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A study of an operative outcome of a basitrochanteric fractures of the hip treated by dynamic hip screw and enders nail with percutaneous canulated cancellous screw

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ABSTRACT

Background: Basicervical or cervicotrochanteric fracture of the femur is considered stable variety of fracture pattern. Most common incidence is seen in elderly patient and in young patient with probably high energy trauma. Appropriate Osteosynthesis confers excellent outcome when reduction is optimally achieved.
Methods: 86 basitrochanteric fractures had been treated with enders nail or dynamic hip screw (DHS) at our institute by a single surgeon. Implant selection was done purely based on plain radiograph, associated co-morbidities and fracture geometry. Patients had been followed up at 1 month, 3 month and 6 month.
Results: In our study there were 86 patients out of which 63 patients (73.25%) were treated with enders nail and 23 patients (26.74%) were treated with DHS. Mean age of patients was 57 years. We noted minimum follow up of 8 months while maximum follow up of 4.5 years where as mean follow up duration is 18 months. We almost noted excellent to fair results in both groups.
Conclusions: Most of the implants in basitrochanteric fractures worked on control collapse principle. Both DHS and enders nail with percutaneous cc screw follow this principle and when used with a proper technique, optimal reduction usually fetch the favourable outcomes with minimalistic approach.

Keywords: Basitrochanteric fracture, Enders nail, DHS, Harris hip score

INTRODUCTION

Peritrochanteric fractures are the most common fracture at the hip in elderly patient. The International Osteoporosis Foundation estimates that approximately 1.6 million such fractures occur per year worldwide, a figure which may rise to six million by 2050.[1]

In the elderly (medically compromised) patients, the main goal is early mobilization in order to avoid complication of the prolonged bed ridden status. The aim of treatment of trochanteric fracture is to obtain optimum functional results in all types of fracture with low complication rate. It can be achieved by means of a short and easy procedure which needs an implant which can provide sufficient stability to allow early weight bearing. In fact there is a high correlation between unstable fractures technical complication and morbidity. The fractures are commonly associated with osteoporosis and they are the result of low energy injuries such as trivial fall.

Over the years various devices were used for the treatment of these fractures. In an attempt to decrease the rate of implant failure and to provide stability of fracture site sliding screw and plate, such as dynamic hip screw was introduced. In early seventies Ender and Simon

introduced flexible pins, (condylocephalic nailing) for the treatment of these fractures.[2] This procedure has an advantage of short procedure with minimal blood loss, without any need of exposing the fracture site.

For fractures that are deemed to be stable, randomized trials comparing these implants have shown no significant difference in functional outcomes.[3]

In the current era of modern and versatile implants, yet none confers the supremacy over the other. In our study we compared the clinical outcome between two fixation modalities which were dynamic hip screw (DHS) and enders nail with percutaneous CC screw respectively in relatively stable variant of basitrochanteric fractures of hip.

METHODS

This is a study of 86 basitrochanteric fractures of which 63 were treated by Ender's nail with percutaneous screw fixation and 23 were treated with DHS. As our study is analysed of treated cases of basitrochanteric fractures either treated with DHS and Enders nail between 2011 to 2018 at our institution GMERS Medical College and Hospital, Himmatnagar, Gujarat. It is a retrospective case series study.

Inclusion criteria

Elderly patient with basitrochanteric fracture, closed fracture, fractures treated with two modalities as mentioned: DHS /ender nail, patient with minimum follow up of six months.

Exclusion criteria

Patients with previously treated fracture of the same limb, compromised lateral wall <20.5 cm or fractured lateral wall.[4] Those with open fracture, fractures extended to subtrochanteric region, reverse oblique intertrochanteric fractures and fractures treated with other modalities like proximal femoral nail, hemi or total hip arthroplasty.

Initially all patients had managed as per institute protocol for treating a hip fracture. All routine blood investigations and optimal radiological investigations were done after admission.

Co morbidities were well taken care of alongside treatment as per physician's protocol. Adequate pain control, skin traction, chest physiotherapy advocated preoperatively. All patients had been undergone operative intervention as early as anesthetic clearance attained.

Patients had been divided in two groups. Enders group was named to patients had been treated with enders nail and CC screw and DHS group was those patients had been treated with sliding hip screw and CC screw.

Prophylactic antibiotic (I.V. ceftriaxone) is given to all patients who are to be operated by DHS. No antibiotics are given to the patients who are to be operated with Ender Nailing and Percutaneous screw fixation. Choice of implant depends on fracture morphology and the decision of surgeon.

