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Research article

OUTCOME OF INTERTROCHANTERIC FRACTURES TREATED WITH SHORT FEMORAL NAIL

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ABSTRACT

Aim: To study the functional and anatomical outcome of Inter trochanteric fractures of femur treated with Short femoral nail. **Method**: This was retrospective study carried out in which 60 patients (50 Male & 10 Female) of 5th to 8th decade of life who underwent Short femoral nail fixation for both Stable & unstable Inter Trochanteric fractures. From the records each patient data was assessed for time required for mobilization, average fracture healing time, degree and grade of hip range of movements, complications, anatomical reduction achieved using Short femoral nail fixation. **Results**: 55 cases achieved Anatomical reduction. Good to Excellent Hip range of Motion was in 55 (90 %) cases. Fracture union was seen in all cases. No evidence of Z Effect, AVN of femoral head, Implant failure, Fracture of femoral shaft below the Nail tip was seen in any case, However Reverse Z Effect was seen in 4 & shortening of less than 2 cm was seen in 2 cases, External rotation of 10 degree was seen in1 case. Average fracture Union time was 14 weeks. **Conclusion:** Short femoral nail appears to be better implant for fixation of both Stable & unstable Inter Trochanteric fractures as it fulfills the biomechanical demands being minimally invasive, less blood loss , it prevents excessive varus collapse at fracture site, produces less stress riser effect below the nail tip, Short operative time, Facilitates early mobilization & functional recovery of patients. But Anatomical fracture reduction & optimal implant placement are absolutely must for better results.

Keywords: Short femoral nail, trochanteric fractures

INTRODUCTION

Intertrochantric fractures are common in 5th – 8th decade of life[1,2]. Conservative treatment is poorly tolerated by elderly patients making operative treatment as treatment of choice [1-4]. Dynamic hip screw is time tested extrmedullary device [1, 4, 5]. But it has disadvantages like larger soft tissue dissection, more blood loss, medialization of distal fragment,cut out of screw & excessive collapse at fracture site[3]. To avoid these complications intramedullary devices are developed which are minimally invasive. Gamma nail first of its generation has provision of only single screw placement which can cutout [3,4]. To overcome this complication Proximal femoral nail was developed by AO/ASIF in 1997 which has provision of two proximal screw placement making construct biomechanically stable & suitable even for Unstable trochnateric fractures[4],. Gamma nail & Proximal femoral both have larger proximal diameter for average Indian femur [1,2,3], which can cause splintering of bone [3]. This led to invention of Short

femoral nail with length of 180mm & proximal diameter of 15mm. This enables easy insertion & reduces chances of fracture of femur [3]. This nail has longitudinal slot throughout its length which helps in accelerating the endosteal bone healing process [3,4]. It also has 6 degrees of medio lateral angle & flutted distal tip which facilitates easy insertion, reduces stress concentration below the nail tip[3] In this series we have reviewed records of 60 patients with both stable & unstable trochanterric fractures treated with short femoral nail.

Aim: To study the functional and anatomical outcome of Inter trochanteric fractures of femur treated with Short femoral nail

Objective:

1. To study the time required for mobilization of Inter trochanteric fractures of femur treated with Short femoral nail fixation
2. To determine the average fracture healing time of Inter trochanteric fractures of femur treated with Short femoral nail
3. To find out degree and grade of hip range of movements achieved with Inter trochanteric fractures of femur treated with Short femoral nail
4. To study the complications if any with the Inter trochanteric fractures of femur treated with Short femoral nail
5. To assess the anatomical reduction achieved using Short femoral nail fixation

MATERIAL & METHOD

Study design: Retrospective analysis. Records of 60cases of Inter Trochanteric fractures treated with Short femoral nail from Dec 2012 to April 2015in our department.

Ethical approval: The study was started after taking permission from Ethical committee.

Inclusion criteria: Patients of both sexes with both Stable & unstable intertrochanteric fractures from of 5^{th} to 8^{th} decade of life who underwent Short femoral nail fixation.

Exclusion criteria: 1. Patients with intertrochanteric fractures with subtrochanteric extensions. 2. Patients with intertrochanteric fractures with ipsilateral femoral shaft fractures fixation. 3. Those patients whose detail records were incomplete

Methodology:

Hospital records of total 60 cases of intertrochanteric fractures treated with Short Femoral Nail fixation from Dec 2012 to April 2015 in the department of Orthopaedics, Rural medical college, Loni.

