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A Prospective Study of Outcome of Intertrochanteric Fractures Treated with Dynamic Hip Screw

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Introduction

The demographics of world populations are set to change, with more elderly living in developing countries. The highest hip fracture rates are seen in North Europe and the US and lowest in Latin America and Africa. Asian countries show intermediate hip fracture rates. With rising life expectancy throughout the globe, the number of elderly individuals is increasing in every geographical region, and it is estimated that the incidence of hip fracture will rise from 1.66 million in 1990 to 6.26 million by 2050.[1]

But as three-quarters of the world's population live in Asia, it is projected that Asian countries will contribute more to the pool of hip fractures in coming years. The highest incidence of hip fractures from Asia has been reported from Singapore. It is estimated that by 2050 more than 50% of all osteoporotic trochanteric fractures will occur in Asia. This variation in the distribution of hip fracture over different regions of the world demonstrate that genetic and environmental factors play a role in the etiology of hip fracture.[1]

In geriatric population, fall is the leading cause of nonfatal injuries and hospital admissions. Proximal femur fractures are divided into three categories: femoral neck and inter-trochanteric fractures account for 90%, sub-trochanteric fractures occurring in 5-10%.[2]

Intertrochanteric fractures unite readily due to broad fracture surfaces, adequate blood supply and they rarely lead to non-unions. If proper precautions are not taken fractures unite in malposition resulting in shortening, limp and restricted movements. Treatment must also consider effective internal fixation to help early mobilisation and to reduce morbidity.[3]A combination of surgical fixation, early postoperative physiotherapy and ambulation is usually the best approach. The overall goal in the treatment of hip fractures is to return the patient to pre-morbid level of function. Among the various internal fixation devices used for trochanteric fractures the dynamic hip screw with sliding plate is one of the implant which permits the proximal fragments to collapse or settle, seeking its own position of stability.

In our study period of two years 45 cases according to the inclusion criteria were radio logically classified and treated surgically as early

as possible. These fractures were treated with dynamic hip screws and plate system. A study was undertaken to study the effectiveness of the DHS and Tip Apex distance, stability, reduction and the functional outcome with Harris Hip score.[4]

Aims and Objectives

To assess the functional outcome of the patients with inter trochanteric fractures treated with DHS using Harris Hip score.

Review of Literature

Before 1930, treatment of trochanteric fractures were basically conservative, i.e. Russell's traction, skeletal traction, counterpoised suspension and well leg traction.

In 1930, Jewett introduced Jewett nail to provide immediate stability of fragments.

The introduction of the Triflanged nail by Smith-Peterson (1931) for treatment of fracture neck of femur has resulted in a great reduction of mortality and improvement in the percentage of union.

Jewett EL in the year 1941 devised a single piece angled nail plate called Jewett nails and used it for internal fixation of trochanteric fractures.[5]

In 1949, Merwyn Evans devised a classification dividing trochanteric fractures into stable and unstable types. He presented 101 cases treated conservatively and 22 case treated by internal fixation with Capener Neufeld nail plates and suggested that internal fixation of trochanteric fractures has the advantages of early mobility of the patient and lowered mortality.[6]

Boyd and Griffin in 1949 presented a classification for trochanteric fractures which is still widely followed all over the world. The mortality rate was 18%, in 300 cases treated conservatively by him, which was comparable with other series. The incidence of coxa vara was 31.3% in his series.[7]

Hafner[9] in 1951 reported trochanteric fractures treated with the 'Low Nail' technique of, Brittain H.A. and described the advantages of the low nail. He preferred internal fixation over other methods.[8]

In 1957, Clawson studied both stable and unstable fractures internally fixed with a nail plate and found that 41% of the fractures go into varus, and he concluded that for the unstable fractures traction was better than internal fixation with a nail plate.[9]

In 1964, Clawson reported the treatment of trochanteric fractures using Sliding Compression Screw and Jewett Nail. In 39 stable fractures treated with sliding screw there were only 5.2% failure rate. In the 26 unstable fractures treated with sliding screws there was a failure rate of 11.5%. In the fractures stabilized with Jewett nail plate device, most of which were stable fractures failure rate was about 32%. The Richard Manufacturing Company and Mr. Ian McKenzie of the Royal National Orthopaedic Hospital developed the Sliding Compression Screw used. Clawson made several modifications and in its current form the device is known as the Richard's Compression Screw.[10]

