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Research Article

A CLINICAL STUDY OF AO CANNULATED CANCELLOUS SCREWS FIXATION FOR GARDEN'S TYPE I AND TYPE II FRACTURE NECK OF FEMUR IN YOUNG ADULTS

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ABSTRACT

Objectives: The objectives of this study were to study the functional outcome of surgically managed type I and II fracture neck of the femur by AO cannulated cancellous screws in young adults.

Methods: A prospective study of 20 cases of type I and II Garden's fracture neck of femur in young adults managed surgically by AO cannulated cancellous screws fixation in Chigateri Government Hospital and Bapuji Hospital, between September 2014 and September 2016 satisfying the inclusion and exclusion criteria which were studied. The functional outcome was evaluated using the Modified Harris hip scoring system.

Results: In our study, we achieved 85% excellent results, 10% good, and 5% fair results. We had 95% satisfactory results in terms of the functional outcome. The results were comparable to other studies.

Conclusion: Intracapsular fracture neck of femur in young adults treated surgically by closed reduction and 6.5 mm AO cannulated cancellous screw fixation gave excellent to good functional outcome in 95%. Hence, this would be the best procedure for intracapsular fracture neck of the femur, and this is going to stay for an extended period in orthopedic practice.

Keywords: Fracture neck of femur, AO cannulated cancellous screws, Garden's type I and II and 2, Young adults.

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INTRODUCTION

Intracapsular fracture neck of the femur has always presented great challenges to orthopedic surgeons and remains the unsolved fracture as far as treatment and results are concerned [1]. Intracapsular fractures are devastating injuries that affect the elderly age group individual [2]. Intracapsular fractures are rare in young individuals with normal bone. Due to high-energy trauma associated with road traffic accidents, there is an increased incidence of intracapsular fractures in the modern era [1,2].

The high incidence of non-union and avascular necrosis (AVN) is associated with intracapsular fracture neck of the femur [3,4]. Furthermore, AVN is more likely to be symptomatic in the younger population [3]. Both non-union and AVN are functionally devastating and affect both the patient and society.

The rationale behind the prompt treatment of intracapsular fracture neck of the femur is the 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 supply [3-5]. The degree of vascular compromise is directly proportional and correlates with the displacement of the fracture which affects fracture union and leads to complications. Hence, intracapsular fracture neck of the femur is regarded as an orthopedic emergency [2] and needs to be reduced with rigid internal fixation which improves the femoral head blood circulation and prevents troublesome complications.

The parallel-screw method appears to set the standard with which other implants must be compared [6]. The cannulated cancellous screws can be inserted relatively simply and atraumatic compared to other methods [6]. Internal fixation with cannulated cancellous screws after good anatomical reduction is the optimum method of treating intracapsular fractures, because it has the benefits of decreased blood loss and operative time, lower transfusion requirements, and decreased length of hospital stay [2].

Given these considerations, the present study of management of Garden's type I and II fracture neck of the femur with 6.5 mm AO cannulated cancellous screws fixation in adults was taken up.

METHODS

Twenty cases, which were admitted to the Department of Orthopedics, Bapuji hospital, and Chigateri hospital, Davanagere from September 2014 to September 2016 were included in the study.

Study type

The study was prospective and interventional study.

Cases

This study includes 20 cases.

Inclusion

Fresh Garden's type I and II fracture neck of femur, age group of 18–45 years, was included in the study.

Exclusion

Type III and IV fractures, pathological fractures, fractures more than 1 week of trauma, and pediatric fractures (before physeal closure) were excluded from the study.

All the patients have explained the aims of the study, and the methods involved and, informed written consent was obtained before being included in the study. As soon as patients were admitted, their history was recorded and a thorough clinical examination was conducted. Radiographs were taken of the affected hip in anteroposterior (AP) view. The fractures were classified based on Garden's classification.

Routine blood and urine investigations were performed to know the patient's fitness to undergo surgery. All patients of Garden's type I and II fractures were taken up for osteosynthesis with 6.5 mm AO cannulated cancellous screw fixation.

Technique

Under spinal anesthesia, the patient was put on a fracture table. Through the lateral approach, the inferocentral guide pin was drilled with help of an angle guide. With the help of a parallel guide placed over the inferocentral guide pin, anterosuperior and posterosuperior guide pins were drilled up to the subchondral bone. 5.0 mm cannulated drill bit was passed over the guide pins and drilled up to 10 mm from the tip of the pin and 6.5 mm cannulated cancellous screws were inserted 5 mm less of guide pin length. All the screws are tightened simultaneously for final purchase into the subchondral femoral head. It provides excellent torque transfer into the neck and subchondral bone of the femoral head. The position of AO screws was confirmed in image intensifier in both AP and lateral views.