The following parameters were assessed form the records:

Age, Gender, Mode of Injury (Domestic Fall /High velocity trauma), Stable or unstable intertrochanteric fractures pattern on X rays (stability of fracture was decided by presence or absence of posterio medial cortex integrity of proximal femur, Fractures were classified by AO/ASIF Classification), Duration between admission & operation, Type of reduction obtained – Closed or Open, Time required for mobilization following fracture fixation, Fracture healing time in weeks, Assessment of Functional recovery by hip range of motion by Harris Hip Score & ability to do activities of daily routine like climbing stairs, squatting, walking, cross leg sitting, Occurrence of Complications following Short femoral nail fixation like Reverse Z ,Z effect, implant failure, infection, AVN femoral head, Non union, Anatomical reduction achieved following fracture fixation by restoration of posterior & medial cortex integrity & restoration of Neck shaft angle.

RESULTS

Amongst 60 cases 50 were Male & 10 Females. Majority of patients were from 5^{th} – 8^{th} decade of life (Mean age 67yrs) [Table 1]. Most common mechanism (in 50 cases) of injury was Domestic fall while in 10 cases it was High velocity trauma. AO/ASIF Classification was used [Table 2]

Table 1: Age wise distribution Number of patients

Age range	Male	Female	Total	Percentage
50-59	15	2	17	28%
60-69	25	4	29	48%
70-79	8	3	11	18%
80-89	2	1	3	5%

Table 2: Fracture Pattern

Fracture Pattern	Number	Percentage
Stable fractures A1	21	35
Unstable fractures A2	24	40
Unstable fractures A3	15	25

Stable fracture pattern was seen in 35 % cases, while unstable pattern was seen in 75 %

Per operatively patients were above knee skin traction on Thomas splint. Average duration between admission & operation was 8 days. No pre operative

CT scan was done in any case. IV antibiotics (Intravenous Injection Cefotaxim 1 gm twice a day) were given up to 5 days post operatively.

Patients were operated in supine position on fracture table with affected limb given adduction & traction. Closed Anatomical reduction was achieved in 55 cases while 5 cases required minimal open reduction [Fig 1].

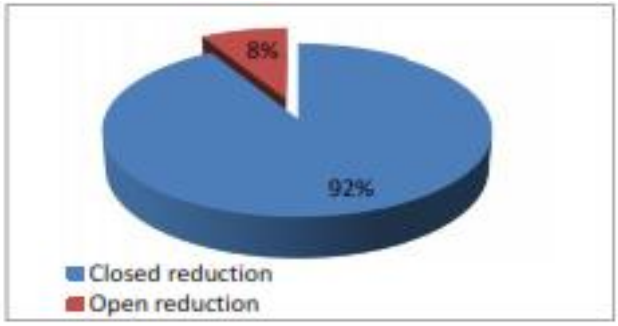

Fig 1 : Type of reduction

In 55(92%) cases closed Anatomical reduction was achieved

Anatomical reduction was assessed on image intensifier in AP & Lateral view by restoration of Posterior & medial cortex continuity. Approximately 5 cm incision was given from Tip of trochanter & extended up wards. Under image intensifier control Guide wire was passed through the tip of trochanter across the fracture site. Short Femoral nail was mounted over Jig & it was inserted across the fracture site over guide wire. Depending up on neck shaft angle of reduced fracture nail of 135 degree was used in 55 while that of 130 degree used in 5 cases. Then over the guide wire for proximal locking screw 6.4mm Antirotation screw & then 7.9mm cervical screw inserted through Jig in to the femoral head their central position was confirmed on image intensifier in both AP & Lateral view [Fig 2, 3, 4, 5].

Fig 2: Case 1 Preoperative and postoperative X ray showing Implant in situ in reduced fracture (AP view)

Fig 3: Case2 Preoperative and postoperative X ray showing Implant in situ in reduced fracture (AP view)

Fig 4: Case 3, Preoperative and postoperative X ray showing Implant in situ in reduced fracture (AP view)

Fig 5: Case 4, Preoperative and postoperative X ray showing Implant in situ in reduced fracture (AP view)

Depending upon the stability of constructs Dynamic or static distal locking was done. Wound was closed in layers. As per pain tolerance active knee &hip mobilization was started by post op day 4 -5.