We usually used 4.5 mm enders nail, 4.0 mm enders nail and 6.5 mm CC screws with washer for enders nail fixation where as in DHS Osteosynthesis we used appropriate angled barrel plate with sliding hip screws.

Enders nailing is done via Medial approach where Vastus medialis is lifted from the medial intermuscular septum. Prebending of the nail is to be done, one size longer nail is preferred.

Entry should be made in the middle of femur ½ inch proximal to the genicular vessels. It shouldn't be anterior as genicular vessels mostly found at the level of the upper pole of patella in fully extended knee. Entry hole should be adequate and blunted so that splinters can be avoided. Very large entry can cause loss of third point of fixation.

Nails were given a smooth curve, acute bend at the tip and a posterior send at the distal end. This posterior (15°) band gives less chances of backing out and gives rotational stability. Distal locking is done with K wire or cortical screw particularly in the osteoporotic patients, where collapse is anticipated and enough space in head is available.

After passing 2-3 Ender's Nail one or two screw are inserted percutaneously from the lateral cortex of femur into proximal fragment by stab incision with the aid of guide pin under the guidance of fluroscopy. Meticulous wound closure done at entry site without keeping any negative suction drain.

Whereas DHS had been performed via standard lateral approach. DHS is carried out under AO Principles. Fracture is reduced on fracture table. Our incision usually follows a less invasive protocol and usually limits the wide exposure. We did not do open reduction in any of our cases.

A lateral approach is taken. Optimal internal fixation done after appropriate fracture reduction. Appropriate sized sliding screw was placed after achieving acceptable reduction and barrel plate with screws were fixed. We used to put a de-rotation CC screw along with sliding hip screw to counteract rotatory forces.

Wound closure done in a standard manner. We did not use any negative suction drain in any cases included in our study.

Post-operative protocol

Quadriceps exercises, ankle toe pump movement along with chest physiotherapy advocated immediately on post-

operative day 1. Patients were kept non weight bearing mobilization with walker. Follow up radiograph was taken on 1st month and 3rd month and 6th month interval. At Each follow up visit patients were explained and encouraged physiotherapy and mobilization. Patients were allowed weight bearing partially once healing signs were present over radiographs.

We have analysed cases with plain statistical analysis as our study doesn't compare a one method to another directly. Hence there weren't any direct comparison between given treatment modalities.

RESULTS

In our study there were 86 patients out of which 63 patients (73.25%) were treated with enders nail and 23 patients (26.74%) were treated with DHS. Mean age group of patients was 51-60 years where mean age is 57 yrs. In our study minimum age of patient was 20 years whereas maximum age of patient was 98 years. In the present study there were 63 males out of them 42 (66.66%) treated with enders nail while 21 (33.33%) were treated with DHS whereas 23 females out of them 21 (91.30%) treated with enders nail while 2 (8.70%) managed with DHS. (Table 1, Figure 1).

Table 1: Demographic details of our study.

Sr. no.	Age group (in years)	Patients treated with Enders nail with percutaneous screw	Patients treated with DHS
1	20-30	01	1
2	31-40	06	5
3	41-50	05	5
4	51-60	16	8
5	61-70	17	3
6	71-80	14	0
7	81-90	03	0
8	91-100	01	1
Total	86 patients	63 (73.25%)	23 (26.74%)

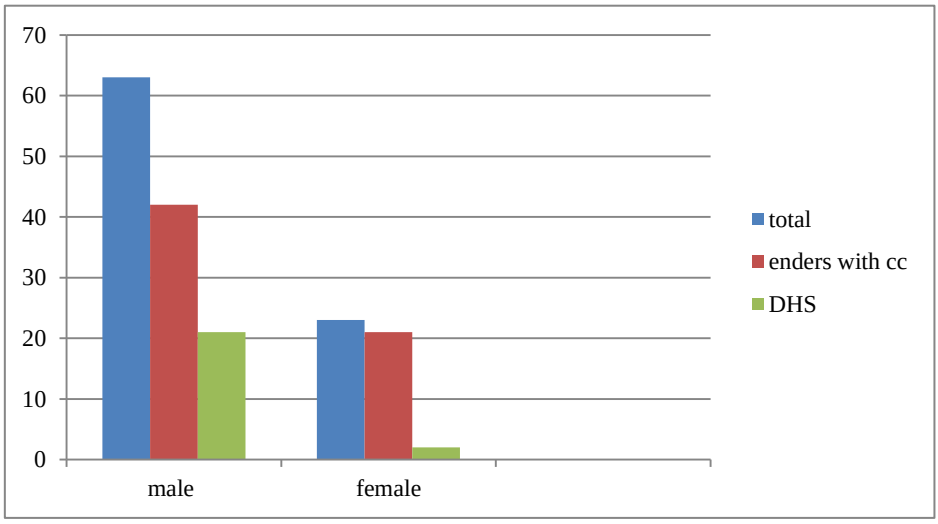

Figure 1: Demographic descriptive details of our study.

