

**A STUDY OF MANAGEMENT OF INTERTROCHANTERIC FRACTURES USING EXTERNAL FIXATOR**Eknath D. Pawar<sup>1</sup>, Saurabh R. Agrawal<sup>2</sup>, Atul W. Patil<sup>3</sup>, Purshottam Pawar<sup>4</sup>, Sandeep Choudhary<sup>5</sup>**HOW TO CITE THIS ARTICLE:**

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**ABSTRACT: INTRODUCTION:** There are various modalities of treatment described for the management of intertrochanteric fractures of femur. The aim of this study is to evaluate the clinical and radiological outcome of external fixation in the management of these fractures with respect to operative time, blood loss, hospital stay, ambulation, union and range of motion of proximal and distal joints. **MATERIAL AND METHODS:** In this study 30 patients with intertrochanteric fracture of femur were treated with simple uniplanar external fixator. Patients of atleast 60 years of age with AO/OTA type 1, 2 and 3 fractures were included in this study. The patients were regularly followed up for a period of 2 years and were evaluated with radiologically for fracture union and functionally with the help of Friedman & Wyman system. **RESULTS:** All patients were Evans stable type either before or after reduction except six cases, according to AO classification. Mean duration of union was around 14.5±1.2 weeks and was somewhat more for comminuted and displaced fractures. The mean operative time for fixator application was 26±5.5min with negligible blood loss. At the end of 2 years 7 patients had a good, 14 had fair and 9 had poor functional outcome. **KEY MESSAGE:** We concluded that though external fixation in intertrochanteric fractures has the advantages of percutaneous procedure with minimal blood loss and lesser operative time, it has less favorable results in terms of functional outcome and post-operative complications and hence should not be the preferred modality of treatment for these fractures.

**KEYWORDS:** Intertrochanteric Fractures, External Fixator.

**INTRODUCTION:** Hip fractures are one of common of all fragility fractures. It has been calculated that more deaths are caused by hip fractures than by other common severe diseases such as cancer of the stomach or the pancreas<sup>1</sup>. Furthermore, regardless of the quality of surgical treatment, hip fractures remain a major cause of disability. Most frequently followed treatment for intertrochanteric femur fracture is dynamic hip screw or by intramedullary nailing<sup>2-14</sup> which may not be practical in very morbid patients due to risk of anesthesia involved for relatively long procedure and blood loss involved. For the elderly patients the treatment of choice for pertrochanteric fractures is surgical because non-operative treatment involves high morbidity<sup>15</sup>. External fixator is a viable option in these groups of patients with acceptable functional and anatomical results.

A surgical procedure that achieves minimal surgical blood loss, short operative time and hospitalization time, minimal anesthetic risk, the least morbidity and mortality rates, and early weight bearing is favored. This study was conducted to assess the use of AO type external fixator in the management of both pertrochanteric fractures in high risk elderly patients and to evaluate the clinical and radiological outcome of external fixation in the management of these fractures with respect to operative time, blood loss, healing of wound, hospital stay, ambulation, weight bearing and range of motion of proximal and distal joints.

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**MATERIALS AND METHODS:** In this study 30 patients with intertrochanteric fracture of femur were treated with simple uniplanar external fixator. Patients of atleast 60 years of age with AO/OTA type 1, 2 and 3 fractures were included in this study while those with pathological fractures, fractures with subtrochanteric extension, patients with multiple and open fractures were excluded from this study.

The patients were admitted as per the inclusion criteria. Any emergency management if required was done and the patients were evaluated with respect to the pre-operative investigations. Radiographic evaluation was done as pelvis with both hips Antero Posterior (AP) view and lateral view of the affected hip.

Patients were operated under anesthesia as per the fitness of patient. Prophylactic IV (intravenous) antibiotic usually, a third generation cephalosporin was given 15 minutes before surgery. All patients were given supine position following anesthesia, on a radiolucent table top to facilitate the use of image intensifier. The unaffected extremity was abducted and flexed and fixed to the post of fracture table. A closed reduction of the fracture was performed under image intensification in both the AP and lateral planes before application of the fixator. Closed reduction was usually accomplished by applying traction and internal rotation to the slightly adducted injured limb. Foot of the affected extremity was rotated to obtain correct rotational alignment with respect to anteversion of the hip as determined by image intensifier.

The reduction was considered anatomical if the neck-shaft angle was between 120° and 140° and the distraction at the fracture site was less than 2 mm. Minor varus angulation (<10°) and a distraction of less than 5 mm were considered acceptable if an anatomical reduction could not be obtained. The fixator was applied using the AO principles and technique. Draping and painting was done. Two stab incisions were taken on the skin at the level of lesser trochanter for passing femoral neck pins. Upper pin was inserted from the flare of greater trochanter with the help of chuck after drilling with 4mm drill bit under image intensifier guidance.

