

Non-Union in Fractures Neck of Femur in Adults Fixed with Cannulated Screws

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ABSTRACT

Background: Neck of femur fractures is a devastating injury. Nonunion is one of its main complications. Cannulated screws are now universally used for the fixation of femoral neck fractures.

Objective: To determine the frequency of non-union in fracture neck of femur in adults fixed with Cannulated screws.

Material and Methods: This descriptive cross sectional study was conducted at orthopedic unit of Ayub Teaching Hospital Abbottabad from 7th March, 2011 to 6th September, 2011 recruiting 113 patients of either gender between 15 to 60 years of age with fracture neck of femur who were fixed with cannulated screws. The data was entered and analyzed with the help of SPSS 10.

Results: There were 113 patients with an overall mean age of 43.51 years \pm 11.94SD. Maximum number of patients was 56 (49.50%) from the age group of 46 to 60 years. Non-union was noted in 16 (14.16%) cases. The maximum number of patients with non-union was 7 (43.75%) in the age group of 46 to 60 years and minimum in the age group of 15 to 25 years i.e. 1 (6.25%).

Conclusion: Non-union is high in old ages in displaced fractures of neck of femur treated with cannulated screws.

Key Words: Neck of femur fracture, Non-union, Cannulated Screw.

INTRODUCTION

Fracture neck of femur (NOF) is common in elderly and is related to high-energy trauma in young adults, nonunion is one of its common complications¹. So it is a medical, social & economic challenge for orthopedic surgeons & society. It has been labeled as an unsolved fracture².

Fracture NOF can be treated in a number of ways depending on physiologic age & activity level of patient & on displacement of fracture³. Impacted & undisplaced fractures (Garden types I & II) are treated by internal fixation with Cannulated/Cancelous screw or a compression screw with a side plate. Displaced fractures (Garden types III & IV) are treated by closed/open reduction & internal fixation below age of 65 years. In patients with pre-existing hip lesions, total hip replacement (THR) is offered⁴. In cases of neglected fracture NOF in young adults (<60 years), bone grafting with internal fixation is a reliable

method with good long term functional outcomes⁵. Urgent fracture reduction is necessary to minimize the risk of avascular necrosis, and the gold standard is internal fixation through cannulated screw⁶.

Cannulated screws are now universally used for the fixation of femoral neck fractures⁷. Patients with less than 60 years of age with fracture NOF are treated by closed/open reduction & cannulated screws fixation. There is minimal blood loss, less operative time & decreased chances of avascular necrosis compared with compression screw & side plate⁸. Two screws fixation appears to be adequate⁹.

While managing fracture neck of femur in patients with less than 60 years of age, it is important that the head of femur should be preserved as well as to achieve union and prevent avascular necrosis. This study will help in determining the trend of non-union in fracture neck of femur fixed with cannulated screws. The results of this study will be used to make standard ward and surgical guidelines in case if the frequency of non-union is found to be significantly high. The results of this study will also help other orthopedic surgeons to update them about the frequency of non-union and recommendations will be given regarding modification of surgical technique.

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The objective of this study was to determine the frequency of non-union in fracture Neck of Femur in adults fixed with Cannulated Screws.

MATERIAL AND METHODS

This descriptive cross sectional study was carried out at Orthopedic unit, Ayub Teaching Hospital, Abbottabad during 6 months from 7th March 2011 to 6th September 2011. The sample size was 113 and the sampling technique was consecutive non-probability. The inclusion criteria adopted was; patients, aged 15-60 years, presenting with fracture neck of femur within two weeks of injury of either gender. Patients with hip arthritis, pathological fracture and severe osteoporosis diagnosed on x-rays were excluded from the study.

All the patients attending the outpatient department and accident and emergency department of the Ayub Teaching Hospital Abbottabad with fracture neck of femur providing informed consent and meeting inclusion criteria were included in the study. Fracture neck of femur was defined as when there was a break in the continuity of the cortices of femoral neck anywhere from subcapital to basicervical area seen on X-Rays of the affected hip. Variables like age and gender were noted. The diagnosis and degree of displacement of fracture neck of femur was established by taking history, doing physical examination, taking proper images like x-rays of the involved hip; Antero-posterior views with foot internally rotated and lateral views. Preoperative laboratory investigations were arranged. After putting the patient in supine position under spinal anesthesia, fracture was manipulated and reduced anatomically under C-arm control by closed method. After cleaning 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 some cases two guide wires were passed superiorly and inferiorly. Cannulated screws were used to fix the fracture in compression mode. Postoperative analgesia and antibiotics were given for 3 to 5 days as in the protocol. The rehabilitation program was started on first postoperative day by advising the patient about isometric exercises of the limb and non-weight bearing for 6 to 8 weeks. The patients were followed up after three months to evaluate radiologically for non-union. Nonunion was defined as when there was no sign of callus formation and partial obliteration of the fracture site after 3 months on x-rays of affected hip. Patient’s telephonic

contacts and addresses were taken to ensure follow-up. The data was recorded on the proforma. Exclusion criteria were strictly followed to control confounders and bias in the study results.