In our study minimum follow up of patients was about 8 months and maximum follow up of about 4.5 years. Mean follow up duration is about 18 months. At six month follow up patients were assessed with Harris-hip score. Mean fracture union duration was 14 weeks. Mean Harris hip score in enders group was 82.8 and in DHS group was 87.5.

There were seen that left side involvement was more predominant 48 patients (55.81%) than the right side 38 patients (44.18%).

Most common mode of injury was domestic fall in 61 patients (70.93%) which was followed by road traffic accident in 11 patients (12.79%), fall from heights 10 pateints (11.86%) and rest by other types (4.65%).

We have noted that preexisting illnesses were present in29 patients (33.72%) in form of hypertension (10 patients), diabetes mellitus (6 patients), bronchial asthma (4 patients), IHD and CV stroke (2 patients), tuberculosis (2 patients), hemiplegia (2 patients) and poliotic deformity (3 patients). We noted that number of patients

with pre-existing illness were high in enders group (25 patients) while lesser in DHS group (4 patients).

We have noted that shortening was present in 17 cases (19.76%) out of which 12 were from enders group and 5 were from DHS group. There was shortening less than 1 cm noted in 10 cases from enders group and 4 cases in DHS group. Two cases from enders group and one case from DHS group had shortening ranges between 1-2 cm. There were no cases had more than two cm shortening.

In the our study there were 3 cases where we encountered infection out of which 1 case with superficial infection noted in enders group whereas 1 case with superficial and 1 case with deep infection noted in DHS group. Superficial infection resolves with dressing and antibiotics by 2 weeks where as deep infection in DHS group required Joe's procedure eventually healing attained after 1 month.

External roatation deformity had been seen in 2 patients in the Enders group. We also noted that backing out of nails in 4 patients in enders group. None of the patient had undergone for premature removal of nail or any other alternative mode of fixation. We did not encountered osteonecrosis of femoral head in any of our operated case.

At final follow up patients were assessed with Harris hip score which was depicted in the Table 2 for the study.[5] At final follow up clinical pictures along with radiographs showed in Figures 2-5.

Table 2: functional outcome at final follow up assessed by Harris Hip score5 (n=86).

S. no.	HHS variables	Enders group (n=63)		DHS group (n=23)	
		N	%	N	%
1	Excellent	22	34.92	06	26.08
2	Good	26	41.26	12	52.17
3	Fair	09	14.28	03	13.04
4	Poor	06	09.52	02	08.69

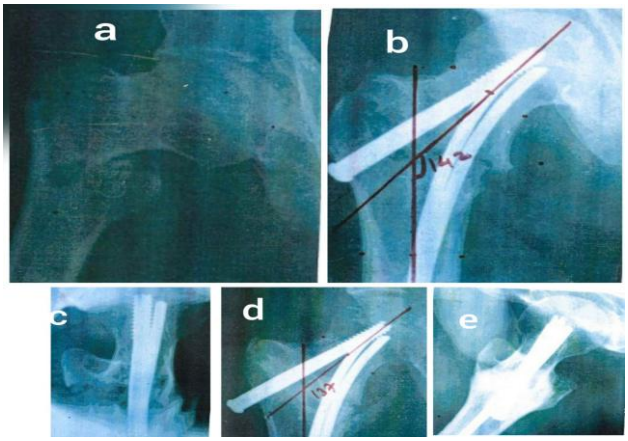

Figure 2: (a) Preoperative radiograph showed basitrochanteric fracture of the femur, (b) post-operative immediate radiograph with CCD angle marked over true film, (c) postoperative immediate lateral radiograph showed optimal reduction. (d) postoperative radiograph at final follow up (change in CCD angle noted) and (e) Postoperative lateral radiograph showed healed fracture.

Figure 3 (a-c): Postoperative clinical pictures and range of motion at hip.

Figure 4: (a) Preoperative radiograph of basitrochanteric fracture of femur, (b) immediate post-operative radiograph and (c) postoperative radiograph at final follow up.

Figure 5 (a-d): Postoperative clinical pictures and range of motion at hip in same case as mentioned above.

