

Radiological Outcome of Fracture of Neck of Femur Treated with Two versus Three Cannulated Screws Fixation in Adults

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ABSTRACT

Objective: Adults with neck-of-femur fractures will be compared between two and three cannulated screws for fixation in this study.

Study Design: Comparative/Experimental study

Place and Duration: Orthopaedics and Trauma Department of Bacha Khan Medical College, Mardan and the department of Orthopaedics, Gambat Institutes of Medical and Science, Sindh during the period from April 2021 to September 2021

Methods: There were 90 patients of both genders had garden type fractures of neck of femur with ages 15-55 years were included. Age, gender, and the reason of the fracture were among the variables collected after patients provided written consent. Patients were equally segregated into two groups. Group I had 45 patients and received cannulated screws fixation and in group II 45 patients received three cannulated screws fixation. Post treatment radiological union was assessed and compared at the 14th week. We used SPSS 23.0 to analyze complete data.

Results: There were majority males 75 (83.3%) and only 15 (16.7%) females in this study. Most common cause of fracture was road accidents found in 65 (72.2%) cases followed by falling from height in 18 (20%) cases and sports in 7 (7.8%) cases. In group I mean age of the patients was 34.9±7.16 years and had mean BMI 23.6±3.22 kg/m² while in group II mean age was 35.2±3.61 years with mean BMI 24.2±2.19 kg/m². Mean union time in group I was 9.1±3.16 weeks and in group II mean time was 13.3±4.14 weeks. Frequency of radiological union in group I was higher among 43 (95.6%) cases as compared to group II in 37 (82.2%) cases. Overall success rate of radiological union was found among 88.9% cases.

Conclusion: We concluded in this study that two cannulated screws fixation was effective and useful as compared to three cannulated screws fixation in the management of fracture of neck of femur in terms of less radiological union time and higher number of success rate among all cases.

Keywords: Fracture Neck of Femur, Two Cannulated Screws Fixation, Three Cannulated Screws Fixation, Radiological Outcome

INTRODUCTION

The femoral neck accounts for 58% to 54% of all hip fractures, while only 3% of femoral neck fractures occur in patients under 65 years old [1-3]. It's difficult to treat young people with traumatic orthopaedics. Failed hip surgery can be performed on young individuals who have fractured the femoral neck. Internal fixation surgeries frequently employ hollow compression screws, dynamic hip screws, compression plates, and novel compression locking nail plate systems. Internal fixation techniques all have weak anti-rotation forces and loosening of internal fixation devices, therefore it's difficult to declare which is the best right now [4]. An important blood supply to the femoral head following fracture of the femoral neck was discovered by Putnam et al. in cadaver specimens, which is easily injured during high-energy impacts and the corrective surgery itself, and can lead to serious postoperative complications, such as bone necrosis and nonunion of the femoral head, among others.

There are two therapy choices for young adults: dynamic hip screws (DHS) and cannulated compression screws (CCS). Cancellous lag screws, the most prevalent type of internal fixation screw, are the most often employed. Pauwel type I and most type II fractures can be successfully treated with three parallel cancellous lag screws put in an inverted triangle configuration at or above the lesser trochanter. Due to their greater mechanical stability and capacity to bear larger shearing stresses, DHSs are superior to cancellous screws for treating Pauwel type III, basicervical, or heavily comminuted unstable fracture patterns. [8].

Fracture non-union and Avascular necrosis (AVN) were observed to occur in 20% to 30% of fractured femoral necks after internal fixation [9,10].

Femoral head fractures in the vicinity of the aortic arch can lead to avascular necrosis, which can be life-threatening and worsen the already-existing disease of severe osteoarthritis. In a study of the literature, it was shown that an unstable blood supply

and greater intracapsular pressures may be responsible for the development of necrosis following femoral neck fractures. [11] The capsule remains intact in fractures that are not displaced. A tamponade effect generated by an increase in intra-capsular pressure might lead to avascular necrosis of the femoral head. [12] Consequently, femoral blood vessels may be injured and blood flow may be impeded. [13] Complications such as non-union, infection, and fixation failure owing to loss of reduction can be caused by a variety of variables, including the patient's age, fracture displacement at the time of injury, fixation time, anatomical reduction of the fracture, reduction technique, and screw placement. [14,15]

Three cannulated screws are usually utilised to give a relative strength of fixation in adult femoral neck fractures and bring about union. This sort of fracture can be stabilised and reattached using two screws. Some internal data were provided, but they weren't strong enough to support the scientific evidence that two or three cannulated screws for fractures of the femur neck should be used.