Follow-up

In our study, patients on discharge were advised to report after 4 weeks, 3 and 6 months, and 1 year. At the follow-up, a detailed clinical examination was done and the patient was assessed subjectively for symptoms such as pain, swelling, and restriction of joint motion.

A modified Harris Hip scoring system was used for evaluation. Radiographs of the affected hip in AP view were taken and looked for progressive signs of union or any complications like the appearance of any coxa vara or screw backing out or breaking or signs of AVN. If trabecular continuity at the fracture site was present, the patient was advised partial weight-bearing with a walker for a further period of 6 weeks. After this period, X-rays were taken and once fracture union was confirmed, patients were permitted to walk full weight-bearing on the affected limb. All patients were advised to the removal of implants after the complete union, at the end of 2 years.

RESULTS

The total number of cases was 20. Of which 55% of the patients were in the age group of 18–30 years out which 75% were male with an M: F ratio of 3:1. Fourteen (70%) cases were of right- sided involvement and the mode of injury in 12 (60%) cases was a road traffic accident.

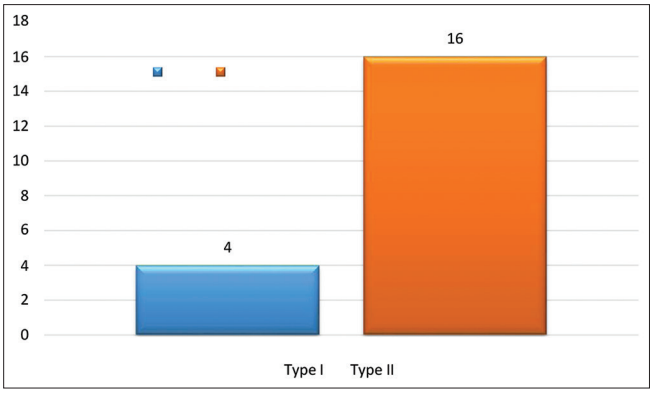
Out of 20 cases, the majority were Garden's type II cases –16 (80%) and the rest were type I (Graph 1). Fourteen (70%) cases were operated on between the 4th and 7th day and the rest were before 3 days from the day of injury (Table 1). Fracture union was seen in 12 weeks in seven cases, 16 weeks in ten cases, and 20 weeks in three cases (Table 2). In our study with 20 cases, two cases went in for AVN and one case for non-union.

In the present study, 20 patients with Garden's type I and II fracture neck of femur were treated surgically. The operative results were satisfactory in 95% of cases by Modified Harris Hip Score. The functional outcome of our cases were Excellent in 17 cases (85%) , good in 2 cases (10%) and fair in 1 case (5%) (Table 3). Excellent results were observed equally irrespective of the timing of surgery in our study, that is, within 7 days. Only one patient with AVN had minimal pain and all other patients had satisfactory functional outcomes at their final follow-up.

DISCUSSION

The femoral neck fracture is the most common skeletal injury, occurring with minor trauma within the osteoporotic bone of elderly patients. In younger patients , femoral neck fractures occur along with other fractures including that of ipsilateral femur shaft fracture. The management of this fracture has evolved significantly.

The presentation at different ages possesses different problems related to the management. The issues are fixation failure in the osteopenic



Graph 1: Fracture type – Garden's classification

Table 1: Time interval between injury and surgery

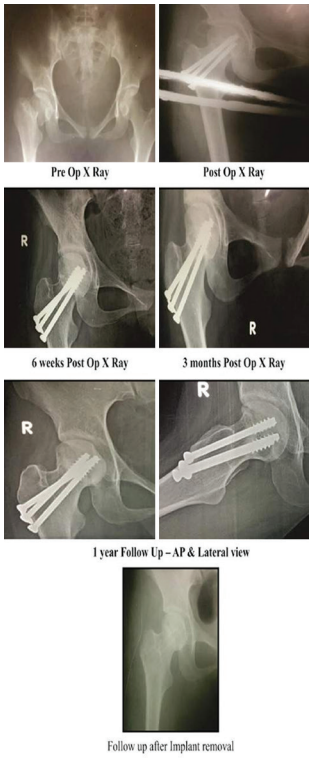
Day of surgery	1st-3rd day	4th-7th day
Number of cases	6	14
Percentage	30	70

Table 2: Time taken for union

Union (weeks)	Eight	Twelve	Sixteen	Twenty
Number of cases	1	6	10	3

Table 3: Results according to modified Harris Hip score

Results	Number of cases	Percentage
Excellent	17	85
Good	2	10
Fair	1	5
Poor	0	0



bone of the elderly, marked displacement of fragments, posterior comminution and disruption of blood supply in young adults, and a higher incidence of non-union and AVN in young adults.

