ORIGINAL ARTICLE

RESULTS OF DELAYED FIXATION OF DISPLACED FEMORAL NECK FRACTURES IN ADULTS: A RETROSPECTIVE CLINICAL STUDY

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ABSTRACT: Femoral neck fractures in young adults still remains a challenge due to high rates of non-union and avascular necrosis associated with it. Traditionally fracture neck of femur are treated as emergency operations but in our set up there is usually a delay in treating them. This paper evaluates the effect of timings of surgery on healing of fracture and functional outcome. **METHODS:** This retrospective study was conducted in Department of Orthopaedics & Traumatology, Bundelkhand Medical College, Sagar from November 2012 to May 2015 during which 34 cases were evaluated and treated with closed reduction and internal fixation. Only physiological young patients between the ages of 15 to 65 years with Garden's grade III & IV were included. Fractures associated with any pathological process or associated with other ipsilateral lower limb fractures were excluded. Patients treated with open reduction were also not included in this study. **RESULTS:** Out of 34 patients only 3 patient could be operated within 48 hours. The average delay in admission of patient was 4 days and average duration from injury to operation was 8.5 days. Non-union rates overall was 38.2%, for those operated within a week was 35.7% and for those operated after was 40%. If non-union due to mal reduction were excluded the rates were 19.2%, 10% and 25% respectively. **CONCLUSION:** In the treatment of fracture neck of femur quality of reduction proves to be the single most important variable affecting the outcome if operated within a week appears to be less significant variable if reduction was within acceptable range as non-union rate of only 14.2% was recorded. Thus good results can be achieved even after 48 hours though after a week non-union rates were high which suggests that after a week fibrosis around the fracture and hip and proximal migration of the distal fragment necessitate other open reduction or procedures such as intertrochanteric osteotomy or bone grafting in order to achieve union.

KEYWORDS: Femoral neck fractures, Young adult, Non-union.

INTRODUCTION: Intracapsular femoral neck fractures in young adults is an uncommon injury and a difficult one to manage. Non-union and avascular necrosis is reported in these injuries with a higher incidence in young adults. Reported rates of non-union ranges from 6 to 59% and reported rates of avascular necrosis ranges from 12% to 86%.¹⁻⁴ Variables that have been postulated to affect the outcome include quality of reduction or fixation of the fracture^{3,5,6}, timing of surgery⁴⁻¹⁰ and elevated intracapsular pressure.¹¹⁻¹³ Variables which are not in control of surgeon includes vascular damage from initial neck fracture, fracture classification,¹⁴ quality of bone and posterior comminution⁹ and delay in seeking medical attention.

There is generally a common consensus that anatomical reduction with stable internal fixation are paramount for good results.^{4,5} But other variables such as use of closed or open reduction,^{8,9,15,16,17} the role of capsulotomy,^{11-13,17} timing of surgery⁴⁻¹⁰ and age group 60-70 years¹⁷ still remains controversial. The method of fixation remains a less controversial variable.¹⁷

ORIGINAL ARTICLE

The usual management of fracture neck of femur (NOF) in elderly patients is hemiarthroplasty or total hip arthroplasty. In contrast, there is much less evidence to support any treatment method in the management of patients under the age of 60 years where these fractures are considerably less common. Since this patient group is younger, it is imperative to retain as much bone as possible; thus, hip replacements are a last resort.¹⁸ There is no consensus regarding exactly how quickly a femoral neck fracture in a individual must be reduced and fixed. As in any fracture, healing is dependent on restoration of alignment, preservation of blood supply and stability of the fracture. Since the blood supply to the femoral head is compromised by displacement or increased intracapsular pressure, some advocates early fixation of these fractures (Within 6 to 12 hours). This allows for early reduction, unkinking of the critical retinacular vessels and thus restoring the blood supply to the femoral head, all of which may decrease the rates of non-union and avascular necrosis. On the contrary there are studies that found that the rates of non-union and avascular necrosis were not statistically different between those treated within 12 to 24 hours from the time of injury from those treated thereafter.^{6-8,10} In our study we aim to address these disparities and study the effect of delayed fixation on union by reducing the confounding factors affecting the outcome.

MATERIAL AND METHODS: This retrospective study in which records from Department of Orthopaedics & Traumatology, Bundelkhand Medical College, Sagar during November 2012 to May 2015 were used. A total of 52 patient who attended the outdoor patient department at the institute with femoral neck fracture irrespective of the institute where operative work was carried out were included in the study. Only physiological young patients between the ages of 15 to 65 years with Garden's grade III & IV were included. Fractures associated with any pathological process or associated with other ipsilateral lower limb fractures were excluded. Patients treated with open reduction were also not included in this study. Garden's classification¹⁴ of fracture NOF was used to divide patients into undisplaced (Garden I or II) and displaced (Garden III and IV) intracapsular fracture groups; there were 6 and 46 patients, respectively, in the two groups. This is an important distinction when considering frequency of avascular necrosis and non-union.¹⁷ Therefore these 6 patients were excluded from the study to minimize their effect. Similarly another 12 patients which were treated with open reduction and internal fixation were also excluded to reduce the bias. Thus only 34 patients with femoral neck fracture under the age of 65 were included. Displaced fracture neck of femur were again divided into two groups those which were treated within seven days and those which were treated after seven days.

