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Fracture neck of femur treated with hemiarthroplasty and cannulated cancellous screw fixation: a comparative study

S. K. Rai*, Rohit Vikas, Vyom Sharma, S. S. Wani, Rohit Varma

Department of Orthopaedics, Indian Naval Hospital Ship Asvini, Colaba, Mumbai, India

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***Correspondence:**
Dr. S. K. Rai,
E-mail: skrai47@yahoo.com

ABSTRACT

Background: Intracapsular fracture neck of femur has always presented great challenges to every Orthopaedic surgeons and it is remain a mystery whether to fix or to replace the fracture in the elderly. The aim of the study was to analyze the functional outcome of two widely used and accepted modalities of treatment in the age group 57-75 years, in Garden's type I and II fractures, namely (a) cannulated cancellous screw fixation(internal fixation) and (b) modular bipolar prosthetic replacement of the femoral head (hemiarthroplasty).
Methods: The total 110 patients were including in the study from age groups 57-75 (mean age 66). The Garden classification of fracture neck of femur was used to evaluate the displacement of femoral neck fractures. Only grade 1 and 2 was included in the study. 55 patients were included in each group A and B. Osteosynthesis (fracture fixation) was carried out by closed reduction and insertion of cannulated cancellous screw and in other group hemiarthroplasty was done.
Results: In group A 55 patient with fracture neck of femur was treated by osteosynthesis i.e. fixation using 02 or 03 cannulated cancellous screw and in group B, 55 patients with fracture neck of femur was treated by modular bipolar replacement hemiarthroplasty. In Group A out of 55, 41 patients union was achieved between 08 to 14 months (mean 11.5 month), 09 patients developed non-union even after 16 months and 05 patients develop collapse of head with AVN with shortening at end of 02 year, however in Group B out of 55 patients 51 patients started walking after 2nd postoperative days, 02 patients developed infection, and 02 patients developed posterior dislocation.
Conclusions: The fracture fixation may be tempting for fracture neck femur in age group 57-75 especially of Garden Type I but internal fixation put risk of non-union and AVN and second surgery may be required after few months or years if patients survive. Based on results in our study we therefore can conclude that in Garden Type I and II femur neck fractures in the patients between 57-75 years of age, hemiarthroplasty is the better modality of treatment.

Keywords: Fracture neck femur, Cannulated screw fixation, Avascular necrosis head femur, Garden classification of fracture neck femur, Hemiarthroplasty

INTRODUCTION

It is one of the more common injuries presenting to the emergency Department of Othopaedics OPD. It is usually seen in old age due to osteoporosis but in can also occurs in young age due to road traffic accident, sports related and fall from height. However, the optimal timing for surgical fixation of these fractures is still subject of debate in the literature.

Femoral neck fracture is a common and severe injury in the elderly with associated high mortality and morbidity. The incidence of these fractures has increased with improvement in life expectancy and is expected to double

in the next 20 years and triple by 2050.[1] Mortality rate of 20-30% in the year following the fracture has been reported.[1] Management of these fracture poses a challenge to the orthopaedic surgeon especially in the elderly patient with medical co-morbidities.

Fracture neck femur always required surgical intervention and is the gold standard treatment, but the best surgical treatment option is still to be found out.[2] Hip replacement arthroplasty (hemoarthroplasty or THR) is widely used modality of treatment option and it is supported by the review of literature and more so a broader consensus has been made regarding its benefits which allow immediate weight bearing, early restoration of premorbid activity level and enhanced quality of life in elderly patients.[3]

A study conducted by Rogmark et al showed complications of non-union, avascular necrosis and a high rate (30-40%) of reoperation following internal fixation and superior function after primary hemiarthroplasty which eliminates these complications as the femoral head and neck is replaced by metallic implant.[4]

In elderly even in undisplaced fracture neck of femur, there is no assurance that a fracture will attain an excellent result and 10% to 15% of these patients will develop complications like non-union and AVN, over which the surgeon has little or no control.[4] Moreover successful union with conservative management is not supported by literature and it is uncommon. So, surgical intervention has become the gold standard for all types of femoral neck fractures. Early anatomical reduction, compression of the fracture and stable internal fixation are used to promote fracture union.

