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RESEARCH ARTICLE
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FRACTURE NECK OF FEMUR IN YOUNG ADULTS MANAGED WITH CANNULATED CANCELLOUS SCREWS

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Abstract
Femur neck fractures are always a great challenge to orthopaedic surgeons and remain inexplicable fractures in terms of management and outcome. In addition to the relative rarity of the injury, there has been a high incidence of avascular necrosis and nonunion reported in the literature. This study was to know the outcome of cannulated cancellous screw fixation in the fracture neck of femur in young patients. This is both a retrospective and prospective study of twelve cases over 5 years with a minimum follow-up of 2 years As per the inclusion and exclusion criteria, cases presented within 24 hours were operated immediately with closed reduction and cannulated cancellous screws in an inverted triangle configuration. Pot operatively mobilization and weight bearing were done according to the radiological signs of healing, we had only one avascular necrosis at one and half-year follow-up patients were evaluated for functional outcomes for a minimum period of 2 years, and functional outcomes were assessed by using modified Harris hip score. The score at 24 months was excellent in 50%, good in 25%, medium in 16.6 %, and poor in 8.3% with good functional outcomes. We achieved union in all twelve patients. Our average union time was 11.6 weeks.
Femoral neck fracture fixed with cannulated cancellous screws gives good results in young patients with minimal complications. The key factors in treating femoral neck fractures should include early surgery with anatomic reduction and stable internal fixation and delay in complete weight bearing till union.

Keywords: cannulated cancellous screws, young adult, fracture neck of femur

Introduction

Femur neck fractures are always a great challenge to orthopaedic surgeons and remain inexplicable fractures in terms of management and outcome.(1) In young patients the neck of femur fracture is observed as a distinct category because of the prime concern regarding retaining the femoral head.(2-4) In addition to the relative rarity of the injury, there has been a high incidence of avascular necrosis and nonunion reported in the literature ranging from 12-86 percent.(5-8) Results after the treatment need to be very good to meet the high functional demands of young individuals.

Results after this injury depend on the extent of the injury, the timing of surgery since the injury, the adequacy of the reduction and fixation and the adequacy of fixation.[1] Various treatment modalities are available including Femoral Nailing System, Proximal Femoral Nail, sliding hip screw, augmentation procedures like muscle pedicle graft, Parallel cancellous lag screws, hemiarthroplasty and total hip replacement.[9]

Many studies have assessed the type of implant for the fixation of neck of femur fractures and emphasized the good results of using cannulated cancellous screws.[10,11] Despite marked improvements in implant design, surgical technique, and patient care other treatment variables, such as time to surgery and the fixation methods are still given much importance.[9] In younger age patients joint replacement procedures are not desirable.[12,13]

Currently, the multiple cannulated screw method appears to be the standard of care for younger patients, as this approach is less invasive and preserves blood supply in comparison with others.[3] These multiple cannulated screws are applied in different configurations like an upward triangle, inverted triangle, diamond shape, criss-cross, and perpendicular type. Closed reduction with internal fixation with parallel cancellous screws in an inverted triangular configuration is our preferred treatment. This study was to know the outcome of cannulated cancellous screw fixation in the fracture neck of femur in young patients.

Materials and methods

This is both a retrospective and prospective study of 12 cases over 5 years (from May 2018 – April 2023) at M.V.J. Medical College, Bangalore with a minimum follow-up for 2 years This study was conducted after obtaining ethical clearance from the institute's ethical committee on Fracture neck of femur cases in young adults with the following criteria Inclusion criteria: Intracapsular neck of femur fracture, Age 20–50 years, presentation to the emergency room in less than 24 hours, and no associated fractures.

Exclusion criteria: Age less than 20 and more than 50 years, presentation more than 24 hours, comminuted neck of femur fractures, previous hip disorders affecting the function, osteoporosis, pathological fracture, cases requiring open reduction, and patients who lost follow-up less than 2 years. Preop protocol: Patients were taken up for surgery as early as possible. Patients after administration of spinal epidural anesthesia, were placed in the supine position on an orthopaedic traction table. Closed reduction is done by using the Whitman method which involves traction on the limb in extension, abducted approximately 20 degrees, and then internally rotated until the patella faces 20 to 30 degrees internally.[14] The Reduction position was confirmed with the C-arm and once confirmed that the fracture was in an adequate reduction position, then sterile preparation was done. Guide pins were inserted parallelly into the head of the femur along the longitudinal axis of the femoral neck in an inverted triangle configuration under the c-arm by using the jig. Once confirm the correct position of the guide pins, three titanium cannulated screws were inserted. The threaded portion of the screw should cross beyond the fracture line completely. Care was taken not to put the screws below the lesser trochanter.

