

Role of External Fixators in Intertrochantric Femur Fracture as Definitive Treatment in Patients with Comorbidities.

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ABSTRACT

Background: Trochanteric fractures are most frequent fractures of proximal femur and occur predominantly in geriatric patients. The early perioperative is therefore high. These elderly patients are often beset with medical problems of cardiac, renal, respiratory and metabolic diseases like diabetes and hypertension. **Methods:** The treatment of Trochanteric fracture with DHS(1) and PFN (2) depends on the fractures as classified by Boyd and Griffin(1949). However risks of open surgeries and anaesthesia, blood loss with patients medical problems and reluctance forces surgeon to opt for conservative treatment with consequences of malunion and prolonged recumbency. **Results:** Fixation of these fractures using external fixator under local/regional anaesthesia without opening fracture and offers adequate stability so as to mobilize patient early with least risk from comorbidities. **Conclusion:** This study was done to assess the role of external fixation as definitive treatment of intertrochantric fracture in patients with high operative risk and its superiority if any to conventional open osteosynthesis. Adequate fixation, early mobilisation, early weight bearing, minimal or no blood loss regional or local anaesthesia simple quick and inexpensive procedure are some advantages of it.

Keywords: Trochanteric fracture, Stable fixation, early mobilisation with weight bearing, Comorbidities.

INTRODUCTION

Trochanteric fractures are around proximal femur from intertrochanteric line to transverse line drawn at the level of distal end of lesser trochanter which marks the defined inferior limit of trochanteric fracture beyond which it becomes subtrocanteric trauma.

Muller classification divides it into three groups. A1 are simple two fragments fracture with good support at medial cortex. A2 fracture are multifragmentary with medial and dorsal cortices broken at several level but lateral cortex is intact. In A3 fractures lateral cortex is also broken (reverse type).

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Boyd and Griffin classified it into four group and included all fractures from extracapsular part of neck to a point 5 cm. Distal to lesser trochanter. Tronzo proposed five groups of fractures based on their reduction potential. Suggesting a specific mode of reduction for each type prior to fixation.^[3]

Intertrochantric fracture from a practical standpoint can be divided into stable or unstable fractures. Stable fractures can be treated by fixation internal or external after anatomical reduction. Unstable fracture may require osteotomy or displacement of shaft beneath the calcar portion of neck to convert them into stable fracture. They can then be fixed by any standard fixation devices. It is essential that continuity of bone be established along the medial aspect of femoral neck, trochanter and upper shaft restore stability.

The common fixation methods used are DHS, Various Plates, P.F.N., External fixation ect. In these patients as the fracture is more common above 60 years of age and are more common in females a usual comorbidity exists as Hypertension, Diabetes, Cardiac decompensation, Renal insufficiency. This coupled with long immobility in convalescence make fracture hazardous for life. Moreover they become high risk for anaesthesia, reluctant for open surgery, not ready to spend long time on bed and hence can external fixator be provided to them which can mobilise the patient gives the stable fixation and can be applied in regional block or local block and applied closed under image intensifier?

In this study we did a series of 35 patients suffered from intertrochantric fracture over a period of 8

years who were unacceptable anaesthesia risk or not willing for open surgery or had comorbidity for which open surgical option was life threatening we fixed fracture with External Fixator mobilised the patient early and tried to save complication of comorbidity and bed riddance.

“Thanks to its position outside the soft parts the external fixator is a safe device for stabilising all sorts of different fractures, “(Ruedi & Murphey).

An external fixator is a device placed outside the skin which stabilizes the bone fragments through wires or pins connected to one or more longitudinal bars/tubes. One of the main character of external fixators is skin penetration creating so called pin tracts. Most of the disadvantage of external fixator (ExFix) are related to pin-tracts infections. But its advantages outweighs it and they are namely-

- less damage to blood supply of bones.
- Minimal interference with soft tissue cover.
- Useful for stabilizing open fracture.
- Rigidity of fixation adjustable without surgery.
- Good option in situation of possibility of infection or genral high risk patients due to comorbidity.

The main component of ExFix system are

- Pins (Schanz screws)
- Stainless steel tubes or carbon fiber rods.
- A variety of clamps to connect pins to tubes /rods.
- A variety of clamps to connect rods or tubes.

The modular concept or ExFix. Helps to adjust length of different bones or bone of different individuals .The stiffness of frame depends upon the following factors.

- Distance of pins /Schanz screw from the fracture line: the closer the better. Within each main fragment the further apart the better.
 - Distance of longitudinal connecting bar / rod from Bone: the closer the better.
 - Numbers of bar / tubes: two are better than one.
- Though in our studies one bar was used as the site permits only one sided fixation by pins.

-Configuration unilateral.

Combination of limited internal fixation (lag screw) with ExFix.

