fractures type 3, 4, 5 in which chances of shortening, excessive medialization of distal fragment is there which causes varus angulation and failure. this is why anatomical reduction is one of the important factor. Bone graft can be used which helps maintaining reduction and increase chances of healing but additionally it requires opening of fracture site which leads to loss of hematoma and increases surgical time and pain and discomfort at bone graft site.

Bone grafting has been tried to increase union rate in non-union fracture IT femur. Results are satisfactory. One study comprising of 16 patients shows union in all by 16 weeks.<sup>(8)</sup> another study where 7 cases of Non-union intertrochanteric fractures were operated, only one case showed failure.<sup>(9)</sup> Both studies used iliac crest cancellous bone graft to fill non-union site.

In our study we have observed 30 cases each, with bone grafting and without bone grafting along with dhs fixation, over a period of one year, in all cases reduction at fracture site was satisfactory with proper screw placement in femur head, we observed only one case of failure among patients with bone grafting. There was no significant difference between union rate in group 1 and group 2. Degree of collapse was also statistically insignificant in both groups. Hence bone grafting in fresh comminuted it fractures does not change the final outcome in terms of radiographic union and degree of collapse.

### Summary and Conclusion

1. Introduction of bone grafting in patients with fracture it failed to show any benefit in rate of union at fracture site.

2. Bone grafting along with fixation does not have any added benefit in terms of degree of collapse when compared with the group without bone grafting.
3. No demonstrable added benefit in terms of outcome with the use of bone grafting in fracture of femur.

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