Post op protocol

Our postoperative protocol is to continue antibiotics for 3 days, deep venous thrombosis prophylaxis with low molecular weight heparin for 3 days, and then aspirin clopidogrel for the next 5 weeks. We started active toe and ankle movements on day one and active knee and hip movements on day five. And quadriceps exercises as tolerated by the patient. Based on the radiological union which was around 6 weeks to 12 weeks the toe-touch weight-bearing with a walker was allowed. Then based on healing status and follow-up radiographs, we allowed an increase in weight bearing gradually, if in doubt a CT scan was also done.

Regular follow-up was done at 2 weeks, 6 weeks, 3 months, 6 months and at one, one and a half, and two years.

Results

We collected 5 years of data retrospectively and prospectively from patients whose age is between 20 years to 50 years with femoral neck fractures in our hospital. Sixteen cases were taken in which two cases had less than 24 months follow-up and two cases with neck of femur associated with shaft of femur fracture. These four cases are excluded and the remaining 12 cases were included in the study. Information about age, sex, side, time of presentation, type of fracture, union, complications, intraoperative and postoperative complications, screw backout, screw cut through, implant failure, varus collapse, reduction difficulty, functional score at 24 months noted, and the results analyzed. Evaluation of the functional results was done using the Modified Harris Hip score at 24 months. Information and observations were tabulated below. (Table1-5)

Based on the duration between injury to femur neck and surgical fixation, cases were divided into three groups for convenience and further studies 1) less than 8hrs, 2) between 8hrs to 24hrs, and 3) between 24hrs to 48hrs.

Fig 1: Neck of femur fracture

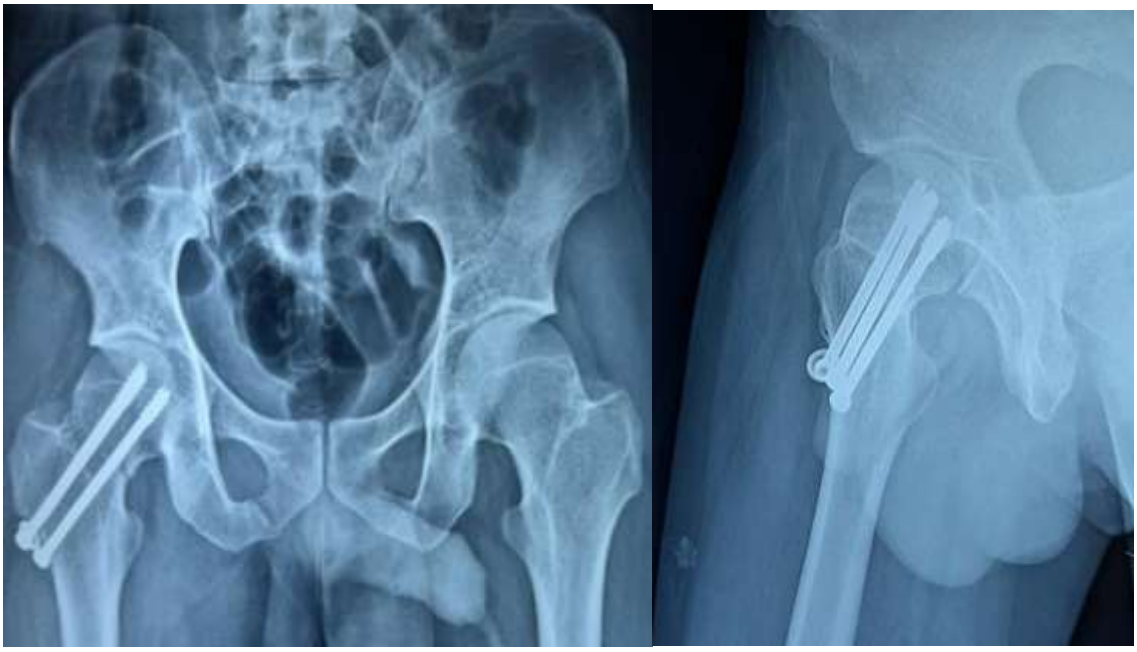

Fig. 2: CCS screw fixation AP and Lateral views

Fig 3: one month follow up

Fig 4 : 3 month follow up

Table 1: Age and Sex

Age / Sex	Number of patients	Percentage
20 - 30 yrs	3	25%
30 - 40 yrs	6	50%
40 - 50 yrs	3	25%
Male	8	66.6%
Female	4	33.3%