- In the management of such fractures it may be necessary to dynamize an initial quite stable configuration or add stability in case of pin loosening.
- The ExFix is eccentrically located and exhibit an asymmetric mechanical behaviour .They are stiffer when loaded in the plane of Schanz screw than when perpendicular to it.^[4]

MATERIALS AND METHODS

Study was done in last 8 years January 2009 to January 2017 in Muzaffarnagar Medical College at Department of orthopaedics. ExFix was done in all stable and unstable fractures in all patients of trochantric fracture. The selection criterion was

high Anaesthetic risk for prolonged and invasive surgery according to the American society of Anaesthesiologist risk score. [Total 1] of 40 cases was done.



Figure 1: Fracture Intertrochantric.

Table 1: Anaesthesiologist Risk Score.

Risk score grade 1	No case	0%
Risk score grade 2	No case	0%
Risk score grade 3	23 cases	57.5%
Risk score grade 4	17 cases	42.5%

Assesment of operative risk modified from Shrek and Foster (1985) was done in three grades. AP. And Latral X-Ray view of the injured hip fracture were done and fractures were graded according to Boyd & Griffin classification. The average age of patient at operation was 75 years (70 +- 80) and had female predominance 24:16. The selection criterion was more than one comorbidity e.g. Diabetes mellitus, neurological disease, heart failure, coronary disease, respiratory disease or anaemia with Hb. Less than 6-7 gm/l.

Exclusion criterion was a previous hip fracture, pathological fracture, multiples fractures & patient undergoing chemotherapy and extremely obese patients.

Table 2: Shrek and Foster Operative Risk.

Grade 1	8 Cases	20%
Grade 2	20 Cases	50%
Grade 3	12 Cases	30 %

All patients were operated under regional block or local anaesthesia with I.M. sedation Closed reduction was achieved gently on fracture table by traction and gentle manipulation under fluoroscopy control and acceptable reduction in both AP and Latral view before surgical skin preparation and draping .Preoperatively an external construct was formed with tube / rod 15 cm. long and clamps on it to accommodate neck shaft angle of femur and its anterior curve of shaft. 3-4 clamps are attached to proximal part of tube / rod so as to insert at least 4 Schanz screw 4.5 to 6.5 mm in thickness parallel o each other across the fracture site up to the subcondral bone of head of femur. Reduction is checked in both AP and Latral view with image intensifier. Now traction is released and knee flexed to 90 degree and shaft was fixed with

4.5 mm schanz screw and assembly is completed. Final images are taken to confirm the reduction. Post-operative Management – Patients were encouraged to sit up and do quadriceps exercises immediately after the surgery as soon as the conditions permits. Assisted ambulance with the help of walker or crutches was started on day 2-3 and patients were discharged on 5 day postoperatively after educating the patient s about the care they have to undertake for ExFix. Material – The series of 40 patients was undertaken at Muzaffarnagar Medical College and Shyamal trauma & Child Care Muzaffarnagar from January 2009 to January 2017.

Observation

Intertrochanteric fracture of all type were fixed using ExFix in one plane and either 4.5 mm or 6.5mm Schanz screw were used in fixator assembly. Procedure was completed on an average in 30 minutes (range 20 to 40 minutes)after giving anaesthesia appropriate to patients condition .One patient developed cardiac complication and two respiratory complicationbut all revived after appropriate treatment. Follow up regime – evaluation performed every month to note the ambulatory status of the patient, waisting of quadriceps muscle and radiographs obtained at each visit. If required to change the position of implants, adequacy of reduction, neck-shaft angle & fracture union and complication if any.

Table 3: Pre Injury Health Status.

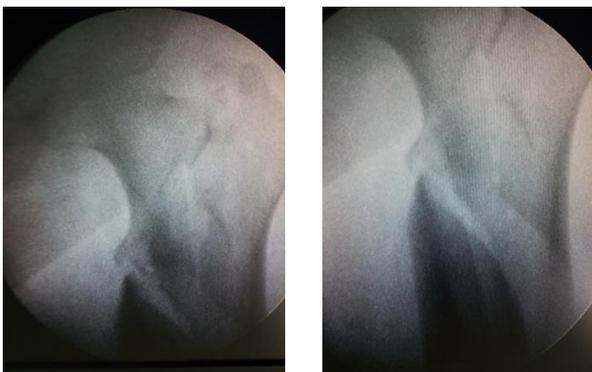
Co Morbidity	Number Of Patients	Percentage %
Heart Faliure	6	15 %
Respiratory Disease	14	35 %
Diabetes Mellitus	8	20 %
Neurological Disease	2	5 %
Anaemia	10	25 %
Total	40	100 %

The lower extremity measure modified by Borretto et al was used to assess the pre injury and post-operative functional status at 12 months based on daily activity,^[5,6] walking capacity, and pain.



Figure 2-7: Fracture Intertrochantric closed reduction and various stage of Schanz screw insertion.

Figure 8-12: Patient seen bearing weight very early comfortable and fixator in position.



