

Osteosynthesis of un-displaced Femoral Neck Fractures Using Two Canullated Screws. A Study from a Tertiary Care referral institution in India

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ABSTRACT

Introduction: Canullated screws are now universally used for the fixation of femoral neck fractures either by open or closed reduction in younger patients. It is not only difficult to achieve a proper triangular configuration when using three cannulated screws, but struggling to achieve it leads to extra irradiation and sometimes can result in mal positioning and cut out of screws.

Material and Methods: From January 2014 to March 2016, thirty two patients with undisplaced femoral neck fractures were treated by close reduction and two cannulated screw fixation and were followed with the monthly clinical and radiological examination to establish fracture healing and record any complications for at least one year.

Results: All fractures except one united with excellent results in 22(68.75%) fair in 4(12.5%) Good in 5(15.6%) and poor in one (3.12%) patient.

Conclusions: Two parallel canullated screw fixation is a safe and effective method for the treatment of undisplaced femoral neck fractures with less irradiation, less operating time and minimal complications.

Keywords: Femoral Neck Fractures, Two Canullated Screws

INTRODUCTION

Fractures of femoral neck remain a challenge in the clinical practice of orthopedic surgeons.¹ It is still a subject of debates with regards its management, since the first description of a femoral neck fracture by Park in the 16th century and of the first screw osteosynthesis by Langenbeck in 1878.² Canullated screws are now universally used for the fixation of femoral neck fractures either by open or closed reduction in younger patients.¹ Replacement is a preferred option for patients with advanced age and with pre-existing degenerative changes in the hip. Non operative treatment was recommended by some authors for undisplaced (Garden's type-1 and type-2) fractures, but the risk of nonunion is twice in patients treated non operatively than in those treated operatively.² Risk of displacement varies from 19-46% in patients treated by non-operative methods.^{3,4} Postoperative complications like nonunion and avascular necrosis is seen more in displaced (Garden's type-2 and type-3) than undisplaced fractures.⁵ 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, biomechanical studies in cadavers or using bone model favor the application of three screws in triangular fashion.^{6,7} It is not only difficult to achieve a proper triangular configuration by closed means, but struggling to

achieve it leads to extra irradiation and sometimes can result in to cut out and mal positioning of screws. There are hardly accounts in literature that have reported the results of two screw fixation in femoral neck fractures.⁸ This study aimed to contribute to the discussion whether two cannulated screws can provide sufficient fixation for undisplaced femoral neck fractures.

MATERIAL AND METHODS

This study was conducted prospectively involving patients who presented to the Accident and Emergency Department of the Government hospital for Bone and Joint Surgery Srinagar (India) with undisplaced femoral neck fractures. The hospital is a tertiary care referral center specifically catering patients who require orthopedic management. From January 2014 to March 2016, 39 patients presented to one subunit of this hospital with undisplaced femoral neck fractures. Seven patients (4 with associated fractures, one lost in follow up and two were found displaced under image intensifier examination in operating room) were excluded from the study. Among the 32 patients 19(59.32%) were males and 13(40.62%) were females with an average age of years 35.75 (range19-55 years). The left femur was involved in 14(43.75%) and the right in 18(56.25%) patients. Regarding their occupation, there were 9(28.12%) house wives, 11(34.37%) agriculture workers, 8(25%) labourers and 4(12.5%) were office workers. The mechanism of injury was a simple fall in 15(46.87%), a fall from a height in 9(28.15%) and a road traffic accident in 8(25%) cases. Using Gardens classification, 11(34.37%) were type-1, 21(65.62%) type- 2 fractures.

Assessment included thorough physical evaluation, followed by ante posterior radiograph of pelvis with both hips.

Lateral radiographs were not taken in the X-ray room to avoid manipulation of the injured hip and displacement of the fracture. The patients were operated within 72 hours

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of injury depending on the clearance for the anesthesia and availability of the operating room. After the aesthesia, patients were carefully evaluated for displacement in both antero posterior and lateral planes using the fracture table and an x-ray image intensifier keeping Garden's alignment index in mind. Close reduction and three screw fixation was done in two patients whose fracture was displaced and were excluded from the study. The procedure was carried out by four different orthopedic surgeons who used two parallel 6.5 partially threaded canullated screws by percutaneous technique. The lower screw was placed just superior to the calcar in frontal and almost central in sagittal plane with the tip in the subchondral bone within 5mm to the joint line. The second screw was placed in parallel fashion superiorly in the antero posterior and posteriorly in sagittal plane. All patients were ambulated with toe touch weight bearing after 24 hours and were discharged two days after the operation. Full weight bearing was allowed only after clinical and radiological signs of union. The patients were followed up at the outpatients department with the monthly clinical and radiological examination to establish fracture healing and record any complications for at least one year.

