ORIGINAL ARTICLE

Non-Union and Avascular Necrosis in Fracture Neck of Femur Fixed with Cannulated Screws in Young Adults

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ABSTRACT

Objective: To determine the frequency of non-union and avascular necrosis in fracture neck of femur in young adults fixed with cannulated screws.

Methods: This descriptive Case series study of 55 patients was conducted from January 2012 to June 2014. Each case was followed up for a period of three months to observe non-union and avascular necrosis after neck of femur fracture. Fracture was stabilized in compression mode by cannulated screws.

Results: There were 42 males and 13 females with male to female ratio 3.3:1. The mean age was 29.69±11.43 years. There were 47 patients having no avascular necrosis and 8 patients have avascular necrosis. Five patients have non-union and in 50 patients union achieved.

Conclusion: we concluded in treating femoral neck fractures should include early diagnosis, early surgery, anatomic reduction, capsular decompression and stable internal fixation with cannulated screws.

Key words: Non-union, Avascular Necrosis, Femoral neck fractures, Cannulated screw fixation.

INTRODUCTION

Fracture of the neck of the femur have always presented great challenges to orthopaedic surgeons and remain in many ways today the unsolved fracture as far as treatment and results are concerned. With life expectancy increasing with each decade, our society is becoming more and more a geriatric society, with significant number of hospitalized and nursing home patients suffering from femoral neck fractures and their sequelae.[1] Femoral neck fractures in young patients usually are caused by high-energy trauma and often are associated with multiple injuries and high rates of avascular necrosis and nonunion.[2]

The commonest site of fracture in elder peoples is fracture neck of femur.[3] In elderly fractures are due to weakened bone and may occur even minimal trauma is often referred to as a fragility fracture.[5] Due to precarious blood supply of neck of femur, chances of nonunion and avascular necrosis (AVN) are high.[6,7] So it is challenge for orthopedic surgeons and society to prevent and manage fracture neck of femur.

Fracture NOF can be treated in a number of ways depending on age and Physical activity of the patient and on displacement of fracture.[7] Garden classification is the most common classification for fracture neck of femur. Garden types I and II (Impacted and undisplaced fractures respectively) are treated by internal fixation with cannulated screws. Garden types III and IV (Displaced fractures) are treated by closed/open reduction and internal fixation below age of 55 years and above age 55 years treated with hemiarthroplasty or total hip replacement. In patients with pre-existing hip lesions, total hip replacement (THR) is offered[8]. In neglected non union cases of fracture NOF in young adults (<55 years), bone grafting with internal fixation is a reliable method with good long term functional outcomes[9]. Early reduction of fracture is necessary to decrease the risk of avascular necrosis and non-union, and the gold standard is internal fixation through cannulated screw[10]. In one previous study the frequency of avascular necrosis after treatment with cannulated screws was 12% and non union was 16%[7] another study non union and avascular necrosis have been reported to occur in 10-30% and 10-45% of patients respectively[5]. Cannulated screws are now universally used for the fixation of femoral neck fractures[7].

Our study will determine the frequency of nonunion and avascular necrosis in fracture neck of femur fixed with cannulated screws in our population

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as previous literature show variable/conflicting results regarding this issue.

METHODS

It was a Descriptive case series study conducted from 1st January 2012 to 30th June 2014. Sample size of 55 cases is calculated with 95% confidence level, 9% margins of error and taking expected percentage of avascular necrosis i.e. 12% (least among both) in fracture neck of femur in patients fixed with cannulated screws. After evaluation according to Advance Trauma Life Support (ATLS) protocol, 55 cases fulfilling the inclusion and exclusion criteria were selected from department of Orthopaedics and Spine Surgery, Ghurki Trust Teaching Hospital Lahore, for a period of six months. Each case was followed up for a period of three months to observe non-union and avascular necrosis after fracture neck of femur. All patients were asked to sign informed consent. The ethical committee of the orthopaedic department Ghurki Trust Teaching Hospital Lahore approved study procedure.

Patient was placed on traction table in supine position under spinal anaesthesia, fracture was manipulated and reduced anatomically under image intensifier. After paint and draping, a small incision was given. Three guide wires were passed with the control in anterior, posterior and inferiorly in an inverted triangle fashion, through the shaft to the neck and head of femur. In few cases two guide wires may be passed superiorly and inferiorly. Cannulated screws were used to fix the fracture in compression mode. Postoperative antibiotics and analgesia will be given for 3 to 5 days as in the hospital protocol. The rehabilitation program was started on first postoperative day by advising the patient about isometric exercises of the lower limb and non-weight bearing for 8 weeks. The patient was followed up after three months to evaluate radiologically for nonunion and a bone scan to determine avascular necrosis.

