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Original Research Article

Outcome Assessment of Internal Fixation of Fracture Neck Femur in the Sixth and Early Seventh Decades of Life by DHS and Antirotation Screw

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Abstract

Aim: To assess the results of internal fixation of fracture neck femur in the sixth and seventh decades of life

Methods: The study included 40 patients with displaced fracture neck femur and treated by closed reduction and internal fixation in Department of Orthopedics, SB Medical College & Hospital, Hazaribagh, Jharkhand, India during the period of 12 months by Dynamic Hip Screw (DHS) and anti-rotation screw. During each visit patients were examined clinically for wound healing, range of hip and knee movements. Radiological evaluation was done to assess bone union and stability of fixation.

Results: Out of 40 patients, 26 patients were males and 14 were females with their ages ranged from 50 to 69 years with an average of 60 years. The etiology was fall at home in 23 patients and outdoor injury in 17 patients. The fractures were Garden type III in 27 patients and garden type IV in 13 patients. The follow up period ranged from 24 to 60 months with an average of 41 months. The operative time ranged from 25 to 90 minutes with an average of 45 minutes. Bone union was achieved in all patients except one. The time to bone union ranged from 3 to 9 month with an average of 4.5 months.

Conclusion: Fracture of femur neck affects the healing ability due to poor blood supply causing non-union or osteonecrosis. Internal fixation of fracture neck femur in the sixth and early seventh decades of life by DHS and antirotation screw has the advantages of short operative time and early weight bearing with high union rate with less complication.

Keywords: Femure, Antirotation Screw, Osteonecrosis

Introduction

Femoral neck fractures (FNF) are common in the elderly population and are associated with significant morbidity and mortality [1]. Femoral neck fractures in adults younger than age 50 years are uncommon

and often the result of high-energy trauma [2,3]. Fracture neck of femur is common in elderly people due to osteoporosis or osteomalacia. The most common mechanisms of injury are either a fall that causes a direct blow to the greater trochanter or forced lateral rotation of the lower extremity [4].

The treatment of this fracture depends mainly on the age of the patient and the degree of displacement. In young adults below the age of 50 the treatment is clear by reduction of the fracture and fixation by multiple cancellous screws. In elderly people non-displaced or valgus impacted fractures can be treated with percutaneous pin fixation using cannulated screws while, displaced fracture is best treated with hemiarthroplasty using a cemented stem [5, 6]. Internal fixation of the fracture neck femur in this age group has several advantages compared with arthroplasty including shorter operative time, decreased blood loss, and reduced perioperative mortality [7-9].

In the elderly patients, femoral neck fractures usually occur as a result of a fall from standing height. Poor bone density, multiple medical problems and propensity to fall are major risk factors for femoral neck fracture. The fracture pattern seen in young adults will be different from the elderly patients. The poor bone quality and fall from a standing height leads to a low-energy injury and results in a femoral neck or intertrochanteric hip fracture; the femoral neck fracture seen in elderly patients will often be sub capital. It is common to see a transverse fracture pattern with impaction at the fracture site.

Despite known limitations, femoral neck fractures in elderly patients are frequently described using the Garden classification [10,11]. In this age group, treatment can be recommended based on describing the fracture as non-displaced (Grade I, II) or displaced (Grade III, IV). The Garden classification is not as useful for describing femoral neck fractures in young adults.

In the elderly patient, the goals of treatment are mobility with weight bearing as tolerated and minimizing complications seen with prolonged bed rest. Multiple surgical options are considered, reduction and internal fixation, hemiarthroplasty or total hip arthroplasty. Considerations include the patient's physiological age, level of activity, medical comorbidities and the degree of bone density.

The two most challenging complications of femoral neck fractures in the young adult to deal with are femoral head osteonecrosis and nonunion. Osteonecrosis in the elderly is less likely to be symptomatic because of their lower functional demands and level of activity. Fortunately, total hip replacement is a good option and has consistent good results for the elderly patient with symptomatic osteonecrosis. Nonunion is another complication of femoral neck fractures which is difficult to deal with. There are good surgical options available for this problem. The treatment that has consistent good results is valgus osteotomy [13].

Materials and Methods

The study included 40 patients with displaced fracture neck femur and treated by closed reduction and internal fixation in Department of Orthopedics, SB Medical College & Hospital, Hazaribagh, Jharkhand, India during the period of 12 months by Dynamic Hip Screw (DHS) and anti-rotation screw. Patients with undisplaced fractures, pathological fractures or arthritic changes of the hip joint were excluded. The time elapsed between trauma and surgery ranged from few hours to 7 days with an average of 3 days.

Procedure

All patients gave their informed consent prior to surgery. After induction of anesthesia, patient was put on the traction

table and accurate reduction was achieved under C-Arm control. The proximal femur was approached through a lateral incision started at the greater trochanter and extended distally. One guide wire was inserted in the inferior half of the neck at the proposed site of the lag screw and another two guide pins were inserted in the upper half of the neck to avoid rotational force during reaming and insertion of the DHS lag screw. The length of the lag screw was adjusted to keep the tip apex index less than 25 mm.

After insertion of the DHS the superior guide wires were removed and partially threaded cancellous screw was inserted parallel to the lag screw of the DHS. Active range of movement was encouraged from the second postoperative day. Patients were discharged on an average of 3 days postoperatively and followed up regularly in the outpatient clinic. During each visit patients were examined clinically for wound healing, range of hip and knee movements. Radiological evaluation was done to assess bone union and stability of fixation. At the final follow up radiological evaluation was done by measurement of the following parameters on both sides: (1) Femoral neck length: the distance between the center of the head to the axis of the femoral shaft along the femoral neck axis; (2) Horizontal offset of the femoral head: the shortest distance from the femoral head center to the femoral shaft axis; (3) Femoral neck-shaft angle: angle formed by the femoral shaft axis and the femoral neck axis. The neck length and horizontal offsets were reduced on the operated sides in comparison to the normal sides. Partial weight bearing was allowed from the second postoperative week. Progressive weight bearing was allowed according to the progress of bone healing on the serial radiographs.

