

# To Compare the Frequency of Fracture Consolidation in Two Versus Three Cannulated Screws Osteosynthesis of Femoral Neck Fractures

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## ABSTRACT

**Background:** When it happens in a child or adolescent, an intracapsular femoral neck fracture can be very challenging to heal. Hip fractures are expected to rise from 1.26 million in 1990 to 2.6 million in 2025 and 4.5 million by the middle of this century, according to the latest estimates. 1 After a fixation, problems might occur for a number of various reasons, including those listed above. The initial displacement and the time and accuracy of the reduction are the most essential factors in determining the final output.

**Objective:** To compare the frequency of fracture consolidation in two versus three cannulated screws for osteosynthesis of femoral neck fractures.

**Subjects and Method:** In Karachi, the Al Mumtaz hospital complex hosted a total of eighty patients who met the study's eligibility criteria and agreed to participate. After being informed of the technique, patients agreed to participate. Each patient's name, age, gender, address, and phone number were entered into a database. Utilizing a lottery technique, each patient was placed in one of two groups, A or B. 80 chits (40 for group A and 40 for group B) sealed in opaque envelope was put in a jar and patient was asked to pick one chit from jar and that patient was assigned to that particular group written on that chit. In group A, 40 patients were undergo osteosynthesis by using two cannulated screws, while in group B, 40 patients were undergo osteosynthesis by using three cannulated screws. All procedures were done under general anesthesia and by same surgeon's team having minimum 5 years post qualification surgical experience. After surgery, patients were shifted to ward and was discharged. Then patients were followed-up in OPD for 3 months after surgery for assessment of fracture consolidation. Final assessment was made at 3<sup>rd</sup> month. Data was entered and analyzed through SPSS version 20.

**Results:** In total, there were eighty people that took part in this research. Two cannulated screws were inserted into forty patients, whereas another forty patients received three screws. Patients with ages ranging from 18 to 55 were included in the study. Patients in Group 1 were on average 32.4 years old plus 8.13 years, while patients in Group 2 were on average 35.9 years old plus 9.01 years. Patients who were treated with two cannulated screws achieved fracture consolidation in 35 (87.5% of cases), but patients who were treated with three cannulated screws only experienced fracture consolidation in 20 (50%) of their instances, which is a significant difference.

**Conclusion:** In conclusion, fracture consolidation with two cannulated screws is an effective approach for the treatment of osteosynthesis of femoral neck fractures.

**Keywords:** Femoral neck fractures, Osteosynthesis, two cannulated screws, three cannulated screws.

## INTRODUCTION

When it happens in a child or adolescent, an intracapsular femoral neck fracture can be very challenging to heal. Hip fractures are expected to rise from 1.26 million in 1990 to 2.6 million in 2025 and 4.5 million by the middle of this century, according to the latest estimates. 1 After a fixation, problems might occur for a number of various reasons, including those listed above. It is the beginning displacement, along with the reduction time and precision, that determines the end outcome. 2

Most orthopaedic surgeons use a dynamic hip screw (abbreviated as DHS) or numerous cannulated screws to treat femoral neck fractures internally (abbreviated as MCS). It is less invasive to use MCS fixation for osteosynthesis, therefore less soft tissue is removed and less blood is lost during the process. 3,4

Femoral neck fracture therapy has a number of side effects that aren't good for you. Pseudoarthrosis or avascular necrosis of the femoral head are the most common causes of this condition. If osteosynthesis on an osteoporotic bone is fails, this may happen to a patient. When an anti-rotation screw was used, it had little effect on the number of problems that developed afterwards. 5

Only two screws were needed to fix a total of 23 out of 28 fractures in a worldwide study (82 percent ). There were reports that six of the eleven fractures that had been treated with three screws had healed (55 percent ). 6 There was no statistically significant difference between these percentages. There was no significant difference in how effectively these fractures healed if they were treated with two screws in parallel or three screws, according to the findings of a similar study. For a definitive conclusion, more research is required. 6 On the other hand no local

evidence is available which compares results of two cannulated screws versus three. We wanted to conduct this study locally because the built of our local people is different, our people are short in stature and neck of femur is narrow. Although three screws are being used for fixation of fracture neck of femur, if this study produces the same or better results locally, then it would be used as reference in future for this mode of fixation. That was the rational of this study.