METHODS

Our study was conducted between March 2012 and December 2015. The total 110 patients (69 female and 41 male) were include in the study from age groups 57-75 (mean age 66). Only Garden Type I (49) and II (61) fracture neck femur were included. Patients were divided into two group A & B, each group consists of 55 patients. Group A was treated by closed reduction if required at all and cannulated cancellous screw fixation and group B was treated by Hemiarthroplasty in Department of Orthopaedics , Indian Naval Hospital Ship Asvini, Colaba, Mumbai.

Inclusion criteria were patients with age groups 57-75 (mean age 66), Garden Type I and II fracture neck femur, no previous surgery around hip joint and patient who was mobile before injury.

Exclusion criteria were patients not willing for surgery, medically unfit for surgery, patient below age of 57 years and above age of 75 years, Gardens type 3 and type 4 classifications, patient with dementia and bed ridden patients, mentally deranged patients and pathological fracture neck femur.

The initial evaluation included a complete medical history, laboratory investigations including complete heamogram, radiological studies included X-ray. All patients were evaluated and underwent pre anesthesia checkup. Group A patients were placed supine in C-arm Compatible fracture table and operated using standard technique and protocol (closed percutaneous fixation) and 02 or 03 cannulated cancellous screw fixation was done. Group B patients were placed in lateral position on table and posterior Moors approach was used and modular cemented hemiarthroplasty was done. Group A patients was given preoperative IV Teicoplanin 400 mg and then single injection for 3 days, however group B was given same IV antibiotics for 5 days as many of them has comorbidity like Type II diabetes, hypertension and renal disease. Group A patient were allowed partial weight bearing walking from 3rd postoperative days using axillary crutches for 03 months and full weight bearing after that. Group B patient were allowed full weight bearing walking from 2rd postoperative days onward. We used SPSS ver. 19 for the statistical analysis of data.

RESULTS

In Group A the overall incidence of avascular necrosis in our study was 36% (20 out of 55). Incidence of avascular necrosis was seen more in Garden type II fracture and more in female patients shown in Table 1. We found no significant association between age of patient and avascular necrosis (p=0.462).

The correlation between time since injury and surgery and incidence of avascular necrosis in our patient is shown in Figure 1. We found that the incidence of AVN increased with increasing time lapse since injury and type of fracture also. Garden type II fractures were more prone to developed AVN even after fixation within 24 hr. The incidence of AVN for surgery done less than 24 hours was 3% as compared to 20% for surgery done later than 24 hours. The incidence of AVN compared between cases where the surgery was done before within 24 hours and after 24 hours, was statistically insignificant (p=0.5).

All the patients in our study had sustained intracapsular fractures. Upon analyzing the relationship of location of fractures whether (basicervical) base of neck, transcervical or subcapital, we found is statistical significance between locations of fractures and avascular necrosis (p=0.5). The incidence of AVN (avascular necrosis) in fractures at basicervical was 38% (12 out of 31), transcervical fracture 23% (3 of 13), and subcapital fractures showed AVN in 2 out of 11 (18%). However the overall incidence of AVN in Group A was 30.9 % (17 out of 55) and it was statistically insignificant (p=0.5) as shown in Table 2.

Table 1: Group A (55 patients): demographics and characteristics of evaluated cases (treated by cannulated cancellous screw fixation).