RESULTS

1. Surgery was performed after a mean of 7 days following trauma. This period was needed in most cases to build them up for surgery, metabolic correction and blood transfusion. No intra operative complication occurred as regard surgical side.
2. In cases of anemic patients’ blood were transfused according to their requirement .out of 40 patients 10 required blood transfusion of more than 3 units. Though almost 25 patients required blood transfusion making 62.5 % patients requiring blood.

3. The average time required for surgery in this series was 30 minutes (20 minutes to 40 minutes). (7, 8)
4. The average hospital stay after surgery was 4 days (3 to 7 days).
5. The average union time was 10 weeks. (8 to 14 weeks)
6. All patients returned and were followed up till removal of external fixator. Follow up time was 8 months to 2 years.
7. 32 patients were mobilize at an average time 2- 5 days after surgery.
8. Walking with support and partial weight bearing was possible in 30 /40 patients was possible with in 5 days making a percentage of 75 % and 8 / 40 walked in next 14 days. Rest 2 /40 took more time to walk due to inability to bear pain and poor genral condition .So almost 95 % patient were ambulatory with in 14 days . How ever full weight bearing was possible in all patients with in 3 months.
9. All patients were able to after 1 month and average time to remove ExFix was 4 months longest being 6 months required in patient of neurological disease. Gradually two Schanz screw were removed every 21 -30 days starting after 45 days. (9)
10. 4 patients developed pin tract infection which subsided after removal of pin. (10)
11. 3 patients developed shortning of limb from .6 cm to 1 .0 cm.
12. In our series we did not lose any patient in active folloe up though we lost 6 patients over the course of study to medical problemand not related to trauma in any way.

The pre injury functional status of the patient were as under-

Table 4: Lower Extrimity Measure Score

Score	Results	No. Of Patients	Percentage %
100	Excellent Function	22	55 %
85 – 99	Very Good Function	13	32.5 %
55-84	Good Function	3	7.5 %
26 – 54	Fair Function	1	2.5 %
25	Poor Function	1	2.5 %

After 12 months e.g. post injury functional status of patient were as under.

Table 5: Post Injury Status after 12 Months.

Score	Results	No. Of Patients	Percentage
100	Excellent Function	24	60 %
85 - 99	Very Good Function	10	20.5 %
55 - 84	Good Function	4	10 %
26 – 54	Fair Function	1	2.5 %

Thus it is clear that there is no difference in pre and post injury final functional score so to say that the result of our study is comparable to other studies regarding fixation of trochantric fractures by external fixate in high anaesthetic risk and associated comorbidity. By deciding to fix fracture by ExFix we did not dearranged the internal millue of patient and his comorbidities. They were mobilized as early as possible that too prevented bed riddance complications.

DISCUSSION

Patient having fractures of proximal femur, require surgical stabilization and early mobilization. Closed method of treatment is satisfactory as far as union of fractures are concern. The morbidity is very high in trochantric fracture 34.6 % in traction and 17.5 % by internal fixation.

Patient treated generally are under nourished, anaemic and they are above the age of 70 years. They also suffered from other systemic disease making them more vulnerable and added sudden trauma is enough to start a cascading effect to disturb the precarious balance patients hang to. There are also financial constrains as regarding the cost of internal fixation. Previous reports of ExFix, short operative time, hospitalisation time, high fracture union rate, and minimum blood loss are the advantages and have been confirmed in comparison to sliding hip screw and intramedullary devices which is in accordance with other studies.^[12-17]

The most common complication of trochanteric fracture is late collapse due to instability of medial cortex or non-union, osteoporosis leading to implant failure.

This series proves that ExFix has significantly lower incidence of complications. However a late collapse at the fracture site cannot be ruled out. For unstable fracture ExFix has proved to be effective because of large bone implant and potencial for controlling sliding with impaction. Another possible explanation is element of elasticity which helps rapid and abundant callus formation without disturbing the fracture haematoma.^[18] There is better mobility in the early post – operative period after application of assembly. This can be explained by the fact that these patients have less shortening and less collapse.

The main problem in external fixator is its prolonged care of skin till fracture heals. However this disadvantage becomes advantage in case of loosening when pin or schanz screw can be removed and inserted from different direction without much prepration and surgery. Total cost to patient as regards to the fixation assembly and hospitalization is much less as compared to other methods. Knee stiffness was a major problem which occurred due to transfixation of vastus lateralis muscle.^[6,19] This problem was much lower

in our study as we fix the limb in 90 degree of flexion at knee. Early mobilization lead to impaction and compression forces on fracture lead to good union.

CONCLUSION

Based on above study it can be concluded that external fixator is a good choice in Trochantric fracture in patients having other comorbidities and can provide a definitive method. The method minimizes surgical risk, blood loss and provide early mobilization. The technique is simple safe and economical and could be performed in very high risk cases. This technique is blessing for developing countries as patients are under nourished, anaemic, poor economic condition and could not with stand high cost of treatment or vigorous open surgeries.

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