DISCUSSION

Treatment of basitrochanteric fractures are usually done with various available impalnts among orthopaedic surgeons. Usual basic concept in this fracture treatment to achieve control collapse at a fracture site after innovation of dynamic hip screw. This concept also applies when basitrochanteric fractures are treated with enders nail and cc screw. Sliding hip screw as far as considered gold standard to treat trochanteric fractures till last decade.

Choice of implants depends on fracture geometry and associated co-morbidities. There is no agreement for single implant for particular fractures by different orthopaedic surgeons. Choice of implant is always a debatable questions for some hip fractures which should be well taken care by a treating surgeon on the basis of availability of implants, level of surgical expertise and reduction of fractures. The most important factors for osteosynthesis are the quality of reduction, osteoporosis and associated co-morbidities.

Jacobs et al, reported a series of 173 intertrochanteric fractures managed out of which, 72 with a Jewett nail and 101 with a Sliding Hip Screw.[6] In their study 29 cases were fixation failure. They defined about fixation failure for sliding hip screw. We did not encountered any fixation failure in terms of screw backout, penetration in joint, broken implant, or varus malunion or nonunion in our DHS group.

Sernbo et al compared the study of fixation of trochanteric fractures by enders nail and DHS in more than 100 cases, they noted revision rate is higher in enders group.[7] In our study we faced backing out of nail in 4 cases (6.34%) where we did not carry out any other revision surgery with other modalities of fixation. Backing out of nails was well taken care by inserting again under local anesthesia in all cases.

Baumgaertner et al noted in their series of 131 patients treated with sliding hip screw or intramedullary devices; there is a less surgical time in intramedullary device when used in unstable intertrochanteric fractures.[8] Moreover in the stable fracture variety it used more fluoroscopic timings as compared to external devices. We also noted lesser fluoroscopic timing in enders group than in DHS group (mean difference ~ 20 sec).

Immediate mobilization with full weight bearing is possible for most patients after an adequately performed operation. An appropriate surgical technique with due regard to the position and fixation of the nails in the femoral head as well as in the medullary cavity will give a low failure rate.[9]

In our study agreement to the particular implant was soley depends on operating surgeon for the type and site of fractures alongside with associated co-morbidities. Probably higher number of enders group patients were associated with comorbidities as compared to DHS group. High preferences of enders nail in these group might have explained about lesser surgical time, lower blood loss, minimal invasive procedure, earlier rehabilitation protocol. Yet we noticed in literature enders nail is considered biomechanically low strength for osteosynthesis for basitrochanteric fractures. Proper fanning of nails in proximal fractured fragment superimposed with cc screw confers a reasonable amount of stability to the fractures. Recent advances to the implant for trochanteric fractures have special focused towards intramedullary implants in terms of superior biomechanical property may lead to obsolete the enders nail procedure in various centres in developing countries.

We also noted changes in neck shaft angle after walking in enders group. For that we measured neck shaft angle in each follow up visit. Differences in neck shaft angle described in Table 3.

Table 3: Changes in neck shaft angle in enders group.

S. no	Changes in neck shaft angle	N	%
1	No change	20	31.74
2	±10 degree	41	65.07
3	±20 degree	02	3.17

Although the changes in CCD angle radiologically after final follow up might not correlate clinically in all patients in terms of functional outcome.

We assessed both groups at final follow up with Harris hip score and noted that similar results excellent to good in both the groups (enders group ~76%, DHS group ~78%). Whereas fair and poor results in 14.28%, 9.5% in enders group while 13%, 8.69% in DHS group respectively. In our study probably a similar results in almost both group due to surgical procedure by similar surgeons, expertise to use enders nail and percutaneous CC screws, comorbidities of patient, quality of reduction and postoperative treatment of osteoporosis till fracture healing. Indeed the comparison between two groups aren't direct comparison and not done in a prospective manner may lead to lacking in certain standards.

CONCLUSION

Control collapse at a fracture site is a main motto in the treatment of basitrochanteric fractures. This can be achieved by both dynamic hip screw and enders nail with percutaneous CC screw. In our study we noted almost similar functional outcome at the final follow up. Enders nail with percutaneous CC screw help to prevent many complications with minimalistic interventional approach. Final implant selection should always be done by the level of surgical skills, type of fracture anatomy, associated comorbidities, osteoporosis, facility available at trauma care unit especially in the remote places in developing country. Though our study doesn't directly compare one method over another but to suggest the consideration for an additional option to treat such kind of fractures in selective cases. To establish the superiority of one implant over other needs more research and studies in particular fracture trauma management.

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