Characteristics	Number (%)	Fracture union at 18 months (%)	Feature of AVN at 18 months (%)	Patients developed non-union at 18 months (%)	P value
Sex					
Male	21 (38)	14 (25)	07 (12.7)	09 (16)	
Female	34 (61.8)	16 (29)	10 (18)	11 (20)	
Age group					
57-60	13 (23)	16	01	03	
61-65	12 (21.8)	06	03	05	0.462
66-69	16 (29)	06	07	07	
70-75	14 (25)	02	06	05	
Garden type					
Type - I	31 (56)	18 (32)	04 (06)	06 (10.9)	0.5
Type- II	24 (43)	12 (21.8)	16 (29)	14 (25)	
Time of surgery (in hours)					
<24	09 (16)	09	02 (03)	4	
24-72	12 (21.8)	11	04 (06)	7	0.5
>72	34 (61.8)	10	11 (20)	9	
Reduction configuration- (AP view)					
Neutral	18 (32)	05	---	---	
Valgus	29 (52)	16			
Varus	8 (14)	09			
Reduction configuration- (Lat view)					
Anterior	29 (52)	07	---	---	
Neutral	19 (34.5)	18			
Posterior	7 (12.7)	05			

Table 2: Type of fracture neck femur (location wise).

Type of fracture	No of patients (%)	Development of AVN after 18 months (%)
Basicervical	31 (55)	12 (38)
Transcervical	13 (23)	3 (23)
Subcapital	11 (20)	2 (18)
Total	55	17 (30.9)
P value		P=0.5

Table 3: Group B (55 patients): demographics and characteristics of evaluated cases (treated by modular bipolar hemiarthroplasty).

Characteristics	Number (%)	Postoperative infection	Dislocation
Sex			
Male	20 (36)	02	01
Female	35 (63.6)	01	
Age group			
57-60	09 (16)	01	
61-65	11 (20)	01	
66-69	28 (50.9)	01	01
70-75	07 (12)		
Garden type			
Type - I	12 (21.8)	02	01
Type- II	43 (78)	01	
Time of surgery (in hours)			
<24	02 (03)	01	01
24-72	23 (41.8)	02	
>72	30 (54.5)		