Mechanisms of injury ranged from high-energy trauma, such as road traffic accidents, falls from significant heights to low-energy injuries, such as mechanical falls. 24(70%) were due to fall and 10(30%) were due to RTA. (Table No. 1) Time elapsed from injury to admission and from admission to surgery were noted and cause of delay were also recorded.

Patients were operated on traction table and fixation was achieved usually by dynamic hip screw with a de rotation screw except for 6 sub capital fractures in which 6.5mm cannulated cancellous screws were used in an inverted triangle fashion which were equally distributed among the both groups. Nonunion was defined as a loss of reduction or fixation after six weeks or radiological absence of union at one year. Average age of patient was 32 years, 23(70%) of them being males. Average duration of injury to surgery was 8.5 days. Acceptable reduction was achieved in 28(82%) cases.¹⁹ Average follow up was 14 months.

ORIGINAL ARTICLE

OBSERVATION AND RESULTS: Of the total 52 patients addressed during the study 6 were excluded for being un displaced and 12 were excluded for being treated by open reduction. Thus out of 34 patients 14 were operated within a week and remaining 20 after one week. Only 3 patients could be operated within 48 hours. (Table no. 2) 5 non-union were reported among 14 patients operated within a week accounting for a non-union rate of 35.7%. 3 out of these 5 non-union can be accounted for unacceptable reduction. (Table no. 3) Thus accounting for non-union due to delay in surgery was only 14%. Similarly in the group of 20 patients operated after a week, 8 non-union were reported giving a high non-union rate of 40%. But if again 3 patients with unacceptable reduction were deducted a non-union rate of 25% was achieved. Overall non-union rates also decreased from 38.2% to 21% when the cause of non-union as unacceptable reduction was taken into account.

DISCUSSION: Younger patients have a higher prevalence of femoral head osteonecrosis and non-union and it is imperative to anticipate the occurrence of Osteonecrosis and non-union as it can lead to further complications. The femoral head has an inherently vulnerable blood supply due to its natural course²⁰ It is fed by a different vessels, predominantly by branches of the medial and lateral femoral circumflex arteries that encircles the femoral head in the trochanteric area and branch off into retinacular vessels that pass proximally toward the head in three segments: small anterior, posteroinferior and posterosuperior retinacular arteries. Anterosuperior femoral head usually supplied by the acetabular branch of the obturator artery through ligament of teres. More specifically, the terminal arteries are intracapsular and can be easily disturbed with fracture NOF, their manipulation and changes in intracapsular pressure.¹¹⁻¹³

It is widely accepted that anatomical reduction and stable internal fixation of fracture NOF reduces the risk of osteonecrosis of femoral head and is therefore the goal of therapy. In our study we also reported fairly low non-union rate of 21% in cases with near anatomical reduction. However, there is paucity of evidence-based literature indicating the most favourable time to fixation that minimizes its complications. Swiontkowski et al achieved union of 100% when surgery was performed within eight hours of the injury.⁵

This high rate of union may have been influenced by the number (30%) of un displaced Garden grade II fractures among their patients. Zetterberg et al⁴ and Bray⁹ also suggested that the timing of surgery after injury was an important factor in influencing the outcome. Haidukewych et al reported that osteonecrosis rates were not statistically significant between those treated within 24 hours from the time of diagnosis and those treated more than 24 hours from the time of diagnosis.⁶

Upadhyay et al found that internal fixation was equally effective within one week of injury irrespective of whether it was carried out before or after 48 hours.⁸ They also commented that after a week fibrosis around the fracture and hip and proximal migration of the distal fragment necessitate other open procedures such as intertrochanteric osteotomy or bone grafting in order to achieve union.

Our study from the developing countries is unique since patients rarely presents to us with fresh fracture. There is delay on part of patient in seeking medical attention and most of the time they are delayed while been referred to our institute from smaller centres.

Causes of delay after admission included delay on part of anesthesia, unavailability of emergency operating hours and delayed availability of implants due to various schemes. We in our study were able to neutralize the effect of confounding variables such as undisplaced fractures,

ORIGINAL ARTICLE

fractures treated by open reduction and those due to method of fixation at the cost of reducing the number of patients from 52 to 34.

Quality of reduction proves to be the single most important variable affecting the outcome. Timings if operated within a week appears to be less significant variable if reduction was within acceptable range as non-union rate of only 14.2% was recorded which is at par rates in literature.^{8,9,10,15,17,18} Thus good results can be achieved even after 48 hours though after a week non-union rates were high which suggests that after a week fibrosis around the fracture and hip and proximal migration of the distal fragment necessitate other open procedures such as intertrochanteric osteotomy or bone grafting in order to achieve union.