The date was analyzed in SPSS version 10 for windows. Mean ± Standard deviation was calculated for quantitative variables like age. Frequency and percentages were calculated for categorical variables like gender and non-union. Non-union was stratified among age and gender to see the effect modification. All the results were presented in the form of tables and graphs.

RESULTS

The total number of patients was 113 presenting with neck of femur fracture. There were 85 (75.22%) males and 28 (24.78%) females. The male to female ratio was 3.03:1. The mean age of male patients was 42.18 years ± 12.72SD and female was 37.92 years ± 13.02SD with an overall mean age of 41.13 years ± 13.02SD.

The total number of patients presenting with non-union of neck of femur fracture was 16 (14.16%). The maximum number of patients with non-union was 9 (56.25%) belonging to the age group of 46 to 60 years while minimum patients were from the age group of 15 to 25 years i.e. 1 (6.25%). According to gender, non-union was in 10(62.50%) males and 6(37.50%) females detail according to age wise distribution is shown in Table No. 1.

According to Garden classification, maximum frequency of non-union of neck of femur fracture was recorded in type IV that was 11 (68.75%). Full detail is in Table No. 2

Table 1: Age and Gender Distribution of Non Union of Neck of Femur Fracture

Age of Patient	Non-union N = 16 (%)
15-25 years n=15(13.27%)	1 (6.25%)
26-35 years n=20(17.70%)	2 (12.50%)
36-45 years N=29(25.66%)	4 (25.00%)
46-60 years n=49 (43.36%)	9 (56.25%)
Gender	
Male	10 (62.50%)
Female	6 (37.50%)

Table 2: Frequency of Non Union in Patients with Neck of Femur Fracture According to Garden Classification

Type of fracture	Non Union
Garden I (Incomplete, undisplaced fracture) N=7 (6.19%)	0 (0%)
Garden II (Complete, undisplaced fracture) N=20 (17.70%)	1 (6.25%)
Garden III (Complete, partially displaced fracture) N=50 (44.25%)	4 (25.00%)
Garden IV (fully displaced fracture) N=36 (31.86%)	11 (68.75%)

DISCUSSION

Intracapsular neck of femur fractures is a devastating injury and its treatment and results have remained a great challenge for orthopedics surgeons. The incidence of such fractures is increasing in the modern world due to high-energy trauma associated with road traffic accidents¹⁰. Nonunion and avascular necrosis of the femoral head or a combination of both is the main complication following fractures of the femoral neck¹¹.

In spite of improved operative techniques, nonunion is still reported in 10-20% of cases¹². The reason is a combination of unfavorable biomechanical and vascular conditions caused by the fracture itself, ignoring general contraindications, poor reduction and inadequate internal fixation. Usually there is shortening in the fracture, which limits the indication for simple re fixation, the least radical operation¹³.

In our study the mean age of the patients was 41.13 years. Most of the patients were male (75.22%). This is because males are more involved in outside home activities while females stay at home most of the time and they sustain less injuries. Male predominance is also noted in another local study (72%)¹⁴. But on the other hand in a retrospective review by Lu HD et al, there was female predominance (52 females with 21 to 88 years old and the average age was 56.3 years) with femoral neck fractures treated with cannulated compression screws¹⁵. Majority of the patients (43.36%) in our study were from the age group of 46 to 60 years followed by the age group of 36 to 45 years (25.66%) and age group of 26 to 35 years (17.70%). These age groups are involved more in daily routine activities in our setup hence affected more than the

younger age group of 15 to 25 years who were 13.27%. This is also in accordance to Nizami et al¹⁴.

The cannulated screws can be inserted relatively simply and atraumatically compared to other methods¹⁶. Internal fixation with cannulated cancellous screws after good anatomical reduction is the optimum method of treating intracapsular fractures as it has the advantages of decreased blood loss and operative time, lower transfusion requirements and decreased length of hospital stay¹⁷. In our study the non-union was observed in 14.16% patients treated for neck of femur fracture with cannulated screws and were more common in the age group of 46 to 60 years. Nizami et al have also reported 16% non-union and 8% implant loosening in neck of femur fractures treated with cannulated screws¹⁴. Karaeminogullari et al have reported nonunion 25% after 2 years follow up of patients who underwent internal fixation of NOF fracture¹⁸. In a retrospective study, Lu HD et al reported nonunion in 8.33% cases¹⁵, Sahu A¹⁹ reported non-union in 7.93%, Huang et al 18.9%²⁰ and Sahu et al in 26% patients²¹.

An important part of rationale for prompt treatment of the fracture neck of femur is preservation of the blood supply to the femoral head, which is critical for a satisfactory long-term result. The fracture is regarded as a vascular injury to the bone's blood supply²². The degree of vascular compromise is thought to directly correlate with the displacement of the fracture, which affects fracture union, and leading to complications²³. In our study, we also correlated our results to find the causes of non-union. Non-union was more in patients whom were having displaced fracture, those who were fixed delayed (more than 48 hours after sustaining fracture) and those who started early weight bearing and did not follow the instructions as advised. Displaced fractures in our study were observed in 76.11% patients, and out of these 17.44% developed non-union. Our findings are according to Nizami et al¹⁴, Sahu A et al¹⁹, Huang et al²⁰, and Sahu et al²¹.