Dimon and Hughston in 1967 reviewed 302 intertrochanteric fractures of which 167 were stable and 140 were unstable type and noted the value of displacement fixation in unstable intertrochanteric fractures. 75 unstable fractures were nailed conventionally and the remaining 75 were treated by primary medial displacement fixation. The numerous complications noted were: (i) The nail penetrates the femoral head and enters the acetabulum as the distal fragment migrates medially and proximally, (ii) The nail bends or break as the fractures collapses, (iii) The nail cuts through the head and neck as the fracture settles into varus deformity, and (iv). The plate pulls away from the femoral shaft. The most unstable intertrochanteric fractures in anatomical position, aligning head and neck segment with the shaft, which leaves posteromedial defect and hence stability was not achieved. So to achieve stability, primary medial displacement was necessary. They concluded that, (i) To recognize stable or unstable fractures by reviewing radiographs preoperatively and at first reduction (ii) Stable fractures should be nailed conventionally (iii) Unstable types should be treated by primary medial displacement

fixation which significantly reduces the post-operative tendency for the fractures to develop a varus deformity.[11]

Sarmiento and Williams in 1970 described valgus osteotomy and I-Beam nail plate fixation for unstable trochanteric fractures. 100 cases were treated from 1964 to 1969. They also observed that, accurate approximation of the medial cortices of the two major fragments greatly enhances the efficiency of the medial cortex, reduces the complications, usually being the proximal migration of the nail. This technique makes the plane of unstable fractures more horizontal, approximates the cortices at the femur in a valgus position.[12]

Holland and Gunn in 1972 reviewed 50 trochanteric fractures treated by Sliding hip screw. They confirmed that stable fracture could be satisfactorily fixed with any rigid internal fixation device.[13]

Herrington and Johnston in 1973 described a modification of the medial displacement osteotomy and fixation technique of Dimon and Hughston, using a Sliding compression screw plate device in 81 patients. Conventional internal fixation had 44% complications, whereas using medialisation technique, they observed complications in only 19.6% (11 out of 56%) cases. When a rigid 6 cms. Jewett nail is used for fixation, and telescoping displacement may concentrate the load at the tip of the nail and protrusion of the nail through the head into the acetabulum occurs and when a short Jewett nail is used, the depth of fixation in the proximal head neck fragment may be inadequate. This problem seems to be solved by the sliding nail which allows continued telescoping of the femoral head neck spike within the medullary canal of the shaft while maintaining the valgus alignment. The screw's blunt nose prevents it from migrating longitudinal through the femoral head into the acetabulum. The broad surface contact of the threads of the compression screw in the proximal segment discourages its lateral migration. In 77 patients, 5 patients died or were lost to follow up, 67 patients had good results and 4 had progressive varus deformity. Majority were allowed weight bearing on the second day of operation with crutches or walkers. There was no metal failure or avascular necrosis.[14]

Collado in 1973 introduced the condylocephalic nailing method. The condylocephalic nail is a clover leaf intramedullary nail, slightly curved. It is passed upwards into the medullary cavity from the medial condyle of the femur into the proximal fragment of the fractures, which has obvious advantage that, the fracture site is not operate and hence infection is prevented. The procedure is simple and the position of nail is favorable as it is in the long axis of the shaft and corresponds to the direction of mechanical forces acting on the fracture line.[15]

Sahlstrand T in 1974 reported the results of using the Richards Compression Sliding Hip Screw system, in the treatment of 48 trochanteric fractures. He noted that this system could stabilize the fracture to such an extent that it is possible to mobilize the patient to walking with full weight bearing on the operated leg within a few days. The results were also compared with those previously obtained when Mac Laughlin plate was used, and the advantages were in the form of better fixation, easy rehabilitation, and a shorter length of hospital stay.[16]

Kjell Matre et al. did a study of treating trochanteric fractures with TrigenIntertan Intramedullary Nail Versus Sliding Hip Screw. In conclusion, we found similar results regarding pain, function, complications, and reoperation rates at one year in this randomized controlled trial comparing the INTERTAN nail and the sliding hip screw for the treatment of intertrochanteric and sub-trochanteric fractures.[70]

Howe et al. described the ascending branches of lateral femoral circumflex artery lateral to the ilio-psoas muscle to reach the femur at the inter-trochanteric line.

The lateral femoral circumflex artery also supplies two or three trochanteric branches to the anterior and lateral surfaces of the greater trochanter, which pierce the posterior surface of the trochanter along with the branches from the first

perforating artery.

Materials and Methods

This will be a single site study at Katihar Medical College and Hospital, Katihar. 45 cases according to the inclusion criteria will be selected between December 2020 and December 2022 will be taken up for the study. Patients and their relatives will be explained the condition, informed consent will be obtained and all details of the patients will be collected in a proforma.

Following discharge, regular follow up will be done on outpatient department for a period of 6 month. In case physiotherapy is needed, patients will be referred accordingly on outpatient basis.

Method of Collection of Data

- By interview
- By follow up at intervals of 3 & 6 months post operatively.
- The cases at follow up will be analysed using harris hip score

Inclusion Criteria

1. Cases of intertrochanteric fractures treated with DHS
2. Patients with age 45 years and above and both sexes are included.