Average operation time was 60 minutes. Average hospital stay was 3 weeks. As per pain tolerance active quadriceps strengthening & knee mobilization exercises started by post op day 4 -5. Non weight bearing mobilization with walker was started by 2 weeks, while full weight bearing was permitted only when complete Radiological & Clinical evidence of complete fracture union [Fig 6].

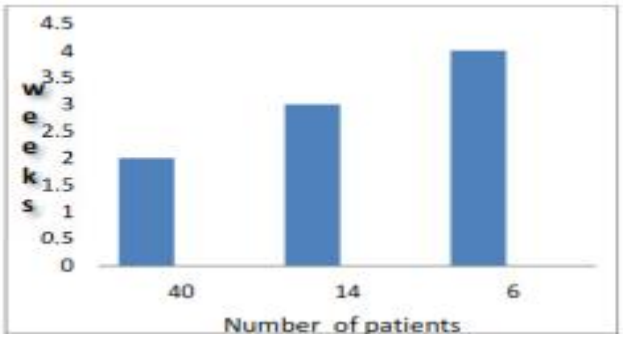

Fig 6 : Time required for non weight bearing mobilization

Average fracture union time was 14 weeks. Fracture union was seen in all cases. Commonly used nail diameter was 10mm. Average follow up period was 1 year. Recently done 5 more cases are still under follow up. Functional recovery of patients was assessed by Harris Hip Score & ability to perform activities of daily routine like walking, squatting, cross leg sitting, stair case climbing was done. Good to excellent results were seen in 55 (90%) cases [Fig7,8]

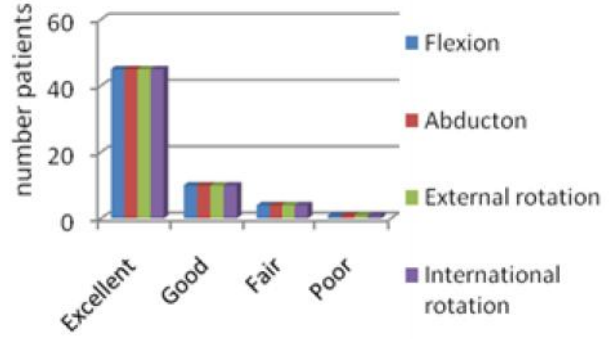

Fig 7 : Hip range of motion as per harris hip score

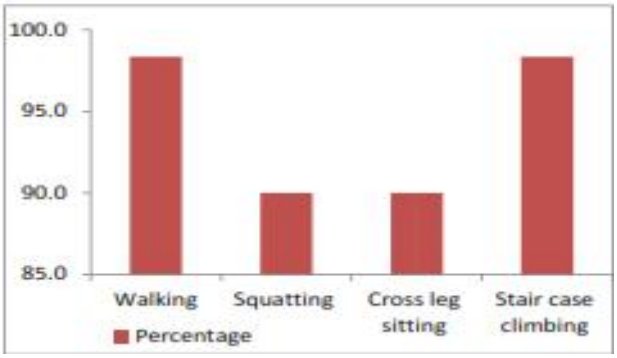

Fig 8: Functional recovery assessment

Few complications were seen in our series. But none of the mentioned complications hampered functional recovery of patient. There was no evidence of Z Effect , non union, implant failure , fracture shaft femur below the nail tip, no revision surgery required, no evidence of Avascular necrosis of femoral head seen in any case in this series.[Fig .9]

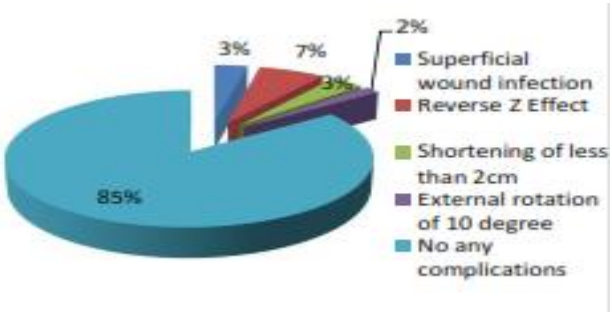

Fig 9 : Post operative complication

Reverse Z effect was seen in 4 cases , shortening of less than 2 cm was seen in 2 cases,.No evidance of Z effect, AVN, Implant failure was seen in any case