Two and three cannulated screws were used in the treatment of fractures in young people in this research, with radiographic evidence of union used to compare results.

MATERIAL AND METHODS

This comparative/experimental study was conducted at Orthopaedics and Trauma Department of Bacha Khan Medical College, Mardan and the department of Orthopaedics, Gambat Institutes of Medical and Science, Sindh during the period from April 2021 to September 2021. The study consisted of 90 patients. Age, gender, and the reason of the fracture were among the variables; collected after patients provided written consent. Patients with skeletal dystrophy or congenital defect (on clinical examination), bone cancer, and numerous fractures were excluded from the research based on clinical and biochemical tests.

Skin traction was used to temporarily immobilise all patients, with a hanging weight of about 4-5 lbs. Two cannulated screws were used on patients in Group I, while three cannulated screws were used on patients in Group 2. The Ledbetter approach was used to minimise fractures in patients on a traction table. Image intensifiers later verified the decline. In all cases, 6.5 mm cannulated stainless steel cancellous screws with a 16 mm thread size were used for closed reduction. A measurement of the screw length was made intraoperatively, if necessary. Surgeons and trainees under general anaesthesia then performed the procedure.

On the third postoperative day, quadriceps exercises were begun. Patients were instructed in quadriceps and knee bending exercises as part of their follow-up care. The radiological union score for the hip was used to assess the progress of the union on radiographs (RUSH). The index of cortical bridging, a measure of cortical appearance, is used to evaluate radiographic union in two orthogonal views. As a result, cortical bridging and disappearance as well as trabecular consolidation and disappearance were used as four separate components of scores in this study's findings. The range of scores for cortical bridging is 4 to 12. Each of the four cortices can be scored from 1 to 3 as having no, partial, or full cortical bridging, respectively.

Cortical bridging is a term used to describe the process of new bone creation occurring in and around a fracture site. Additionally, cortical disappearance has a range of 4 to 12 and is based on the presence or absence of the fracture line on radiographs. Fracture line is clearly apparent in one, there is some evidence of fracture line in another, and there is no evidence of fracture line in a third. T-indices ranged from 1-3 for two different types of bone. Consolidation and disappearance of fracture lines are used as indicators for this calculation. The trabecular index of consolidation is a 1, partial consolidation evidence is a 2, and complete consolidation evidence is a 3. The cortical index of the elimination of fracture lines was 2 and there was no indication of a fracture line as a score of 3.9. Weight-bearing was permitted to return to full in the 8th week following surgery. Radiological union was monitored in the outpatient department for all of the patients in both groups. On a proforma, all of the data was recorded at the second, six-week, ten-week, and fourteen-week intervals after surgery. We used SPSS 23.0 to analyze complete data. Categorical variables were assessed by frequencies percentages.

RESULTS

There were majority males 75 (83.3%) and only 15 (16.7%) females in this study.(fig 1)

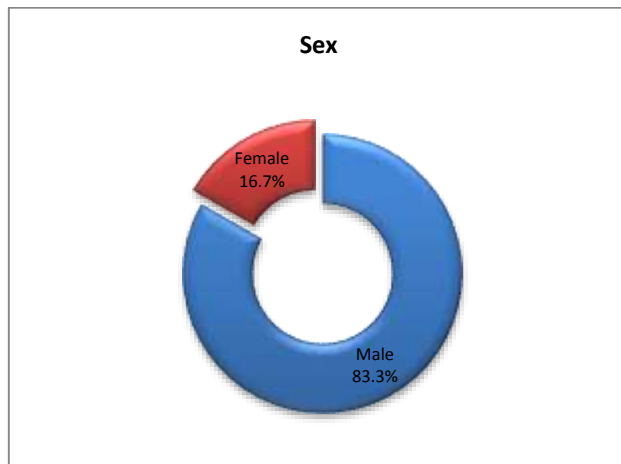


Figure 1: Sex distribution among all cases

Most common cause of fracture was road accidents found in 65 (72.2%) cases followed by falling from height in 18 (20%) cases and sports in 7 (7.8%) cases.(fig 2)

