Evaluation of the Clinical and Functional Outcome of the Patients with Intertrochanteric Fractures Treated with a Proximal Femoral Nail in Northern Tanzania

Juma Mohamed Nahonyo\textsuperscript{1,2}, Anthony Japhet Pallangyo\textsuperscript{1,2}, Honest Herman Lord Massawe\textsuperscript{1}, Casto Elilindia Mlay\textsuperscript{1,2}\textsuperscript{*}

\textsuperscript{1}Kilimanjaro Christian Medical University College, P. O. Box 2240 Moshi, United Republic of Tanzania
\textsuperscript{2}Kilimanjaro Christian Medical Centre. P. O. Box 3010 Moshi, United Republic of Tanzania

\textsuperscript{*}Corresponding Author: Dr. Casto Elilindia Mlay, Kilimanjaro Christian Medical University College, P. O. Box 2240 Moshi, United Republic of Tanzania

Received: 01 January 2021; Accepted: 25 January 2021; Published: 01 May 2021


Abstract

Background: Hip fracture is common and it is escalating, lead to one-fifth of the orthopedic operative work and it is associated with significant morbidity, mortality and leads to a burden to the health care system while over half of the patient does not returns to premorbid mobility status. The goal of the treatment is to attain anatomical reduction with internal fixation to facilitate rapid mobilization of the patient and prevent morbidity and mortality. This study intends to establish the clinical and functional outcome of the patients with intertrochanteric fractures treated with a proximal femoral nail.

Method: This was a hospital-based cross-sectional study conducted at KCMC from January 2018 to November 2019 involving a total of 92 patients with intertrochanteric fractures who were called and evaluated for clinical and functional outcome using
Harris score after treatment thereafter data was analyzed.

**Result:** This study included a total of 92 study participants, 63.1% were males with a mean age of 55 years, the majority come from rural areas 58.7% and had a longer hospital stay of > 14 days 51.4%, simple fall was the common cause of injury 41.3%, while the majority had excellent hip status 42.4%, good hip status was 28.5%, fair hip status was 10.8%.

In this study, 76.1% had appropriate implant position, 18.5% had screw cut out, 81.5 had fracture union, 82.6% had proper fracture reduction, apex distance was less than 25 mm in 77.2% and 81.5% had 120–135 degrees diaphyseal angle, the main leading complication 9.8%, followed by reoperation 6.5%, 9.8% had fascia late pain, 8.7% had acetabula penetration/irritation, death was 4.3%, periprosthetic was fracture 3.3% and, 6.50% had limb discrepancy shortening.

**Conclusion:** Therefore, the proximal femoral nail is a better method of intertrochanteric fracture fixation with a good both clinic and function outcome and minimal complication after the operation.

**Keywords:** Intertrochanteric fracture; Proximal femoral nail; Harris hip score; Tanzania

**1. Introduction**

Hip fracture is common and it is escalating dramatically due to increased life expectancy of the population and lead to one-fifth of the orthopedic operative work and it is associated with significant morbidity, mortality and leads to a burden to the health care system as well while over half of the patient does not return to premorbid mobility status [1, 2].

Intertrochanteric fractures are more common in the elderly population due to reduce bone strength and density however, it can occur in young population following high energy injury, the goal of the treatment is to attain anatomical reduction with internal fixation to facilitate rapid mobilization of the patient and prevent morbidity and mortality [3].

Treatment of intertrochanteric hip fractures is still a challenge to orthopedic surgeons mostly those with unstable fractures and cortical comminution, sliding hip screw have been commonly used, with good outcomes in stable fractures. Unstable fractures are more prone to implant failure, and a load sharing device with a bolt to the femoral head has a biomechanical advantage [4].

The tip-to-apex distance (TAD) is a good intraoperative indicator of the appropriate position of the lag screw or plate on the femoral head, defined as the sum of the distance from the tip of the lag screw to the apex of the femoral head on an anteroposterior and lateral radiograph. The TAD must be less than 25mm to prevent screw cut out and coxa varus collapse after intertrochanteric fracture fixation [5].

Since the introduction of the proximal femoral nail as one of the treatment options for intertrochanteric fractures in our center for the past six years, there is a paucity of data regarding the outcome of the
treatment, this study will establish the clinical and functional outcome of the patients with intertrochanteric fractures treated with a proximal femoral nail.