Lower pin was inserted around 1.5 cm to 2cm below first one using same technique. Pins were inserted till within 1 cm of subchondral bone. Neck pins were of cancellous thread and shaft pins were of cortical thread. Another two pins were inserted at right angles into the middle half of the femoral shaft. Clamps were tightened and the final position was checked under image intensifier.

Intravenous antibiotics in the form of third generation cephalosporin's, aminoglycosides were given. Oral antibiotics were started from third post-operative day for five days.

On the first postoperative day, the active and passive knee and ankle range of movement was started in the bed. The patients started sitting on a bed or chair from first post-operative week after the pain had subsided. From the second postoperative week walking with the help of a walker was started allowing partial weight bearing as tolerated by the patient. Static quadriceps exercises were started preoperatively & continued during postoperative period<sup>16</sup>.

Alternate day care of the Schanz screws and the surrounding skin using povidone iodine solution was done meticulously. After seven days if there was no evidence of pin tract infection whole fixator was cleaned and dressed weekly.

All patients were followed up for a mean of 12±4.5 months. The patients were evaluated clinically and radiologically, bi-weekly for the first month, monthly for the next 5 months and then subsequently every 3 months. The radiological evaluation of all patients was made with AP and lateral radiographs of the proximal femur.

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Hence assessment was done as per operative time, units of transfused blood, duration of hospitalization, clinical (range of motion of the hip, knee and limb-length discrepancy) radiological (signs of union, loss of fixation, failure of implant), complications, post-operative walking ability, healing time, and mortality.

Assessment of functional outcome was done as per system used by Friedman & Wyman<sup>17</sup> which is as follows:

**Good:** No limitation of activities of daily living, no pain, less than 20% loss of hip or knee function.

**Fair:** Mild limitation of activities of daily living, mild to moderate pain, 20-50% loss of hip or knee function.

**Poor:** Moderate limitation of activities of daily living, severe pain, more than 50% loss of hip or knee function.

**RESULTS:** A total of 30 patients were included in our study, all the patients were with age above 60 years. Mean age in our study was 71 years. In this study 64% were males and 36% were females. All patients were Evans stable type either before or after reduction except six cases which were unstable, according to AO classification. Mean duration of surgery was 28 minutes. Mean duration of union was around  $14.5 \pm 1.2$  weeks. Union period was somewhat more for comminuted & displaced fracture. The mean operative time for fixator application was  $26 \pm 5.5$  min with negligible blood loss. Most of the cases required hospitalization for 4-5 days with mean duration 4.9 days. Some patients were kept for a week for co morbidities. At the end of 2 years, 7 patients had a good functional outcome, 14 had fair outcome and 9 had poor outcome. [figure 1] Also 9 patients had shortening  $>2.5$  cm, 7 had rotational deformity, 11 had superficial infection, 2 had deep infection, 5 had pin loosening which required revision of pins, 1 had pin breakage, 9 had malunion with varus  $>15$  degrees, 2 had non-union which were later treated with hemiarthroplasty, 1 had delayed union and 2 patients had knee stiffness. [table 1, 2]

**DISCUSSION:** Our study involved stable type of fracture more commonly. 76% of cases were of EVANS stable type according to AO classification.<sup>18,19</sup> The present study was conducted using the minimally invasive technique of external fixation for the management of pertrochanteric fracture in elderly high-risk patients. Many modifications concerning the external fixation technique have been introduced.<sup>20,21</sup> For developing countries, most of these fixators are expensive and cannot be afforded by patients or hospitals, the reasonable cost, the availability, and familiarity with external fixator were the reasons for its use in the present study. Dahl A, Varghese M, Bhasin VB (1991)<sup>22</sup> used AO fixator in their studies.

The mean operative time for fixator application in the present study was  $26 \pm 5.5$  min, which was approximate to time recorded by Kourtizis et al<sup>23</sup> and Vossinakis et al,<sup>24</sup> Tomak et al<sup>25</sup> and Christodoulou et al.<sup>26</sup> Familiarity with the application technique and the few instruments needed for the external fixator application played a significant role in reducing the mean operative time. The mean time needed to achieve union in the present study ( $14.5 \pm 1.2$  weeks) is similar to other reported studies (12-16 weeks). In a study by Dhal et al<sup>22</sup>, the mean time for union was 16 weeks. At the end of 2 years 7 (23%) patients had a good functional outcome, 14 (46.7%) had fair outcome and 9 (30%) [figure 1] had poor outcome as per Friedman & Wyman system. Out of these 9 poor results 6 patients had unstable fractures, 2 had nonunion which were later treated with hemiarthroplasty and 1 had pin breakage. As per study by Fu Ting Huang et al<sup>27</sup>. 70 % patients had good outcome, 20% had fair

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and 10% had poor outcome when operated by Reconstruction Nail and 61.5% patients had good outcome, 38.5% had fair and no patients had poor outcome when treated by Proximal Femoral Antirotation Nail as per Friedman & Wyman system. Thus the functional outcome was less favourable when operated by external fixator.

