A Retrospective Cohort Study of 23 Cases of Inter Trochanteric Femur Fracture in Elderly Patients Treated with Dynamic Hip Screw (DHS) without Image Intensifier

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ABSTRACT

Objective: To determine the clinical and radiological outcome of the inter trochanteric femur fractures in elderly patients fixed with Dynamic Hip Screw(DHS) without image intensifier.

Methods: This retrospective cohort study was conducted in Department of Orthopaedics Bolan Medical Complex hospital Quetta from 25th November 2017 to 23rd November 2019.The medical records of inter trochanteric fractures fulfilling the inclusion criteria who were operated for DHS without image intensifier were analyzed retrospectively. The screw placement technique, post operative position of lag screw in radiographs, union and complications were noted in each case.

Results: The records of 23 patients with mean age 75 ±7 years(range 58 to 90 years) were analyzed. Male patients were 15(65.2%) and female 8(34.7%). The position of lag screw was central position in 14(60.8%) patients and posterior inferior in 4(17.3%) patients while in 5(21.7%) patients the screw was in anterio superior position. Fracture union was noted in 22(95.6%) patients and implant failure in 1(4.3%) patient.

Conclusion: DHS under image intensifier should be the gold standard treatment of intertrochanteric fractures. However**,** acceptable radiographic position of DHS lag screw in femoral head and neck and ultimate union can be achieved in selected inter trochanteric fractures fixed without image intensifier. However experience of the operating surgeon and accurate preoperative templating and per operative lag screw placement techniques are mandatory.

Key Words: Dynamic Hip Screw, Image intensifier, Inter trochanteric fracture, Lag Screw, Tip Apex Distance.

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INTRODUCTION

The frequency of hip fractures are increasing globally due to increase of elderly people and increase in life expectancy.[1] It has been reported that United States would have over 500,000 hip fractures by the year 2050.[2] After sixth decade majority of hip fractures are inter trochanteric fractures.[3] The overall estimated cost of treatment of inter trochanteric fracture is about 10 million US dollar in United States.[4] Lack of early surgical treatment results in various complications in 20 to 30 percent of these cases and with a mortality rate of 15 to 30 percent.[5] Surgery allows early mobilization and reduces complication rates.[6,7]

Although a variety of implants are available to fix inter trochanteric fractures, broadly they are either extra medullary implants like dynamic hip screw with slide plate and proximal femur locking plate or intramedullary implants like cephalomedullary nails.[8-14] Intramedullary nails have some biomechanical and biological advantages over the sliding compression hip screws as they can be inserted closely without exposing fracture site causing less blood loss and consuming less surgical time.[15,16] The intramedullary nails also seem to have some benefits in unstable intertrochanteric fracture, comminuted trochanteric fractures, reverse obliquity fractures and fractures with sub trochanteric extension. [17,18] However, intramedullary nailing procedure is not only costly but technically demanding procedure and needs more skills and facility of image intensifier is mandatory.[19]

In Orthopedic Department of Bolan Medical Complex Hospital Quetta, all intertrochanteric fractures are treated with Dynamic Hip Screw(DHS) under image intensifier. Our center is a busy but resource-poor facility. We have only one image intensifier, one trained image operator and no immediate electricity backup when regular electricity is interrupted. In this article we reported our experience of 23 patients whose surgeries were completed without image intensifier but with patient consent. We strongly believe that DHS under image intensifier should be the gold standard and we are not advocating routine DHS surgery without image intensifier. We suggest that every Orthopaedic surgeon should have adequate knowledge of proximal femur anatomy, accurate preoperative templating and per operative lag screw placement techniques so that he should be confidant if he has to operate without image intensifier if accidently image gets out of order during surgery or electricity fails and no immediate back up is available. Limited data is available in literature regarding DHS fixation without image intensifier probably because developed countries have well equipped hospitals and sufficient resources. We expect further sharing of experiences by our senior orthopedic surgeons regarding improvement and innovation in DHS techniques without image intensifier so that resource poor centers and young Orthopaedic surgeons could utilize those techniques to their maximum benefits if surgery without image intensifier is inevitable.

METHODS

We conducted this retrospective cohort study in Department of Orthopaedics Bolan Medical Complex hospital Quetta. The study protocols were approved by Ethical Review Board of the hospital. The medical record of intertrochanteric fractures from 25th November 2017 to 23rd November 2019 were analyzed and found that 23 patients of age between 58 to 90 years with isolated intertrochanteric fractures, Boyd and Griffin type I fractures,[20] of less than one week duration were operated with DHS without image intensifier. The image intensifier was not used because either the machine stopped functioning during surgery or electricity was suddenly shut down and we had to complete the surgery without image control but with patient consent. All the surgeries were completed by the primary author who had the post fellow ship experience of more than ten years of managing trauma.All those patients whose surgeries were completed under image intensifier were not included in our study. The aetiology of fractures and demographic details of each patient was documented. A uniform method of preoperative/peroperative templating for the size of lag screw was noted in each case.[21] Pre operative traction radiographs were used for determining the size of lag screw. The distance from the lateral femoral cortex along the center of femoral neck and head upto the femoral head medial articular cortex was measured. A deduction of 10%(magnification factor) was made from this measurement. In cases where the length was not a whole number it was corrected to the nearest whole number but less than 10 mm.