The data was analyzed in SPSS version 10. Mean ± standard deviation was calculated for quantitative variable like age. Frequency and percentages were calculated for categorical variables like age, non-union and avascular necrosis. Results were stratified among age and sex to see the effect modification.

RESULTS

There were 42 males (76.4%) and 13 females (23.6%). Male to female ratio was 3.3:1 (Table 1).

The patients shown in Table 2 were divided into four age groups. The first age group patients aged 15-25 years (n = 25) 45.5%, in second age group patients aged 26-35 years (n = 13) 23.6%, in the third age group patients aged 36-45 years (n = 10) 18.2% and in the fourth age group patients aged 46-55 years (n = 7) 12.7%. The mean ± SD between the ages was 29.69±11.43 years.

Table 3 showed the avascular necrosis of the patients. There were 47 patients (85.5%) have no avascular necrosis and 8 patients (14.5%) have avascular necrosis.

Five patients (9.1%) have non-union and in 50 patients (90.9%) union achieved (Table 4).

Table 1: Distribution of patients according to sex (n=55)

Sex	Frequency	Percentage
Male	42	76.4
Female	13	23.6

Male to female ratio 3.3:1

Table 2: Distribution of patients according to age (n=55)

Age in years	Frequency	Percentage
15 – 25	25	45.5
26 – 35	13	23.6
36 – 45	10	18.2
46 – 55	7	12.7

Mean±SD 29.69±11.4

Table 3: Distribution of patients according to avascular necrosis (n=55)

Avascular Necrosis	Frequency	Percentage
No	47	85.5
Yes	8	14.5

Table 4: Distribution of patients according to non-union (n = 55)

Non-union	Frequency	Percentage
Yes	5	9.1
No	50	90.9

DISCUSSION

Femoral neck fracture in young adult is an emergency and the patient needs to be treated by early closed reduction and stable fixation. Femoral neck fractures

continue to be common injuries. In 1990, there were 1.66 million hip fractures worldwide. That figure is expected to increase to 2.6 million by 2025[11]. From a public health standpoint, prevention is of utmost importance, but, once a fracture has occurred, surgical treatment is usually indicated. In the United States, a common practice is closed reduction and pinning of the hip with 3 parallel screws. However, 2 screws may be more appropriate for small femoral necks, young children, and nondisplaced or stress fractures[12].

Cannulated screws are now universally used for the fixation of femoral neck fractures and providing the better fixation as compared to pins[13].

The pattern of screw application should in a parallel fashion[14] and usually two screws with size of at least 6.5mm to increase the stability[15]. For better fixation place the screw in various positions like inferiorly and close to the calcar in the Anterior Posterior plane and posterior placement of a screw on the lateral view[16,18]. On the lateral view a reduced spread of the screws was associated with an increased risk of nonunion of the fracture[19]. These technical guidelines were strictly followed in our series.

Male female ratio in the present study is reversed i.e. M:F = 3.3:1 (Table 1) as compared to the literature which is M:F ratio is 1:3.5[20]. These contradictions and results are due to the population sample selected from poor society of Punjab province.

In the present study, 90.9% (50 patients) of the fractures united, only 9.1% (5 patients) have non-union (Table 4). In 85.5% (47 patients) have no avascular necrosis and 14.5% (8 patients) have avascular necrosis (Table 3). But in literature the rate of osteonecrosis is 20 to 35% following displaced femoral neck fractures[21,22].

In all of these non-unions cases the head remained viable but hemiarthroplasty was performed despite having the option of valgus osteotomy and bone grafting.

Though there appears to be no clinical evidence indicating which design of screws is preferable, or if two, three or more screws are the best, biomechanic studies in cadavers[23,24] or using bone models[25] favor the application of three screws in a triangular fashion.

Osteonecrosis of the femoral head and nonunion are the two most common and challenging complications after Femoral neck fractures. Initial fracture displacement and disruption of the femoral head blood flow are contributing factors that are out of the surgeon's control. However, there are multiple other factors under the surgeon's control that can minimize and prevent these complications.

CONCLUSION

The key factors in treating femoral neck fractures should include early diagnosis, early surgery, anatomic reduction, capsular decompression and stable internal fixation with cannulated screws.