Results

Out of 40 patients, 26 patients were males and 14 were females with their ages ranged from 50 to 69 years with an average of 60 years. The etiology was fall at home in 23 patients and outdoor injury in 17 patients. The fractures were Garden type III in 27 patients and garden type IV in 13 patients.

Table 1: Demographic and fracture details of patients

Variable		Number	%
Gender	Males	26	65%
	Females	14	35%
Etiology	Fall at home	23	57.5%
	Outdoor injury	17	42.5%
Fracture type	Type III	27	67.5%
	Type IV	13	32.5%
Complications	Superficial wound infection	4	10%
	Bed sores	5	12.5%
	Non-union	1	2.5%
	Osteonecrosis	3	7.5%

The follow up period ranged from 24 to 60 months with an average of 41 months. The operative time ranged from 25 to 90 minutes with an average of 45 minutes. Bone union was achieved in all patients except one. The time to bone union ranged from 3 to 9 month with an average of 4.5 months. The time to full weight bearing ranged from 2.5 to 8 months with an average of 5 months. The reduction in the neck length ranged from 3 to 8 mm with an average of 5 mm. The reduction in the

horizontal offsets ranged from 2 mm to 6 mm with an average of 4 mm. This reduction in neck length and horizontal offset was found statistically to be significant (p value < 0.05). No changes in the neck shaft angles were observed between the operated and non-operated sides. The complications included superficial wound infection in 4 cases, bed sore in 5 patients, nonunion in 1 case and osteonecrosis in 3 cases. Nonunion was diagnosed by persistence of the fracture line for more than 6 months without any evidence of healing. Osteonecrosis was diagnosed by collapse and sclerosis of the femoral head. No cases were complicated by implant failure or deep infection. The Harris hip score ranged from 30 to 97 with an average of 84 [14].

Table 2: Mean variable ranges and their average

Variable	Range	Average
Age (in years)	50-69	60
Follow-up period (in months)	24-60	41
Operative time (in minutes)	25-90	45
Bone union time (in months)	3-9	4.5
Time to full weight bearing (in months)	2.5-8	5
Reduction in neck length (in months)	3-8	5
Reduction in horizontal offsets	2-6	4

Discussion

Femoral neck fractures are a specific type of intracapsular hip fracture. The femoral neck connects the femoral shaft with the femoral head. The hip joint is the articulation of the femoral head with the acetabulum. The junctional location makes the femoral neck prone to fracture. The blood supply of the femoral head is an essential consideration in displaced fractures as it runs along the femoral neck. Femoral neck fractures are associated with low energy falls in the elderly. In younger patients sustaining a femoral neck fracture, the cause is usually secondary to high-energy trauma such as a substantial height or motor vehicle accidents [15,16]. Risk factors for femoral neck fractures include female gender, decreased mobility, and low bone density [17, 18].

Displaced fractures of the femoral neck put the blood supply at risk, usually tearing the ascending cervical branches that stem off the arterial ring supply formed by the circumflex arteries. This may compromise the healing ability of the fracture, inevitably causing non-union or osteonecrosis [19]. Management of these type of fractures can be non-operative and operative. Non-operative management for these fractures is rarely the treatment course. It is only potentially useful for non-ambulatory, comfort care, or extremely high-risk patients. Young patients with femoral neck fractures will require treatment with emergent open reduction internal fixation [15, 20]. Non-displaced fractures are treated typically with percutaneous cannulated screws or a sliding hip screw. However, there a higher rate of avascular necrosis (AVN) with the use of a sliding hip screw (9%) compared to cannulated screws (4%) [21]. With displaced fractures of the femoral neck in elderly patients, the treatment depends on the patient's baseline activity level and age. Less active individuals may receive a hemiarthroplasty [22].

Internal fixation by cannulated screws has the advantages of being an easy and simple procedure but it has the disadvantages of long treatment time and high post operative complications. The construct of fixation is

unstable and the risks of implant failure, nonunion and osteonecrosis are high [23]. Dynamic hip screw is a stable construct. The lag screw produces good grip in the head and the sliding mechanism allows for compression at the fracture site without displacement. Zhang et al [24] compared multiple cannulated screws versus dynamic hip screws for femoral neck fractures. They found that DHS is associated with high overall success rate and lower rates of implant failure, reoperation and postoperative complications.

Wani et al [25] compared internal fixation versus arthroplasty in treatment of fracture neck femur in the same age group. They found that hip arthroplasty improves the hip function and reduces the risk of reoperation but at the cost of high complication rate, long operative time and length of hospital stay. The inferior results in the internal fixation group in their series may be related to the method of fixation. They used cannulated screws which is unstable construct that does not allow early weight bearing and has a high failure rate. Amnian et al [23] compared the biomechanical stability of four different fixation techniques for stabilizing vertical shear femoral neck fractures. They found that the weakest construct was the 7.3-mm cannulated screw configuration. Failure occurs by backing out of the screws and varus collapse.

Conclusion

Fracture of femur neck affects the healing ability due to poor blood supply causing non-union or osteonecrosis. Internal fixation of fracture neck femur in the sixth and early seventh decades of life by DHS and antirotation screw has the advantages of short operative time and early weight bearing with high union rate with less complication.

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