RESULTS

All fractures except one united at 12-25 weeks (average 15.40 weeks) and were satisfied from the operation they had undergone. In one patient the screws backed out as he started unprotected weight bearing against advice. He was re operated by open reduction by using two canullated screw and fibular grafts three month after the primary surgery. The patient united with persistent pain around hip joint. No patients showed radiological evidence avascular necrosis at



Figure-1: (A) Pre-Operative A-P Radiograph Garden's Type-2 Fracture; (B) Radiograph after 8 weeks of Fixation



Figure-2: (A) Pre-Operative A-P Radiograph Garden's Type-2 Fracture; (B) A-P Radiograph 3 months after surgery

one year of surgery. We did not perform MRI screening in all patients for avascular necrosis because of the financial constraints. None of our patients developed infection (deep/superficial) or deep vein thrombosis. As we placed the tip of screw in the subchondral bone close to joint line it was debated pre operatively that the screws may penetrate the joint on weight bearing. None of our patient except one developed implant loosening/breakage/ screw cut out or penetration in to the joint. The duration of the procedure was 20-35 minutes (average-27.75 minutes) and the blood loss was 25-50 ml (average 37.83ml). The number of exposures was 8-14(average 10 exposures). Using the Harris Hip Score, the results were excellent in 22(68.75%) fair in 4(12.5%) Good in 5(15.6%) and poor in one (3.12%) patient.

DISCUSSION

Femoral neck fractures account for nearly half of all hip fractures with the vast majority occurring in elderly patients after simple falls.¹⁰ Only 3%-10% of femoral neck fractures do occur in younger adults.¹¹ Improved short and long term hip function and lower re-operation rates with hip arthroplasty as compared to internal fixation strongly favours the routine use of hip replacement surgery for low demand elderly patients with displaced femoral neck fractures.^{12,13}

Preservation of the natural hip anatomy and mechanics is a priority in young adults as their high functional demands preclude their candidacy for replacement procedures.¹⁴ Anatomic reduction and stable internal fixation are of paramount importance for preservation of the femoral head while minimizing rates of non-union and osteonecrosis¹⁵ Many authors have reported that, the degree of displacement of a fracture, the accuracy of reduction, the location of internal fixation, the degree of comminution of the posterior cortical bone, and the time interval between being injured and undergoing an operation are important factors that affect outcome of any method of treatment.^{16,17} Femoral neck fractures are displaced in 85% cases and are inherently unstable than non-displaced fractures. We used Garden's classification system judged by the trabecular relationship on the AP radiograph, where fracture is easily classified in to undisplaced (Type-1 and Type-2) and displaced (Type-3 and Type-4) types to dictate the appropriate method of treatment. Non operative treatment was advocated by some authors for non-displaced fractures but, confinement to bed, and high risk of displacement and nonunion has made this ancient method of treatment unpopular among the surgeons. Patients treated operatively have much better outcome in terms of short hospital stay, early weight bearing and less chances of displacement.

Canullated screws are universally accepted as a method of fixation for femoral neck fractures. They provide better fixation and have a significantly lower rate of nonunion and infection than pins and the sliding screw-plate¹⁸ Though there appears to be no clinical evidence indicating the design and number of screws, biomechanical studies in cadavers or using bone models favor the application of three screws in a triangular fashion^{6,7}

Three cannulated screw fixation is routinely used in our institution for displaced as well as non-displaced femoral neck fractures. Longer operating time, increased irradiation and difficulty in achieving an ideal triangulation generated a debate, whether two screws can be a safe and effective for the fixation of undisplaced femoral neck fractures.

The operative technique guidelines as laid down in various textbooks were strictly followed while operating the patients. Placement of one screw inferiorly and close to the calcar in the antero posterior plane and centrally in lateral plane offered better cortical support and therefore stronger fixation. Second screw was placed parallel to first, superiorly in antero posterior and posteriorly in lateral plane.

26 of 32(81.25%) patients in our series had excellent to good results without many complications.5(15.6%) patients with fair results, even after union and with no signs of avascular necrosis at one year had some issues with the activities of daily living and did not score more than 79 points using Harris Hip Score.

Our study is unique as we use only two 6.5mm partially threaded cannulated screws percutaneously for the fixation of undisplaced femoral neck fractures. Less irradiation, less operating time, less blood loss and easy placement of two parallel screws without complications strongly favor the use of two cannulated screws for the fixation of undisplaced femoral neck fractures. However, further studies with longer follow up need to be carried out to study the use of two cannulated screws in displaced femoral neck fractures.

Limitations of the study

1. Small series of 32 patients
2. Not a comparative study.
3. Shorter follow up of one year

CONCLUSION

Three Canulated screws in an inverted triangular fashion are universally accepted as a method of fixation of both displaced and undisplaced femoral neck fractures. Two parallel cannulated screw fixation is a safe and effective method for the treatment of undisplaced femoral neck fractures with less irradiation, less operating time and minimal complications.

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