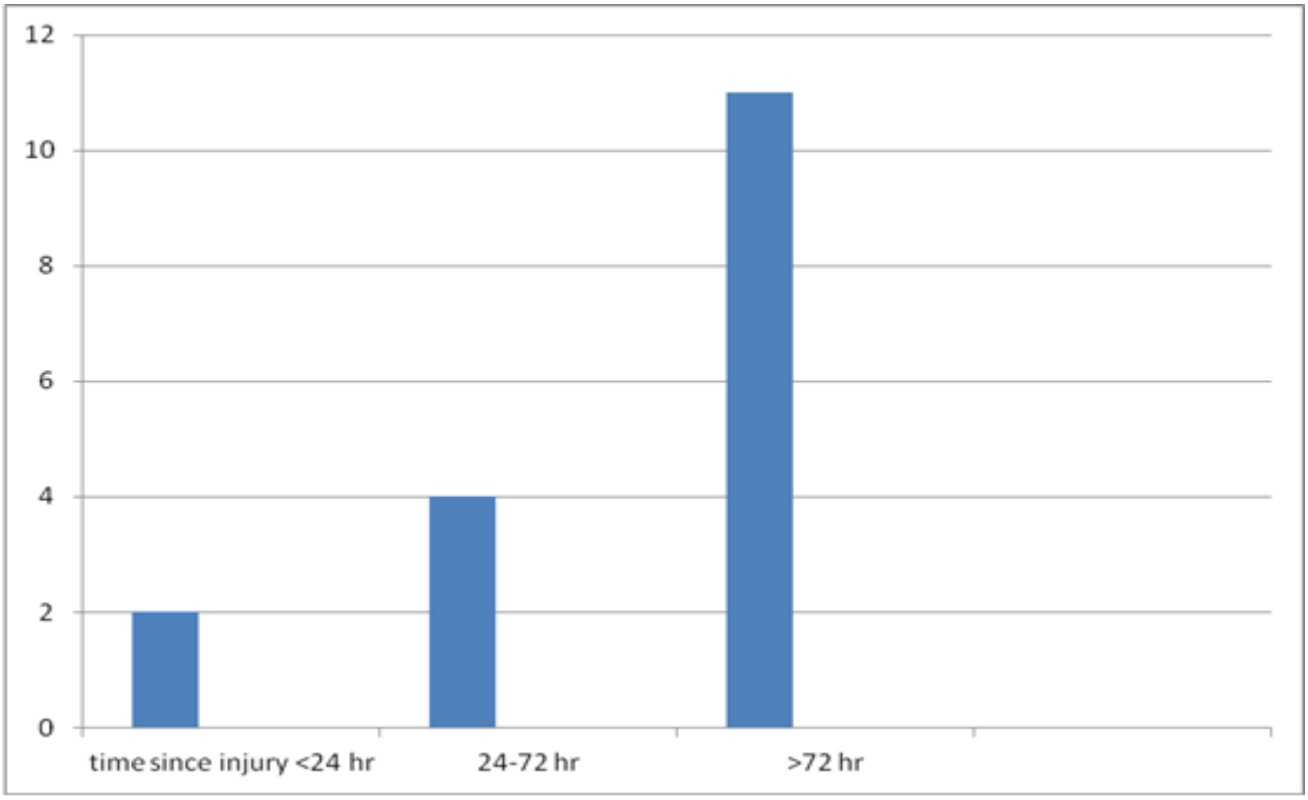

Figure 1: Interval to surgery and incidence of AVN.

In our study in group B, 03 patients developed postoperative infection which was managed by repeated wound debridement and suction drainage and after 35 days wound has healed. 01 patient developed posterior dislocation of hip on operated side which could not be relocated even under anesthesia. We offered him second surgery but patient refused. The dislocation was probably due to less anteversion of femoral stem.

DISCUSSION

Fracture neck of femur form a major share of fractures in the elderly. Osteoporosis, in elderly contribute co-morbidities, increased incidence of trivial trauma increases the incidence and complicates the treatment of these fractures. The treatment goal is to return the patient to his or her pre-injury status of function as early as possible.

Cannulated screws are now widely used for the fixation of femoral neck fractures. They provide stable and robust fixation than pins which are known to have a significantly lower rate of nonunion and infection than the sliding screw-plate.[5,6]

Screws should be applied in a parallel fashion[7] and when two screws are used, they should have a shaft diameter of at least 6.5 mm.[8] Positioning of a screw inferiorly and close to the calcar in the AP plane, offers cortical support to the screw and therefore better fixation. The same applies for posterior placement of a screw on the lateral view.[9] On the lateral view a less widely spread of the screws was associated with an increased risk of nonunion of the fracture.[10] These technical guidelines were strictly kept in our series forming the operative technique that has already been described.

In our opinion, given the right conditions specially in Garden Type I and Type II fracture as reduction is not much problem and after reduction close to ideal, proper prompt fixation and early mobilization is probably more significant than bothering for two or three screws for fixation. We think the percutaneous application of two cannulated screws as a less harming method for bone and soft tissues, relates to quicker bone healing and minimal complications. If good reduction has been achieved, early weight bearing is possibly a contributing factor to fracture healing through impaction and backing of the screws. However with all such precautions fracture neck femur is still has tendency to developed AVN especially in age group range from 55-75 even fracture was in Garden Type I and Type II (29%).

CONCLUSION

In the two study groups were comparable with respect to duration of surgery, and early mobilization with external support. Hemiarthroplasty study group was superior with respect to early mobilization however it was associated with estimated blood loss, requirements for blood transfusion, complications of few mechanical failures. While the cannulated screws study group had less

hospital stay, no blood loss. However this group associated with delayed mobilization, prolonged and protected mobilization with support and risk of development of AVN especially in Garden type II fracture.

Based on our study we can conclude that in the age group between 57–75 even it is undisplaced and incomplete fracture neck femur Garden Type I and Type II hemiarthroplasty gives excellent result and eliminate changes of non-union, AVN and second surgery in this age group where comorbidities like diabetes, hypertension, chronic kidney diseases, ischemic heart disease is common occurrence.

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