DISCUSSION

Inter Trochanteric fractures are very frequently faced by orthopaedic surgeons worldwide [4]. Increase in the incidence of these fractures are seen 5th decade of life onwards [1,4,5]. Age of patient, osteoporosis, general health, associated co morbidities are some of the key factors to be considered for the successful treatment of these fractures[3,4]. Conservative treatment is poorly tolerated by elderly patients & it is also associated with complications like Decubitus ulcers, Deep vein thrombosis, and Aspiration pneumonitis [4]. There for surgical treatment is preferred option of treatment as it facilitates early mobilization & functional recovery [1,4-9]

Dynamic hip screw is time tested extramedullary load bearing device used for fixation of trochanteric fractures [1,4,10-13]. It works on the principal of controlled concentric collapse at fracture site. But it also has disadvantages like it requires larger surgical exposure leading to more blood loss, devices causes excessive collapse at fracture site, possibilities of cut out of lag screw from femoral head if not placed properly[3,4]. In osteoporotic bones & unstable fractures complications like fracture instability, excessive medialization fracture fragment may lead to pain & deformity [3]

The Cephalomedullary nails with Trochanter tip as entry portal are Load sharing implants, as they are placed close to the mechanical axis of femur, they have short lever arm. In unstable trochanteric fractures control of axial load transmission & rotational stability are important factors which are effectively managed by intramedullary devices[3]. So

they are considered biomechanically stronger than extramedullary devices [3,4]. Identification of Tip of trochanter is easy & requires less soft tissue dissection [3,4]

Gamma nail the original design of cephalomedullary nail has provision of single screw placement in the femoral head. But single screw construct was considered unstable for trochanteric fractures [3,4], which led to introduction of Proximal femoral nail in 1997by AO/ASIF which has provision of two screw placement in the femoral head. This system of Antirotation screw & cervical load bearing screw in this nail makes this construct biomechanically very stable [3,4,9] . As compared to Gamma nail there is less incidence of fracture of femoral shaft below the nail tip[4,9] But Proximal femoral nail may also have complications like Reverse Z effect, Z effect, lateral wall of trochanter fracture in osteoportic bone, incidence of fracture of femoral shaft below the nail tip cannot be ruled out12[4,9]

Both Gamma & Proximal femoral nail has proximal diameter of 17mm which can be large of average Indian femur13 [1,3]. Thus it can lead to widening & eventual fracture of trochanter [3]

Standered Proximal femoral nail has 250mm length, it crosses femoral isthmus &sometimes it can abut against the femoral shaft leading anterior thigh pain. Fixation below the level of isthmus is not required in most of intertrochanteric fractures.If there is mismatch between nail size & femoral curvatures it can lead to cortex penetration & splintering [3,4]. This can happen due to over sized implant which is manufactured as per western population anthropometric parameters [3].

Short femoral nail is designed to have length of 180mm with proximal diameter of 15mm. It also has tip of trochanter as entry portal but due to its small size it reduces stress concentration at this site[3]. It doesn't cross femoral isthmus, it prevents metallization of femoral shaft [3][Fig8.1,8.2] . It also causes efficient load transfer than extramedullary devices by acting like internal buttress [3]. Small diameter of nail may also prevent splintering of femoral shaft & fracture below the nail tip[3] [Fig9.1,9.2].

In our assessment it was observed that majority of patients were from 5^{th} – 7^{th} decade of life. Average time of non weight bearing mobilization of patient following short femoral nail fixation was 2weeks, Good to excellent functional recovery assessed by Harris Hip Score & ability to perform activities of daily routine like walking, squatting, cross leg sitting, climbing stairs was seen in 90 % cases, it is minimally invasive so it is better tolerated by elderly patients. Closed anatomical reduction which achieved by restoration of integrity of posterior & medial femoral cortex seen on AP & Lateral view of X-rays was seen in 92% cases. Average fracture union time was also 14 weeks. Fracture fixation with short femoral nail was also observed with fewer complications. None of the observed complications in the assessment was hampering functional recovery of patients.

CONCLUSION

Short femoral nail appears to be better implant for fixation of both Stable & unstable Inter Trochanteric fractures as it fulfills the demands being minimally invasive, less blood loss prevents excessive varus collapse at fracture site, produces less stress riser effect below the nail tip, Short operative time, Facilitates early mobilization of patients which is very helpful in elderly patients. But it also important that Anatomical or Near Anatomical fracture reduction & optimal implant placement are absolutely must for better results.

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Conflict of interest: None declared

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