Operative Technique

A uniform standard operative technique was adopted for each patient.[21] Surgery was done under spinal or epidural anaesthesia on traction table. Pre operative Cefuroxime 1 gram intravenously was given about 30 minutes before the skin incision. After standard lateral incision fracture reduction was confirmed by palpating the fracture site. To determine the anteversion of femoral neck, a 3 mm k wire was inserted along the long axis of the anterior surface of femoral neck and at the level of center of femoral neck width. The entry point of the guide wire was set at a point about 0.5 cm anterior to midline of the lateral surface of femoral shaft at the level of lesser trochanter. (Fig I)[21] An angle guide of 135 degree was used to insert guide wire at this point parallel to the 3 mm k wire already in place. In order to achieve central position in the neck and head a 5 degree tilt to posterior was adopted while advancing this guide wire. The position of the guide wire was checked visually and by palpation around femoral neck

followed by triple reaming over the guide wire, tapping and insertion of pre determined length of lag screw. The full coverage of lag screw inside the neck was once again confirmed with finger palpation around the neck of femur followed by four hole side plate application and compression screw.

Immediate post operative AP and lateral radiographs were seen and fracture reduction, neck shaft angle, position of the lag screw inside the head and neck and Tip Apex Distance(TAD)[22] was calculated and noted. The Tip Apex Distance(TAD) of 25 mm was considered optimal. The desired position of lag screw was central or posterior inferior in neck and head of femur. Fracture was considered reduced and stable when fracture gap was less than 5mm. The neck shaft angle was considered varus if less than 122 degree. All patients were mobilized by physiotherapist and follow up notes at 2,nd 4th ,6th ,8,th 10th and 12th and then monthly were seen. Partial weight bearing was allowed at 4th week and full weight bearing at 8th to 16th week. Follow up x rays and clinical notes were seen for fracture union, cut out, shortening, deformity and other complications.

We analyzed our data with SPSS version 29. Frequencies and percentages were calculated for qualitative variables while mean and standard deviation(SD) for quantitative variables. We reported our study in accordance with guidelines of Strengthening the Reporting of Observational studies in Epidemiology(STROBE).[23]

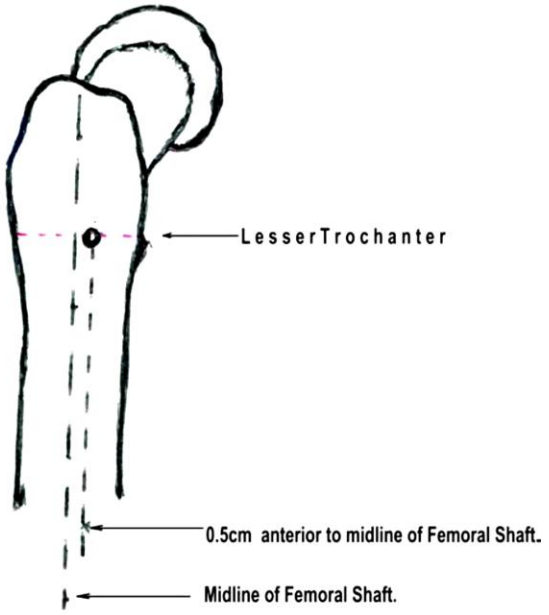

Fig I: Landmarks for guide wire and subsequent triple reamer and insertion of lag screw.

RESULTS

We analyzed the data of 23 patients who were operated with DHS without image intensifier. The mean age was 75±7 years(range 58 to 90 years). Male patients were 15(65.2%) and female 8(34.7%). History of fall was the cause of fracture in 15(65.2%) patients and motor vehicle accidents in 8(34.7%). Right side was involved in 12(52.1%) patients while left in 11(47.8%). Majority(65.2%,n=15) of surgeries were done under spinal anaesthesia while 8(34.7) surgeries were done under epidural anaesthesia. The clinical notes indicated that image intensifier was out of order in 19(82.6%) cases and sudden electricity shut down during surgery in 4(17.3%) cases.