CONCLUSION

From the results of this study it is concluded that non-union is high in displaced fractures of neck of femur treated with cannulated screws. Also frequency of non-union is high in older age groups. It is recommended that displaced fractures of neck of femur must be properly anatomically reduced while fixing them with cannulated screws to reduce non-union.

REFERENCES

1. Ly TV, Swiontkowski MF. Treatment of femoral neck fractures in young adults. *Instr Course Lect* 2009;58:69-81.
2. Patwa JJ, Krishnan A, Pamecha CC. Biogeometry of femoral neck for implant placement. *Indian J Orthop* 2006;40:224-7.
3. Keating J. Femoral neck fractures. In: Bucholz RW, Heckman JD. *Rockwood and Green's fractures in adults*. 7th ed. Philadelphia: Lippincott Williams & Wilkins; 2010;1561-96.
4. LaVelle DG. Fractures and dislocations of the hip. In: Canale ST (edi). *Campbell's operative orthopaedics*. 11th ed. Philadelphia: Mosby Elsevier 2008;3237-308.
5. Roshan A, Ram S. The neglected femoral neck fracture in young adults: review of a challenging problem. *Clin Med Res* 2008;6:33-9.
6. 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.
7. Papanastassiou ID, Mavrogenis AF, Kokkalis ZT, Nikolopoulos K, Skourtas K, Papagelopoulos PJ. Fixation of femoral neck fractures using divergent versus parallel cannulated screws. *J Long Term Eff Med Implants* 2011;21(1):63-9.
8. Leighton RK. Fractures of the neck of the femur. In: Bucholz RW, Heckman JD, Court-Brown CM (edi). *Rockwood and Green's fractures in adults*. 6th ed. Philadelphia: Lippincott Williams & Wilkins 2006;1753-92.
9. Walker E, Mukherjee DP, Ogden AL, Sadasivan KK, Albtight JA. A biomechanical study of simulated femoral neck fracture fixation by cannulated screws: effects of placement angle and number of screws. *Am J Orthop* 2007;36:680-4.
10. Piirtola M, Vahlberg T, Isoaho R, Aarino P, Kivela SL. Incidence of fractures and changes over time among the aged in a Finnish municipality: a population based 12 year follow up. *Aging Clin Exp Res* 2007;19(4):269-76.
11. Iorio R, Healy WL, Lemos DW, Appleby D, Lucchesi CA, Saleh KJ. Displaced femoral neck fractures in the elderly: outcomes and cost effectiveness. *Clin Orthop Relat Res* 2001;(383):229-42.
12. Ly TV, Swiontkowski MF. Treatment of femoral neck fractures in young adults. *J Bone Joint Surg* 2008;90A:2254-66.
13. Mathews V, Cabanela ME. Femoral neck nonunion treatment. *Clin Orthop Relat Res* 2004 Feb;(419):57-64.
14. 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.
15. Lu HD, Dong YX, Wen XY, Wang K, Shi DH. Analysis of therapeutic effects of cannulated compression screws for the treatment of femoral neck fractures. *Zhongguo Gu Shang*. 2011 Apr;24(4):315-8.
16. Martyn J Parker & Glyn A Pryor. *Treatment of intracapsular fractures*. In: *Hip Fracture Management*. London. 1993: Blackwell Scientific Publications;88-160.
17. Ly TV, Swiontkowski MF. Management of femoral neck fractures in young adults. *Indian J Orthop* 2008;42(1):3-12.
18. Karaeminogullari O, Demirors H, Atabek M, Tuncay C, Tandogan R, Ozalay M. Avascular necrosis and nonunion after osteosynthesis of femoral neck fractures: effect of fracture displacement and time to surgery. *Adv Ther*. 2004;21(5):335-42.
19. Sahu A, Harshavardena N, Maret S, Dhir A, Taylor H. Outcome of AO Cannulated screws for the fracture neck of femur in 412 patients done over a 5 year period with a minimum follow-up of 2 years. *J Bone Joint Surg Br* 2012;94B Suppl IV:95.
20. Huang HK, Su YP, Chen CM, Chiu FY, Liu CL. Displaced femoral neck fractures in young adults treated with closed reduction and internal fixation. *Orthopedics* 2010 Dec 1;33(12):873.
21. Sahu A, Harshavardhana N, Maret S, Kolwadkar Y, Taylor H. Outcome of AO canulated screws for the fracture neck of femur in patients with diabetes mellitus; a retrospective study of 62 patients. *J Bone Joint Surg Br* 2010;92(Suppl II):310-11.
22. Lucie RS, Fuller S, Burdick DC, Johnston RM. Early prediction of avascular necrosis of the femoral head following femoral neck fractures. *Clin Orthop Relat Res*. 1981; 161:207-14.
23. Farooq MA, Orkazai SH, Okusanya O, Devitt AT. Intracapsular fractures of the femoral neck in younger patients. *Ir J Med Sci* 2005;174(4):42-5.