Table 2: Duration since injury to surgery

Timing for surgery	Number of patients	Percentage
Less than 8 hrs	3	25%
8 – 24 hrs	7	58.3%
24 – 48 hrs	2	16.6%

Table 3: Type of the fracture and side of the fracture

Type of the fracture	No. of patients	Percentage
Anatomical		
Sub capital	3	25%
Transcervical	7	58.3%
Basi cervical	2	16.6%
Garden		
Type I	0	0
Type II	2	16.6%
Type III	6	50%
Type IV	4	33.3%
Side of the fracture		
Right	7	58.3%
Left	5	41.6%

Table 4: Functional outcome

	No. of patients	Percentage
Excellent	6	50%
Good	3	25%
Medium	2	16.6%
Poor	1	8.3%

Table 5: Intra-operative and post-operative complications

Healing time (weeks)	11.6 weeks
Femoral neck shortening (mm)	>3mm one case ≤ 3mm two cases
Nonunion	0
Avascular necrosis	1 case
Varus deformity	0
Screw backout from the head	1
Screw back out due to neck collapse	3
Reduction failure	0
Screw cut through	0
Implant failure	0
Infection	0
Screw malposition	1

Discussion

The single important priority in young adults with femoral neck fractures is to retain the head rather than replace it. The most challenging complications are femoral head osteonecrosis and nonunion.[1] Anatomic reduction, compression of the fracture, and stable internal fixation are paramount for a good outcome, but the surgeon probably has less control over osteonecrosis because the blood supply to the femoral head after the femoral neck fracture is compromised.[14] CCS screws fixation is widely used for fracture neck of the femur in young adults with the advantage of minimally invasive fixation, it is known to give good results.[9]

The duration since injury to surgery for the neck of femur fracture is an argument topic. Whether to operate an emergency or wait for some time is not decided based on the data available. Many surgeons advised doing early reduction of the fracture and surgery leads to unkinking the blood vessels which in turn decreases the development of avascular necrosis and early fixation seems to be commonly practiced.[15-17]

Swiontkowski et al., advised the fracture neck of the femur should be fixed less than eight hours after the injury.[15] Many clinical studies suggested that to prevent the avascular necrosis of femoral head fracture has to be fixed early less than 12 h.[15-19]

In our study, we included the fractures that presented within 24 hours and the fixation within 48 hrs. These were categorized as less than 8 hours, 8 to 24 hours and 24 to 48 hours to know the outcome

of early fixation. However as our sample size is small and we got only one avascular necrosis at one and half year follow up which was in the group between 8 to 24 hours, we could not come to any conclusion.

Non-union rate in the neck of femur fracture fixed with CCS is 10 to 30 percent and may require surgery.[20-23] We achieved union in all the twelve patients. Our average union time was 12 weeks.
List of other complications after fracture neck of femur fixed with CCS screws includes infection, screw cut through, screw backout, DVT, screw malposition, implant failure, varus collapse and femoral neck shortening.[9]
In our study, one male patient was obese and operated on after 24hrs had shortening with screw backout more than 3mm with minimal pain. But there is no varus, no avascular necrosis and the patient was asymptomatic at 2-year follow-up. Two patients developed screw backout less than 3 mm due to collapse at the fracture site but eventually healed without complications. We had no cases of deep infection, implant failure and screw cut-through. There were no cases of varus collapse, or implant failure probably because of prolonged immobilization and nonweight bearing in our protocol.

Compared to the CCH Khoo study in which good outcome was observed in 81.1% and poor outcome in 18.9%.[24] In our study the modified Harris hip score at 24 months was excellent in 50%, good in 25%, medium in 16.6 %, and poor in 8.3% with good functional outcome. Hence we concluded that CCS screws are suitable for fixation of fracture neck of the femur in young adults.
Limitations for this study was conducted on a small sample. Large studies with further follow-up are necessary.

Conclusion

Fixation with cannulated cancellous screws in fracture neck of femur in young adults gives good results at 24 months follow-up with minimal complications including delayed union, shortening, and avascular necrosis. The key factors in treating femoral neck fractures should include early surgery with anatomic reduction and stable internal fixation and delay in complete weight bearing till union.

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