## METHODOLOGY

Pakistan's Al Mumtaz Medical Complex in Karachi was the site of a Randomized Controlled Trial (RCT) in the field of orthopedic surgery and traumatology. Eighty patients from the Al Mumtaz medical complex who met the study's eligibility requirements were enrolled. The study began on January 1, 2022, and finished on April 30, 2022. After being informed of the technique, patients agreed to participate. Each patient's name, age, gender, address, and phone number were entered into a database. Utilizing a lottery technique, each patient was placed in one of two groups, A or B. 80 chits (40 for group A and 40 for group B) sealed in opaque envelope was put in a jar and patient was asked to pick one chit from jar and that patient was assigned to that particular group written on that chit. In group A, 40 patients were undergo osteosynthesis by using two cannulated screws, while in group B, 40 patients were undergo osteosynthesis by using three cannulated screws. All procedures were done under general anesthesia and by same surgeon's team having minimum 5 years post qualification surgical experience. After surgery, patients were shifted to ward and was discharged. Then patients were followed-

up in OPD for 3 months after surgery for assessment of fracture consolidation. Final assessment was made at 3<sup>rd</sup> month. Each and every piece of information on the forms that had been created in advance was thoroughly described in its entirety. SPSS version 16 was used for the statistical analysis of the data that was gathered. Quantitative data, including age, height, weight, length of fracture, and body mass index, will be presented (BMI). Qualitative factors like gender, diabetes mellitus, fracture type, and fracture consolidation were shown in frequency and percentage. As part of the study, a chi-square test was used to compare how well fractures mended between the two groups. Stratification by age, gender, body mass index (BMI), diabetes mellitus, duration of fracture, and kind of fracture was undertaken in both therapy regimens. Post-stratification chi-square tests were used, and the p-value of 0.05 indicated that the results were statistically significant.

## RESULTS

A total of 80 patients included in this study. 40 were treated with two cannulated screws and 40 were treated with three cannulated screws. The age of the patients ranged from >18-<55 years. The average age of the patients in group 1 was 32.4 + 8.13 and in group 2 was 35.9 + 9.01, average weight in group 1 was 67.73 + 11.92 and in group 2 was 69.05 + 10.82, average height in group 1 was 161.94 + 7.62 and in group 2 was 167.4 + 9.2, average BMI in group 1 was 25.7 + 4.05 and in group 2 was 27.3 + 3.9 and average duration of fracture in group 1 was 3.19 + 0.9 and in group 2 was 2.9 + 1.2.

21(52.17%) of the patients were male in group 1 and in group 2 23(57%) were male and 19(47.83%) were female in group 1 and 17(43%) were female in group 2. 27(67%) were diabetic in group 1 and 25(62.5%) were in group 2. In group 1, 7(17.5%) were of type-I, 19(47.5%) were of type-II and 14(35%) were of type-III of femoral neck fractures and in group-2, 9(22.5%) were of type-I, 15(37.5%) were of type-II and 16(40%) were of type-III of femoral neck fractures. Fracture consolidation was observed in 35(87.5%) in patients treated with two cannulated screws and 20(50%) was observed in patients treated with three cannulated screws and significant difference was observed.

Significant difference was observed, when outcome variable i.e. fracture consolidation was stratified with respect to age group (19-35 years), gender, BMI, duration of fracture < 3 days, diabetes mellitus and type-II femoral neck fracture and insignificant difference was observed when outcome variable was stratified with respect to age group (<35-54years), duration of fracture >3-7 days, in diabetic Mellitus free patients and in patients with type-II and type-III femoral neck fractures (Table no: 1 and 2).