The average time taken to complete the surgery was 85±8 minutes(range 60 to 95 minutes).Per operative two units of blood was transfused to 14(60.8%) patients one unit to 9(39.1%) patients. The size of lag screw used was 90 mm in 10(43.4%) patients,85mm in 9(39.1%) and 95mm in 4(17.3%) patients. Post op radiographs revealed the position of lag screw in central position in 14(60.8%) patients, posterior inferior in 4(17.3%) patients while in 5(21.7%) patients the screw was at anterio superior position. Fracture reduction was anatomical in 18(78.2%) patients and not anatomical in 5(21.7%). Majority(78.2%,n=18) of patients had a TAD of 25 mm or less while 5(21.7%) patients had a TAD of more than 25 mm. Superficial infection was reported in 2(13%) patients and deep infection in 1(4.3%) patient and treated with dressing, antibiotics and debridement. Screw cut out and back out was noted in 2(8.6%) patients each.Varus malunion was reported in 1(4.3%) and shortening of about 2cm was documented in 2(8.6%) patients in follow up visits. Fracture union was noted in 22(95.6%) patients at 16th week follow up. Implant failure was documented in 1(4.3%) patient who was successfully treated with calcar replacing hemiarthroplasty.

DISCUSSION

The dynamic hip screw (DHS) first introduced by Clawson, remains the implant of choice to fix inter trochanteric fractures even today by most of the surgeons.[24] DHS application under image intensifier is a technically easy surgery and associated with less blood loss, less operative time and low rate of complications and good bone healing.[25] Chinoy [26] in his meta analysis of 2855 patients compared DHS with fixed angle nail plate and reported an increased frequency of complications and mortality in fixed angle nail plate patients. Watson [27] compared 160

stable and unstable intertrochanteric fractures with Medoff Sliding Plate and standard DHS. No significant difference was noted in both groups in terms of union, functional status and complications. However, Olsson [28] reported more medialization of femur shaft with DHS in his comparative study of Medoff plate and DHS.

Although DHS was initially used to treat both stable and unstable inter trochanteric fractures, Haidukewych [29] reported a higher rate of failure in reverse obliquity trochanteric fracture treated with DHS. Gotfried [30] also noted a high failure rate in DHS cases where lateral wall was fractured. Bendo [31] treated 142 patients with intertrochanteric fracture with DHS and reported collapse in 26 unstable fractures with poor functional results. Pajarinen [32] reported a high varus deformity with DHS than with nails. To overcome lag screw cut out in osteoporotic bones Moroni [33] used hydroxyapatite coated lag screws to fix 120 intertrochanteric fractures. He documented no lag screw cut out in hydroxyapatite group while 4 patients had lag screw cut out in uncoated group. Percutaneous compression plates had been used by Gotfried [34] with good results while Peyser [35] was of the opinion that percutaneous compression plates were associated with less pain score and early weight bearing than DHS in his series.Davis[36] treated 230 intertrochanteric fractures with either dynamic hip screw or Kuntscher Y nail and noted a less cut out rate in nail group. Sommers [37] revealed better resistance to rotation with TFN helical blade than with DHS. Adams[38] compared DHS with gamma nail and noted a higher post operative complication rate with gamma nail than with DHS. Kaufer[39] was of the opinion that five variables namely quality of bone, geometry of fracture, fracture reduction, design of the implant and application of the implant all determine the final strength of fixation in intertrochanteric fractures.

We conducted this study on 23 elderly patients with intertrochanteric fractures fixed with DHS without radiological control. Mean age in our study was 75±7 SD years (range 58-90 years).Kovel [1] is of the opinion that age younger than 85 years is positive predictor of independence after fracture. The number of patient with age 90 year or above is much less in our study compared with studies conducted in other regions. [3] Most patients (65.2 %)in our study were males. The literature reveals more female hip fracture in Europe and USA. [2] Majority(65.2%) of fractures in our study was due to fall which is comparable with other studies. [3, 4] The weak balance, poor vision and osteoporosis in elderly could be the possible be reasons.

In literature although studies[40] can be found investigating the methods of reducing radiation hazards while doing DHS under image intensifier, studies addressing DHS surgery without image intensifier are lacking. In fact we were able to find only two studies: One study was conducted by Honga[41] by treating hip fractures with SIGN hip construct without image intensifier and the other by Ikpeme[21] and his colleagues on intertrochanteric/subtrochanteric fractures treated with DHS or DCS without using image intensifier. Ikpeme[21] treated 4 patients with DHS and 2 with DCS without image intensifier. The position of lag screw was optimal(center) in all cases. All fractures were united without any major complication. However, their study had a very small sample size and the mean age of patient was 55 years.

Our study had few limitations. Our sample size was small and the design of our study was cohort. We recommend large sample size comparative studies on this topic to confirm our results. However, patient safety should be of primary concern while designing and implementing such studies. We further recommend arranging hands on workshop for young Orthopaedic surgeons to practice lag screw application on saw bones or cadavers without using image so that they familiarize themselves with proximal femoral anatomy and the techniques to optimally placed lag screw without image intensifier.

CONCLUSION

DHS under image intensifier should be the gold standard treatment of intertrochanteric fractures. However**,** acceptable radiographic position of DHS lag screw in femoral head and neck and ultimate union can be achieved in selected inter trochanteric fractures fixed without image intensifier. However experience of the operating surgeon and accurate preoperative templating and per operative lag screw placement techniques are mandatory.

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