A femoral neck fracture is unique due to its anatomical and biomechanical considerations. The blood supply to the femoral head comes from three main sources, that is, medial femoral circumflex artery, lateral femoral circumflex artery, and obturator artery through intracapsular terminal branches which run parallel to the neck. Any femoral neck fracture disrupts the terminal blood vessels producing AVN. Hence, it is aptly called a vascular injury to the femoral head. The fracture is intra-articular and this exposes the fracture surface to synovial fluid and its enzymes. Depending on the fracture configuration and, therefore, the action of varied groups of muscles working on the hip, it is subjected to a high degree of shearing strain. Hence, accurate reduction and internal fixation are mandatory requirements to expect fracture healing. The incidence of AVN in our study was 10% which was comparable to 16% in the study by Khoo *et al*. [7].

The treatment of intracapsular fracture neck of the femur with anatomical reduction, early, and stable fracture fixation using 6.5 mm AO cannulated screws was found to give a high percentage of excellent and good results [4,7-9]. This study supports these conclusions.

In the present study, we have 20 young adults with Garden type I and II fracture neck of femur who are operated upon. All patients were followed up for 3 months–2 years.

Preservation of the femoral head with internal fixation is desirable in younger and more active patients with a femoral neck fracture. A healed femoral neck fracture, without the development of osteonecrosis, leads to a good functional outcome [7,9-11]. Initial fracture displacement and disruption of the femoral head blood flow are contributing factors that are outside of the surgeon's control. The ability to realize an honest outcome by decreasing function failure and therefore the rate of non-union depends on several factors that the surgeon can control – namely, timing of surgery, the quality of reduction, and obtaining a stable fixation [12-14]. We found a 5% incidence of non-union in our study which is comparable to a study done by Raj *et al*. [15].

Jain *et al.* [16] compared early and delayed fixation of subcapital hip fracture in Asians who were 60 years of age or less. After a minimum of 2 years of follow-up, they did not find any significant difference between the early and delayed fixation groups regarding the functional outcome. There was also no significant difference in outcome between displaced and non-displaced fractures. Our study confirmed the same as there was no difference in the outcome of patients who operated early (1–3 days) and late (4–7 days). Functional results are similar in both groups.

Placement of the screw is also of paramount importance. An inverted triangle with apex inferior is preferred as there will be less stress raiser effect and decreases the subsequent chances of subtrochanteric fracture. The screws should be placed as far as possible from one another close to the cortical bone of the femoral neck. Screws should be parallel with unacceptable not more than 10° angulation between them. Screws tips should be within 5 mm of subchondral bone.

Walker *et al*. [17] compared the relative stiffness of fixation of simulated Pauwels type III femoral neck fractures fixed with either two or three cannulated screws implanted at 135, 145 and 150.

Results showed that axial stiffness values were not statistically different at different angles. Two–screw fixation appears to be adequate; adding the 3rd screw might not be necessary.

In our series, we have allowed early non-weight-bearing ambulation with a walker strictly for 3 months. Following this period, based on clinical and radiological signs of union, patients were allowed unaided full weight bearing. The range of motion of the hip was returned to near pre-trauma level in almost all the cases. The functional results of the present study were comparable with that of Raj *et al.* [15] with 85% excellent results, 10% having good results, and fair results in 5%.

The high rate of fracture healing in these patients probably was due to the healing potential and good bone quality of the femoral head and neck of most young patients.

The limitations of the current study are the study group is small and follow-up was of short duration to comment on the incidence of AVN. The study requires further follow-up to comment on the incidence of AVN.

The treatment of intracapsular fracture neck of femur in young adults with anatomical closed reduction stable internal fixation using AO cannulated cancellous screw was found to give a high percentage of excellent and good results [4,7-9]. This study supports these conclusions and was comparable with those in other studies.

CONCLUSION

Intracapsular fracture neck of femur in young adults is increasing due to road traffic accidents. These injuries are common in middle-aged men attributed to RTA. Early diagnosis, early fixation, that is, within 7 days with anatomical reduction, and internal fixation with cancellous screws gave excellent results in this study. There was no significant difference in the outcome between patients who operated within 3 days and 4th–7th day. Hence, we could conclude that Garden's type I and II fracture neck of femur in young adults treated surgically by closed reduction and internal fixation with 6.5 mm AO cannulated cancellous screw fixation gave excellent to good functional outcome in 95%. Hence, this would be the best procedure for Garden's type I and II fracture neck of femur and this is going to stay for a long period in orthopedic practice.

AUTHORS' CONTRIBUTIONS

Assessing the patients in OPD, Deciding which patients to take up for study according to inclusion and exclusion criteria, conducting surgery in study cases, regular follow-up of cases till study ended.

CONFLICTS OF INTEREST

Nil.

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