2. Methods
This was a hospital-based cross-sectional study was conducted at Kilimanjaro Christian Medical Center (KCMC) in the Department of Orthopaedic and Traumatology which included 92 who met inclusion out of 120 all patient with intertrochanteric fractures and treated with proximal femoral nail between January 2018 to December 2019. All patients who had intertrochanteric fracture and treated with proximal femoral nail were identified from the registry and called at the clinic for evaluation of clinical and functional outcome by using Harris score whereas a score of <70 was regarded as poor hip status, 70-79 fair hip status, 80-89 good hip status, 90-100 excellent hip status after obtained consent from the patient and all patients post-operative x-rays were evaluated for proper implant position, tip to apex distance, screw cut out, appropriate fracture reduction and neck angle all information was entered in structured questionnaires and analyzed by using SPSS version 25, mean, frequency table, graph, and a histogram was used to summarize the result.

3. Results
3.1 Social demographic characteristics and timing
This study included a total of 92 study participants, 54 (63.1%) were males and the mean age was 55.0 (19.5) years. A large proportion of the study participants 37 (40.2%) were aged ≥ 61 years 37 (42.2%), the majority come from rural areas 54 (58.7%) and had a longer hospital stay of > 14 days 45 (51.4%).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Attributes</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td>58</td>
<td>63.1</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>34</td>
<td>36.9</td>
</tr>
<tr>
<td>Age (in years)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21-30</td>
<td></td>
<td>11</td>
<td>11.9</td>
</tr>
<tr>
<td>31-40</td>
<td></td>
<td>15</td>
<td>16.3</td>
</tr>
<tr>
<td>41-50</td>
<td></td>
<td>17</td>
<td>18.5</td>
</tr>
<tr>
<td>51-60</td>
<td></td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>&gt;61</td>
<td></td>
<td>37</td>
<td>40.2</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary</td>
<td></td>
<td>50</td>
<td>55.4</td>
</tr>
<tr>
<td>Secondary</td>
<td></td>
<td>42</td>
<td>45.6</td>
</tr>
<tr>
<td>Residence</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td></td>
<td>38</td>
<td>41.3</td>
</tr>
<tr>
<td>Urban</td>
<td></td>
<td>54</td>
<td>58.7</td>
</tr>
<tr>
<td>Hospital stay</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 14 days</td>
<td></td>
<td>41</td>
<td>44.6</td>
</tr>
<tr>
<td>&gt;14 days</td>
<td></td>
<td>45</td>
<td>51.4</td>
</tr>
</tbody>
</table>

Table 1: Characteristics of the study participants (n=92).
3.2 Mechanism of Injury
In this study simple fall was the commonest cause of injury 38 (41.3%), followed by motorcycle accident 28 (30.4%), car accident 12 (13.0%), high energy falls 11 (11.9%), and pedestrian accident 3 (3.3%) as shown in Figure 1.

3.3 Fracture type classification
In this study most of the fractures encountered in our patients were type A2 fracture 66 (71.7%) followed with A3 which was 15 (16.3%) and A1 which 11 (11.9%) as shown in Figure 2.

3.4 Clinical and function outcome by Harris score
In this study Harris Hip Score of the study participants excellent hip status was 39 (42.4%), Good hip status was 27 (28.5%), Fair hip status was 10 (10.8%) Poor hip status was 16 (18.3%) as shown in Table 2.

Figure 1: Mechanism of Injury.
Figure 2: Fracture classification (n=92).

<table>
<thead>
<tr>
<th>Harris Hip Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
</tr>
<tr>
<td>90 - 100</td>
</tr>
<tr>
<td>n (%)</td>
</tr>
<tr>
<td>39 (42.4)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>mean (SD)</td>
</tr>
<tr>
<td>21 – 30</td>
<td>11 (28.2)</td>
</tr>
<tr>
<td>31 – 40</td>
<td>9 (23.1)</td>
</tr>
<tr>
<td>41 – 50</td>
<td>6 (15.4)</td>
</tr>
<tr>
<td>51 – 60</td>
<td>3 (7.7)</td>
</tr>
<tr>
<td>≥ 61</td>
<td>10 (25.6)</td>
</tr>
</tbody>
</table>

Table 2: Harris score by age (n=92).
Figure 3: Radiological presentation of intertrochanteric fracture post PFN surgery.

Figure 4: Complications after intertrochanteric fractures treatment with PFN.
3.5 Radiological presentation of intertrochanteric fracture post PFN surgery
In this study, 70 (76.1%) had appropriate implant position, 17 (18.5%) had screw cut out, 75 (81.5) had fracture union, 76 (82.6%) had proper fracture reduction, apex distance was less than 25 mm in 71 (77.2%) and 75 (81.5%) had 120 – 135 degrees diaphyseal angle as shown in Figure 3.