Also 9(30%) patients had shortening > 2.5cm along with malunion with varus>15 degrees, 7 had rotational deformity (23.33%), 11(36.7%) had superficial infection, 2(6.67%) had deep infection, 5(16.67%) had pin loosening which required revision of pins, 1(3.33%) had delayed union and 2(6.67%) [table 1, 2] patients had knee stiffness. The incidence of loss of reduction and varus malunion (15° with shortening 2 cm) in the present set of patients (9 patients) is more as compared to other studies treated by external fixator such as Dahl et al.<sup>22</sup> and Boghdady et al.<sup>28</sup> [table 3]

Also the number of patients with varus deformity and malunion in our study (30%) was comparable to that by conservative treatment as per studies by Hornby et al.<sup>29</sup> (37%) and Luo W. et al.<sup>30</sup> (27.3%). [table 4] The number of patients with superficial pin tract infections and deep pin tract infection was comparable to above mentioned studies. The varus and shortening was explained by Dahl et al.<sup>22</sup> to be due to either fixation in varus or due to collapse of the neck shaft angle on weight bearing. In this study, none of the fractures were fixed in varus. As a consequence, mal reduction was not a factor producing shortening in the 9 patients but probably the type and pattern of fracture and its subsequent stability.

**CONCLUSION:** We concluded that though external fixation in intertrochanteric fractures has the advantages of percutaneous procedure with minimal blood loss and lesser operative time, it has less favourable results in terms of functional outcome and post-operative complications and hence should not be the preferred modality of treatment for these type of fracture.

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SL. No.	Complications	No. of Patients
1	Shortening > 2.5 cm	9
2	Rotation deformity	7
3	Superficial infection	11
4	Deep infection	2
5	Bed sores	0
6	Mortality (within 30 days post-operative)	0
7	Pin loosening	5
8	Pin breakage	1

**Table No. 1 Early postoperative complication**

SL. No.	Complications	No. of patients
1	Malunion > 15° varus	9
2	Non union	2
3	Delayed union	1
4	Knee stiffness	2

**Table no. 2: Late complication**

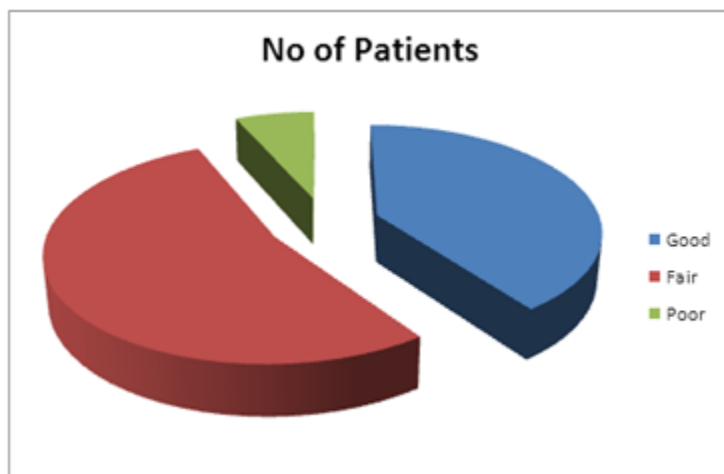
Complications	Dhal et al	G. Boghdady and M. Shalaby	Our study
Deep pin track infection	4%	2.5%	6.7%
Pin breakage	0.5%	-----	3.3%
Pin loosening	6%	7.5%	16.67%
Superficial pin infection	30%	35%	36.67%
Varus malunion	12%	15%	30%

**Table no. 3: Comparison of our study with other studies in terms of post-operative complications**

Studies	Number of patients with malunion and varus deformity
Our study	30%
Hornby et al	37%
Luo w. et al	27.30%

**Table no. 4: Comparison of incidence of malunion with varus deformity in our study with studies following conservative management**

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**Fig. 1: Functional outcome as per system used by Friedman & Wyman**



**Fig. 2: Pre-Operative X ray of patient with intertrochanteric fracture Left Hip**



**Fig. 3: Immediate post-operative X ray with external fixator applied**



**Fig. 4: Post implant removal X ray (at 3 month) showing union at fracture site**



**Fig. 5: Pin track infection**

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