Exclusion Criteria

1. Patients with sub-trochanteric fractures, fractures extending into the femoral shaft, intra-capsular fracture neck of femur.
2. Patients who are medically unfit for surgery
3. Polytrauma patients
4. Patients with pathological fractures

Procedure of the Study

Pre Operative

Patients admitted with trochanteric fractures will be examined and X-rays of hip in anterio-posterior and lateral views obtained. In the pre-operative radiographs the Evans type of fracture and quality of bone by Singh's index will be assessed. Skin traction with weight of 3-4 kilograms was applied. Oral and parenteral NSAIDs available in the hospital were used in most cases to relieve pain. Routine blood investigations, Hemoglobin level, urine routine, bleeding and clotting time, blood urea, serum creatinine, blood grouping typing, random blood sugar, Electro cardiograph (ECG), chest radiographs were obtained routinely. Physician opinion regarding fitness was obtained and Echocardiography obtained as per cardiologist opinion if needed. Fractures will be classified according to Evans. Patient was advised to perform chest physiotherapy, static quadriceps exercises preoperatively. Pre anesthetic evaluation was done for all cases. Parenteral 3rd generation cephalosporin were administered 1 hour prior to surgery.

Part preparation was done on the morning of surgery or before shifting patient to the operation theatre. Foleys catheterisation was done prior to surgery.

Operative Procedure

1. Type of anesthesia: one of the below anesthesia was used.
   a. Spinal anesthesia
   b. Epidural anesthesia
   c. Combination of spinal and epidural

Surgery

Position

Patient will be positioned in supine position. Fracture table was used as per the choice of the surgeon. The fracture will be reduced with Whitman's technique and reduction checked under C-arm in Antero-posterior and lateral views. This reduction will be held by fixing the foot to foot holder.

Exposure

Parts painted and draped. Watson –Jones lateral approach to proximal shaft and trochanteric region used. Skin incision was made about 5 centimeters proximal and anterior to greater trochanter and was curved distally and posteriorly over the postero-lateral aspect of trochanter. The length of incision dependent on the length of Barrel plate to be used varying according to fracture type. Incision will be deepened down to fascia lata, with a scalpel in the distal part of the wound and was

split proximally with scissors. In proximal part of the wound fascia lata is divided posterior to the tensor fascia lata muscle.

Observation and Discussion

The results will be compiled, tabulated and compared with previous studies.

Summary and Conclusion

On the basis of outcomes of all observations and results, data will be analysed to reach a definite summary and conclusion of present study under the direct guidance of Dr. Laljee Chaudhary, Professor, Department of Orthopaedics, Katihar Medical College and Hospital., Katihar

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ANNEXURE – A

PATIENT'S INFORMED CONSENT FORM

Patient identification number for this trial:

Title: A PROSPECTIVE STUDY OF INTERTROCHANTERIC FRACTURES TREATED WITH DYNAMIC HIP SCREW.

Name of the Principal Investigator: DR.LALJEE CHAUDHARY

The contents of the information sheet dated _____ (version) _____ that was provided have been read carefully by me/explained in detail to me, in a language that I comprehend. I have fully understood the content of the information sheet and I confirm that I have opportunity to ask questions.

The nature and purpose of the study and its potential risks/benefits and extented duration of the study and other relevant details of the study have been explained to me in detail. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal right be affected. I understand that the information collected about me from my participation in this research and sectionsof any medical notes may be looked at by responsible individuals. I gave permission for these individuals to have acess to my records. I agree to take part in above study.

Date:_____

Place:_____

Name of participants:_____ (Signature of patient / Left thumb impression)

Son/Daughter/ Spouse of :_____

ANNEXURE – B

UNDERTAKING

I/We agree to abide by the ethical guidelines for biomedical research on human subjects(As per the ICMR guidelines)while the research project being submitted for Ethical Committee consideration.

1. Project is considered to the absolutely essential for the advancement of knowlegdge and for the benefit of all.
2. Only subjects who volunteer for the project will be included . Their informed consent will be obtained to commencement of the research project and subjects will be kept fully appraised of all the consequences.
3. Privacy and confidentiality of the subjects shall be maintained and without the consent of the subject no disclosure will be made.
4. Proper precautions shall be taken so as to minimize risk and prevent irreversible adverse effects.
5. Research will be conducted by the professionally competent person.
6. Research will be conducted in a fair , honest ,impartial and transparent manner.Research will be accountable for maintaining proper records.
7. Research will be conducted keeping in view the public interest at large.
8. Research reports, material and data will be preserved (as per institutional guidelines
9. Results of research will be made known through scientific publication.
10. Professional and moralresponsibilties will be of the researchers ,directly or indirectly connected with the research.
11. Only those drugs which are approved by the Drug Controller of India for a specific purpose will be used in the research project.