3.6 Complications after intertrochanteric fractures treatment with PFN
In this study, infections were the main leading complication 9 (9.8%), followed by reoperation 6 (6.5%), 9 (9.8%) had fascia late pain, 8 (8.7%) had acetabula penetration/irritation, death was 4 (4.3%), periprosthetic was fracture 3 (3.3%) and 6 (6.50%) had limb discrepancy shortening as shown in Figure 4.

4. Discussion
4.1 Social demographic characteristics
In this study, 63.1% were males and the mean age was 55.0 (19.5) years. A large proportion of the study participants 40.2% were aged ≥ 61 years 42.2%, the majority come from rural areas 58.7% and had a longer hospital stay of > 14days 51.4% however, this could be explained due to associated comorbidities in the elderly that require to be addressed before surgical intervention.

These results are similar to a study done by Khairnar in India that found male predominance of 67.3% while patients above 60 years were the majority 61.2%. The study done by Sahim and Reddy observe the average length of hospital stay of 14days and 13.5days which is similar to our study findings [6- 9].

4.2 Mechanism of injury
In this study simple fall was the commonest cause of injury 41.3%, followed by motorcycle accident 30.4%, car accident 13.0%, high energy falls 11.9% and pedestrian accident 3.3%. Similar results observed in Sri Lanka by James and Reddy fracture due simple were 68% and 76% while fracture due to road traffic were 31% and 26% respectively [9, 10].

4.3 Fracture type classification
In this study most of the fractures encountered, were type A2 intertrochanteric fracture 66 (71.7%) followed with A3 which was 15 (16.3%) and A1 which 11 (11.9%) similar results observed by Koyuncu and Mandice A2 account for the majority of the intertrochanteric fractures 70.4% and 66.66% followed by A1 which was 15.5% and A3 13.8% respectively [11, 12].

4.4 Clinical and function outcome by Harris score
In this study Harris Hip Score of the study participants Excellent hip status was 42.4%, Good hip status was 28.5%, fair hip status was 10.8% poor hip status were 18.3% similar results were observed in the study done by Khairnar in India found Excellent hip status of 30.6%, good hip status of 44.9%, fair hip status of 14.2% and only 10.2% had poor hip status among 98 patients who had intertrochanteric fracture treated with a proximal femoral nail.

The same results observed by Sharma in Nepal 44.73% had excellent hip status, 26.31% had good hip
status while 13.16%, had fair hip status and poor hip status was 2.63% [6, 7].

4.5 Radiological presentation of intertrochanteric fracture post PFN surgery
In this study, 76.1% had appropriate implant position, 18.5% had screw cut out, 81.5 had fracture union, 82.6% had proper fracture reduction, apex distance was less than 25 mm in 77.2% and 81.5% had 120 – 135 degrees diaphyseal angle. A retrospective study done by Koyuncu assessing the post-operative x-rays after PFN, observed similar results, (88.9%) had a good reduction while (0.6%) had a poor reduction and (10.5%) had a poor reduction.

A similar finding observed by Yasir 90.47% had appropriate implant position, 4.76% had screw cut out and 4.76% had non-union while 9.52% had poor reduction while mean neck shaft angle range from 125-137 degree [11, 13].

4.6 Complications after intertrochanteric fractures treatment with PFN
In this study, infections, and fascia late pain were the main leading complication 9.8% and 9.8% respectively, followed by acetabula penetration/irritation 8.7%, while reoperation and limb length discrepancy were 6.5% and 6.5% respectively and death was 4.3%, periprosthetic was fracture 3.3%.

A retrospective study done by Landevoisin observed surgical site infection 2 (2%), screw cut-out 1(1%), acetabula penetration 2(2%), periprosthetic fracture and, 5(4.9%) fascia-lata pain 1(1%) developed pressure sores and the mortality 1 (0.9%).

Our study showed a slightly high infection rate this could be contributed to a high resistance pattern to the antibiotic used in the hospital a study at KCMC observed resistance to cefazolin 72.9% and ceftriaxone 51.8% [14, 15].

5. Conclusion
Based on our research findings, therefore, proximal femoral nail provides a good outcome and less complication so is a better method of intertrochanteric fracture fixation with a good both clinic and function outcome and minimal complication after the operation.

However, more studies are required to compare PFN and other treatment modalities for intertrochanteric fractures in the department such as angles blade plate dynamic hip screw.

Acknowledgments
We would like to thank all staffs in the Orthopedic and trauma department at Kilimanjaro Christian Medical Centre for their support in data collection.

Special gratitude to all specialist and residents in the Department of Orthopedic and trauma for their input on this manuscript development.

Disclosure
The authors declare no conflicts of interest in this work.
References


14. de Landevoisin ES, Bertani A, Candoni P, et al. Proximal femoral nail antirotation (PFN-ATM) fixation of extra-capsular proximal...