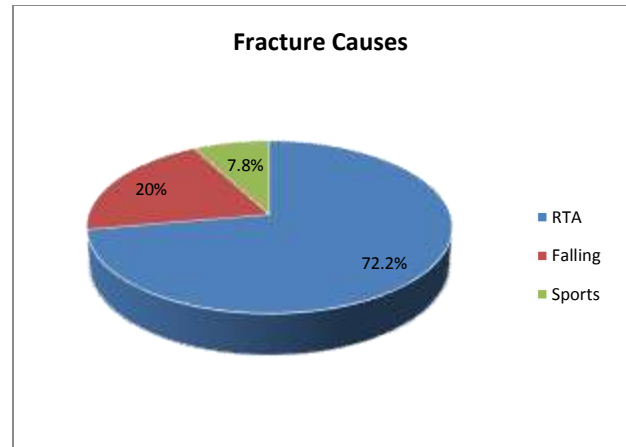


Figure 2: Distribution of causes among cases

In group I mean age of the patients was 34.9±7.16 years and had mean BMI 23.6±3.22 kg/m² while in group II mean age was 35.2±3.61 years with mean BMI 24.2±2.19 kg/m². Mean operative time in group I was 36.12±6.42 minutes and in group II mean operative time was 37.04±5.18 minutes.(table 1)

Table 1: Age and operative details among both groups

Variables	Group I	Group II
Mean age (years)	34.9±7.16	35.2±3.61
Mean BMI (kg/m ²)	23.6±3.22	24.2±2.19
Mean Time of Surgery (minutes)	36.12±6.42	37.04±5.18

Mean union time in group I was 9.1±3.16 weeks and in group II mean time was 13.3±4.14 weeks. Frequency of radiological union in group I was higher among 43 (95.6%) cases as compared to group II in 37 (82.2%) cases.(table 2)

Table 2: Post-operative comparison of results among both groups

Variables	Group I	Group II
Mean Union Time (weeks)	9.1±3.16	13.3±4.14
Radiological Union		
Yes	43 (95.6%)	37 (82.2%)
No	2 (4.4%)	8 (17.8%)

Among 90, success rate of radiological union was found among 82 (88.9%) cases.(fig 3)

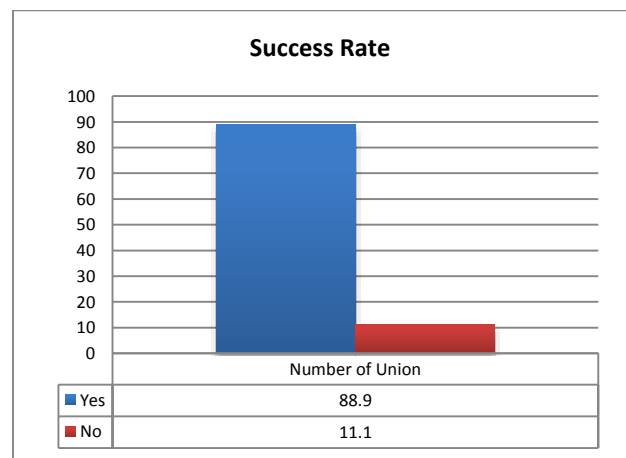


Figure 3: Overall frequency of union among cases

DISCUSSION

High-energy trauma is the most prevalent cause of neck-of-femur fractures in younger patients, which are more common in males

than women. Compared to individuals who are older, these fractures are more easily repaired with primary hemi-arthroplasty in younger patients who have less physical demand. Disruption of blood flow can result in avascular necrosis of the femoral head, which is a frequent consequence. As a result, immediate fracture reduction is necessary to prevent necrosis. Cannulated screws are the gold standard for internal fixation. [16]