BIBLIOGRAPHY:

1. Kuslich SD, Gustilo RB. Fractures of the femoral neck in young adults. *J. Bone Joint Surg.* 1976; 58A: 724.
2. Massie WK. Fractures of the hip. I. *Bone joint Surg.* 1964; 46A: 658.
3. Protzman RR, Burkhalter WE. Femoral neck fractures in young adults. *J. Bone Joint Surg.* 1976; 58A: 689.
4. Zetterberg CH, Instam L, Andersson GBJ. Femoral neck fractures in young adults. *Acta Orthop. Scand.* 1982; 53: 427.
5. Swiontkowski MF, Winquist RA, Hansen ST Jr. Fractures of the femoral neck in patients between the ages of twelve and forty-nine years. *J Bone Joint Surg Am.* 1984; 66: 837-46.
6. Haidukewych GJ, Rothwell WS, Jacofsky DJ, Torchia ME, Berry DJ. Operative treatment of femoral neck fractures in patients between the ages of fifteen and fifty years. *J Bone Joint Surg Am.* 2004; 86: 1711-6.
7. Jain R, Koo M, Kreder HJ, Schemitsch EH, Davey JR, Mahomed NN. Comparison of early and delayed fixation of subcapital hip fractures in patients sixty years of age or less. *J Bone Joint Surg Am.* 2002; 84: 1605-12.
8. Upadhyay A, Jain P, Mishra P, Maini L, Gautum VK, Dhaon BK. Delayed internal fixation of fractures of the neck of the femur in young adults. A prospective, randomised study comparing closed and open reduction. *J Bone Joint Surg Br.* 2004; 86: 1035-40.
9. Bray TJ. Femoral neck fracture fixation. *Clin Orthop* 1997; 339: 20-31.
10. Fathima Razik et al. Time to internal fixation of femoral neck fractures in patients under sixty years—does this matter in the development of osteonecrosis of femoral head? *Int Orthop.* 2012 Oct; 36 (10): 2127–2132.
11. Bonnaire F, Schaefer DJ, Kuner EH. Hemarthrosis and hip joint pressure in femoral neck fractures. *Clin Orthop Relat Res.* 1998; 353: 148-55.
12. Barnes R, Brown JT, Garden RS, Nicoll EA. Subcapital fractures of the femur. A prospective review. *J Bone Joint Surg Br.* 1976; 58: 2-24.
13. Maruenda JI, Barrios C, Gomar-Sancho F. Intracapsular hip pressure after femoral neck fracture. *Clin Orthop Relat Res.* 1997; 340: 172-80.
14. Garden RS. Low-angle fixation in fractures of the femoral neck. *J Bone Joint Surg Br.* 1961; 43: 647-63.
15. Gautum VK, Anand S, Dhaon BK. Management of displaced femoral neck fractures in young adults (a group at risk). *Injury* 1998; 29: 215-18.

ORIGINAL ARTICLE

16. Gray DH. The evolution of a personal philosophy in treatment of subcapital femoral neck fractures. JBS 1988; 70(Br) 1: 161.
17. Thuan V Ly, Marc F Swiontkowski. Management of femoral neck fractures in young adults. J Bone Joint Surg Am. 2008; 90: 2254-2266.
18. Bhandari M, Devereaux PJ, Tornetta P 3rd, Swiontkowski MF, Berry DJ, Haidukewych G, Schemitsch EH, Hanson BP, Koval K, Dirschl D, Leece P, Keel M, Petrisor B, Heetveld M, Guyatt GH. Operative management of displaced femoral neck fractures in elderly patients. An international survey. J Bone Joint Surg Am. 2005; 87: 2122-30.
19. Garden RS. Malreduction and avascular necrosis in subcapital fractures of femur. J Bone Joint Surg 1971; 53B: 183-196.
20. Kregor PJ. The effect of femoral neck fractures on femoral blood flow. Orthopedics. 1996; 19(12): 1031-1036.

Mode of Trauma	Number of Patients
Fall from height	24
Road traffic accident	10

Table No. 1: Mechanism of injury

Timing of Surgery	Number of Patients
< 48 hours	3
Within 1 week	14
After 1 week	20

Table No. 2: Delay in surgery

Quality of Reduction	Number of Patients
Acceptable	28
Unacceptable	6

Table No. 3: Quality of reduction

Chart 1: Distribution of non-union in two groups

ORIGINAL ARTICLE

	< 1 week	>1 week
Non union	5	8
Union	9	12
Percentage	35.7%	40%

Chart 2: Revised rates after excluding cases of unacceptable reduction

Number of Patients	< 1 week	>1 week
Non union	2	5
Percentage	14.2%	25%

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