REFERENCES

1. Schmidt AH, Swiontkowski MF. Femoral neck fractures. Orthop Clin North Am 2002;33A:97-111.
2. Eastwood EA, Magaziner J, Wang J, Silberzweig SB, Hannan EL, Strauss E et al. Patients with hip fracture: subgroups and their outcomes. J Am Geriatr Soc. 2002;50:1240-9.
3. Nayagam S. Injuries of the hip and femur. In: Solomon l, Warwick D, Nayagam S, editors. Apley's system of orthopaedics & fractures. 9th ed. Arnold, 2010;847-53.
5. Patwa JJ, Krishnan A, Pamecha CC. Biogeometry of femoral neck for implant placement. Indian J Orthop 2006;40:224-7.
6. Ly TV, Swiontkowski MF. Treatment of femoral neck fractures in young adults. Instr Course Lect 2009;58:69-81.
7. Nizami MA, Ahmed F, Shah MA, Khan TB. Fracture neck of femur treated with cannulated screws in middle-aged patients. J Pak Orthop Assoc 2009;21:45-51.
8. LaVelle DG. Fractures and dislocations of the hip. In: Canale ST, editor. Campbell's operative orthopedics. 11th ed. Philadilphia: Mosby Elsevier, 2008;3237-308.
9. Roshan A, Ram S. The neglected femoral neck fracture in young adults: review of a challenging problem. Clin Med Res 2008;6:33-9.
10. Xarchas KC, Staikos CD, Pelekas S, Vogiatzaki T, Kazakos KJ, Verettas DA. Are two screws enough for fixation of femoral neck fractures?. Open Orthop J 2007;1:4–8.
11. Gullberg B, Johnell O, Kanis JA. Worldwide projection for hip fracture. Osteoporos Int 1997;7:407-13.
12. Voss L, DaSilva M, Trafton PG. Bilateral femoral neck stress fractures in an amenorrheic athlete. Am J Orthop 1997;26:789-92.
13. Christie J, Howie Cr, Armour PC. Fixation of displaced subcapital femoral fractures. Compression screw fixation versus double

divergent pins. J Bone Joint Surg Br 1998;70:199-201.
14. Parker MJ, Porter KM, Eastwood DM, Schembi Wismayer M, Bernard AA. Intracapsular fractures of the neck of femur. Parallel or crossed garden screws. Bone Joint Surg Br 1991; 73:826-7.
15. Loken S, Andreassen GS. Surgery of femoral neck fractures - higher rate of osteosynthesis failure with the use of 4.5 mm screws compared to 6.5 mm screws Tidsskr Nor Laegeforen 2001;121:2474-5.
16. Lindequist S, Wredmark T, Eriksson SA, Samnegard E. Screw positions in femoral neck fractures. Comparison of two different screws. Acta Orthop Scand 1993;64:67-70.
17. Lindequist S. Cortical screw support in femoral neck fractures. Acta Orthop Scand 1993;64:289-93.
18. Lindequist S, Tornkvist H. Quality of reduction and cortical screw support in femoral neck fractures. J Orthop Trauma 1995;9:215-21.
19. Gurusamy K, Parker MJ, Rowlands TK. The complications of displaced intracapsular fractures of the hip:the effect of screw positioning and angulation on fracture healing. J Bone Joint Surg Br 2005;87:632-4.
20. Hinton RY, Smith GS: The association of age, race, and sex with the location of proximal femoral fractures in the elderly. J Bone Joint Surg Am 1993;75:7-9.
21. Holmes CA. Biomechanics of pin and screw fixation of femoral neck fracture. J Orthop Trauma 1993;7:242.
22. Levi N. Fracture of femoral neck optimal screw positon and bone density determined by computer tomography. Injury 1996;27:287-93.
23. Husby T, Alho A, Ronningen H. Stability of femoral neck osteo-synthesis.Comparison of fixation methods in cadavers. Acta Orthop Scand 1989;60:299-302.
24. Maurer SG, Wright KE, Kummer FJ, Zuckermann JD, Koval KJ. Two or three screws for fixation of femoral neck factures? Am J Orthop 2003;32:438-42.
25. Selvan VT, Oakley MJ, Rangan A, Al-Lami MK. Optimum con-figuration of cannulated hip screws for the fixation of intracapsular hip fractures: a biomechanical study. Injury 2004; 35:136-41.