In current study 90 patients of fracture of neck of femur were presented. There were majority males 75 (83.3%) and only 15 (16.7%) females in this study. Results of our study were comparable to the previous studies.[17,18] The radiological union of two cannulated screws was compared to the radiological union of three cannulated screws in the current study. Mean union time in group I was 9.1 ± 3.16 weeks and in group II mean time was 13.3 ± 4.14 weeks. Frequency of radiological union in group I was higher among 43 (95.6%) cases as compared to group II in 37 (82.2%) cases. In the case of Xarchas et al. [19] and Chen et al. [20] the frequency of radiological union was 100% with two cannulated screws and 89.29% with three cannulated screws, respectively. [19,20] Two cannulated screws are better than three cannulated screws, according to Basile and colleagues in 2012 (82 percent to 55 percent; $P < 0.05$) [21] No substantial difference was observed by Jordan et al. (2014), with 77% of respondents reporting that they were satisfied and 78% reporting that they were dissatisfied. [22] Whereas Jordan et al. had an elderly patient population 80 ± 12.3 y, our research had young adults (mean age 35.2 ± 3.61). This might be a plausible explanation for the discrepancy.

Many studies have revealed that age does little to affect fracture neck fracture AVN rates. [23] In contrast, a research by Kenan S et al [24] on 27 patients with fracture neck femur treated with cannulated screws revealed that 14.8 percent of patients developed AVN or non-union, and all of the patients were over 50 years old. In our narrative, the emergence of non-union has nothing to do with the protagonist's age.

Most common cause of fracture was road accidents found in 65 (72.2%) cases followed by falling from height in 18 (20%) cases and sports in 7 (7.8%) cases. We found that motor vehicle injuries were more common than falls as a cause of fracture neck femur and subsequent AVN in our study. As far as I can tell, there isn't much written about it. In a recent study, it was found that the increased risk of AVN may be linked to the high velocity trauma experienced in car accidents, which can cause multiple injuries, fracture fragment displacement, blood supply damage, and other complications. [27] Further complications such as AVN or non-union can occur if the fracture neck femur is detected too late or not at all in patients who have suffered multiple traumas. In our study, the mechanism of injury had no bearing on the development of non-union.

Using radiological union, two cannulated screws fixation was reported to be superior to three cannulated screws fixation in young adults with broken femur necks.

CONCLUSION

We concluded in this study that two cannulated screws fixation was effective and useful as compared to three cannulated screws fixation in the management of fracture of neck of femur in terms of less radiological union time and higher number of success rate among all cases.

REFERENCE

- Anagnostis P, Paschou SA, Goulis DG. Management of Acute hip Fracture. *N Engl J Med*. 2018;378(10):971-2.
- Orthopedics group of orthopedics trauma branch of Chinese Medical Association, trauma Expert Working Committee of orthopedics branch of Chinese Medical Association. Guidelines for diagnosis and treatment of adult femoral neck fracture. *Chin J Orthop Trauma*. 2018;20(11):921-8
- Robinson CM, Court-Brown CM, McQueen MM, Christie J. Hip fractures in adults younger than 50 years of age. *Epidemiol Results Clin Orthop Relat Res*. 1995;312:238-46.