Table 1: Stratification of Frequency of fracture consolidation in patients of osteosynthesis of femoral neck fracture treated with two versus three cannulated screws in patients with

Age group 19-35 years			
Fracture consolidation	Two cannulated Screws n (%)	Three cannulated Screws n (%)	P-value
Yes	21	14	0.004
No	03	15	
Age group >35-54 years			
Yes	14	06	0.084
No	02	05	
Male patients			
Yes	19	14	0.036
No	02	09	
Female patients			
Yes	16	06	0.005
No	03	11	
With BMI ≤25			
Yes	27	19	0.005
No	02	12	
With BMI >25			
Yes	08	01	0.01
No	03	08	

Table 2: Stratification of Frequency of fracture consolidation in patients of osteosynthesis of femoral neck fracture treated with two versus three cannulated screws in patients

With duration of fracture ≤ 3 days			
Fracture consolidation	Two cannulated Screws n (%)	Three cannulated Screws n (%)	P-value
Yes	33	19	0.003
No	03	13	
With duration of fracture > 3-7 days			
Yes	02	01	0.236
No	02	07	
With diabetes mellitus			
Yes	24	11	0.001
No	03	14	
Without diabetes mellitus			
Yes	11	09	0.221
No	03	06	
With type- I fracture			
Yes	06	04	0.145
No	01	05	
With type- II fracture			
Yes	17	07	0.01
No	02	08	
With type- III fracture			
Yes	12	09	0.118
No	02	07	

## DISCUSSION

Modern medicine uses cannulated screws to treat femoral neck fractures. Pins have a lower risk of nonunion and infection than sliding screw-plates, but these two problems can still occur with the sliding screw-plate. There was no clear advantage to employing side plates over screws when comparing the two designs.4

6.5 millimeters is the minimum required shaft diameter for any screws used in conjunction with each other. There must be equal spacing between the screws. In order for a screw to be more stable, it must be positioned lower and closer to the calcar in the anterior-posterior (AP) plane. A screw in the back produces the same effect when viewed from the side. 7,8,9. Fractures that were not properly stabilized by properly spaced screws had a larger likelihood of not healing properly when viewed from the side. Throughout the duration of our series, we strictly followed these procedural principles. It is important to point out that this process is identical to the one that was previously described.

Biomechanical investigations on cadavers<sup>11,12</sup> or bone models<sup>13</sup> suggest that using three screws in a triangle formation is the most successful way, despite the fact that there appears to be no clinical data to support the ideal screw design or whether two, three, or more screws are better. Researchers from Parker and Blundell<sup>4</sup> found that it was difficult to determine the appropriate number or kind of screws in 25 randomized trials including 4,925 participants.

Femoral neck fractures can be treated with osteosynthesis using various methods and techniques<sup>10,12</sup>. Cannulated screws are a common fixation method because they make surgery easier and less time consuming.

Numerous research have examined the advantages and disadvantages of various surgical procedures and implants. But just a few researchers have examined whether two or three screws are more successful for osteosynthesis.

Research conducted by Selvan et al.<sup>13</sup> found that the standard configuration of three screws arranged in an inverted triangle provides the maximum level of mechanical stability. It has also been decided that the three screws should be positioned in an inverted triangle by the AO-ASIF group.

It is not surprising that a three-screw system is more stable in vitro than a two-screw one. Even though it is less stable than using more screws, the results we obtained here show that the correct treatment of femoral neck fractures can be achieved with just two screws.

Garden RS<sup>14</sup> was able to get satisfactory results with with two screws for synthesis when the break was consistent. Only two

screws are necessary, according to Leighton RK15's biomechanical analysis findings. Both Parker MJ et al.16,17 and Lichtblau S. et al.18 concluded that the use of two or three screws had no noticeable effect. According to our findings, the failure rate for three screws was roughly 14%, whereas the failure rate for two screws was approximately 13.3%. This study's 25 percent failure rate for osteosynthesis of fractures in young individuals is in line with those of others, such as Selvan VT et al19, who studied the same number of patients. Osteosynthesis of fractures in young patients failed at this rate.

In order to identify which method is most effective, more extensive and painstakingly organized research will be necessary.

In order to obtain a clearer idea of whether the two-screw technique for treating femoral neck fractures is superior to the three-screw technique, it is important to conduct larger studies with larger sample sizes. The side effects of both techniques should be examined in these investigations. Despite this, the fact that the medication is working for certain patients should give people reason to be hopeful.

## CONCLUSION

Osteosynthesis, when combined with fracture consolidation and two cannulated screws, is an excellent treatment for femoral neck fractures. In order to determine if the two-screw method of treating femoral neck fractures is superior to the three-screw method, additional studies involving larger samples are required. The side effects of both techniques should be examined in these investigations.

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