- Hoshino CM, O'Toole RV. Fixed angle devices versus multiple cancellous screws: what does the evidence tell us? *Injury*. 2015;46(3):474-7.
- Putnam SM, Collinge CA, Gardner MJ, Ricci WM, McAndrew CM. Vascular anatomy of the medial femoral neck and implications for surface plate fixation. *J Orthop Trauma*. 2019;33(3):111-5.
- Levack AE, Gausden EB, Dvorzhinskiy A, Lorich DG, Helfet DL. Novel treatment options for the surgical Management of Young Femoral Neck Fractures. *J Orthop Trauma*. 2019;33(Suppl 1):S33-7.
- Panteli M, Rodham P, Giannoudis PV. Biomechanical rationale for implant choices in femoral neck fracture fixation in the non-elderly. *Injury*. 2015;46(3):445-52.
- Stockton DJ, Dua K, O'Brien PJ, Pollak AN, Hoshino CM, Slobogean GP. Failure patterns of femoral neck fracture fixation in young patients. *Orthopedics*. 2019;42(4):e376-80.
- Kang JS, Moon KH, Shin JS, Shin EH, Ahn CH, Choi GH. Clinical results of internal fixation of subcapital femoral neck fractures. *Clinics Orthop Surg*. 2016; 8:146-52.doi: 10.4055/cios.2016.8.2.146
- 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. *J Bone Joint Surg Br*. 2004;86:1035-40.DOI: 10.1302/0301-620x.86b7.15047
- Swionkowski MF, Winquist RA, Hansen ST. 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
- 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
- Ehlinger M, Moser T, Adam P, et al. Early prediction of femoral head avascular necrosis following neck fracture. *OrthopTraumatol Surg Res* 2011;97:79-88. DOI: 10.1016/j.otsr.2010.06.014
- Ly TV, Swionkowski MF. Treatment of femoral neck fractures in young adults. *J Bone Joint Surg (Am)*2008; 90:2254-2266 [PMID: 18829925
- Duckworth AD, Bennet SJ, Aderinto J, Keating JF. Fixation of intracapsular fractures of the femoral neck in young patients: risk factors for failure. *J Bone Joint Surg Br*. 2011;93:811-816.
- Ly TV, Swionkowski MF. Management of femoral neck fractures in young adults. *Indian J Orthop* 2008; 42:3-12.
- Saeed Ahmed Shaikh, Sajid Hussain, Muhammad Qasim Ali Samejo, Nadeem Ahmed, Allah Rakhio Jamali. Osetosynthesis of Fractures neck femur with cannulated screws: Evaluation of risk factors for post-operative complications. 2021 (JPMA 71: S-59 [Suppl. 5]; 2021)
- Khalid MU, Waqas M, Akhtar M, Nadeem RD, Javed MB, Gillani SFUHS. Radiological Outcome of Fracture of Neck-of-Femur Treated with Two versus Three Cannulated Screws Fixation in Adults. *J Coll Physicians Surg Pak*. 2019 Nov;29(11):1062-1066
- Xarchas KC, Staikos CD, Pelekas S, Vogiatzaki T, Kazakos KJ, Verettas DA. Are two screws enough for fixation of femoral neck fractures? A case series and review of the literature. *Open Orthop J* 2007; 1:4-8
- Chen Z, Wang G, Lin J, Yang T, Fang Y, Liu L, et al. Efficacy comparison between dynamic hip screw combined with antirotation screw and cannulated screw in treating femoral neck fractures. *Chinese J Reparative Reconst Surg* 2011; 25:26-9.
- Basile R, Pepicelli GR, Takata ET. Osteosynthesis of femoral neck fractures: Two or three screws? *Rev Bras Ortop* 2012; 47:165-8.
- Jordan RW, Smith NA, Dickenson E, Parsons H, Griffin X. Risk factors associated with the early failure of cannulated hip screws. *Acta Orthop Belg* 2014; 80:34-8.
- Kang JS, Moon KH, Shin JS, Shin EH, Ahn CH, Choi GH. Clinical results of internal fixation of subcapital femoral neck fractures. *Clinics Orthop Surg*. 2016; 8:146-52.
- Kenan S, Gold A, Salai M, Steinberg E, Ankory R, Chechik O. LongTerm Outcomes Following Reduction and Fixation of Displaced Subcapital Hip Fractures in the Young Elderly. *Isr Med Assoc J*. 2015;17:341-5
- Duckworth AD, Bennet SJ, Aderinto J, Keating JF. Fixation of intracapsular fractures of the femoral neck in young patients: risk factors for failure. *J Bone Joint Surg Br*. 2011;93:811-816.
- Koaban S, Alatassi R, Alharbi S, Alshehri M, Alghamdi K. The relationship between femoral neck fracture in adult and avascular necrosis and nonunion: A retrospective study. *Ann Med Surg (Lond)*. 2019;39:5-9.
- Barney J, Piuze NS, Akhondi H. Femoral Head Avascular Necrosis. (Updated2019 Sep 3). In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 Jan