DIAPHYSEAL FEMORAL FRACTURES:
OUTCOME TREATED WITH CLOSE VS OPEN

Dr. Muhammad Azeem Akhund1, Dr. Karam Ali Shah2, Dr. Allah Nawaz Abbasi3, Dr. Zulfiqar Ali Mastoi4

ABSTRACT... The femur fractures usually happen with oomph forces like motor vehicle accidents. Objectives: To assess the mode of injury and complications of the management, in diaphyseal femoral fractures, in comparison of close versus open intramedullary interlocking nail (IMN). Study Design: Experimental and comparative study. Period: April 2013 to March 2014. Setting: Department of Orthopaedic Surgery, Peoples University of Medical & Health sciences, Nawabshah. Methods: The cases were divided into two groups A and B. Group A was treated by open nailing (n = 20) and group B by close nailing (n = 20), all the cases were operated within 48 hours of admission. All the data were recorded on well structured proforma. Serial radiographies were performed at 3, 6, 12 weeks, and 6 months; additional radiographies were performed as needed postoperatively. Knee, ankle, and hip motions were begun and protected weight bearing was started on the second day postoperatively and increased gradually to full WB depending on x-ray findings of callus formation. The patients were followed for two years. Results of open and closed I.M.N were assessed and the complications if any were observed over a mean follow-up period of two years. Results: The mean age in group A was 29.40 years and the mean age in group B was 30.45 years. Out of 40 cases, 32(80.0%) were males with male to female ratio 1:4. Mean ± SD hospital stay was 19.80 ± 14.60 days in group A, and 17.90 ± 5.95 days in group B (p value 0.55). Average time between injury and admission was 1.53 days (n = 40), in the group A it was 1.05 days, and in the group B it was 2.0 days (p value 0.03). The average of time between injury and operation in the group A was 8.75 days, and in the group B, it was 8.20 days, (p value 0.71). The average of time between admission and discharge in the group A was 11.0 days, and in the group B was 9.15 days, (p value 0.55). Mean ± SD union time was 11.70 ± 6.45 weeks, in group A and 11.90 ± 5.77 weeks, in group B. (p value 0.91). All the patients had full ranged of hip motion and 2 (10.0%) patients of group A had mild limitation of knee motion with a flexion ranges between 80 and 110 degrees. Final functional results based on Thoresen BO criteria16. Excellent results were observed in 19 (47.5%) cases, out of them 5(25.0%) were in group A and 14(70.0%) were in group B. Good results were found in 13(32.5%) patients, out of these 7(35.0%) were in group A and 6(30.0%) were in group. Fair and poor results were detected in 4(10.0%) cases of group A. Conclusions: Road traffic accidents by motorcycle was found the commonest (47.5%) cause of femur fracture, a few complications were observed in open interlocking nailing as compared to closed interlocking nails.

Key words: Diaphyseal Femoral Fractures, Close & Open IMN, Hospital Stay, Outcome.

INTRODUCTION
The femur is the longest tubular bone, and also more strong & heavy among them. In lower extremity, it is the bone which bears main load1-4. The femur fractures usually happen with oomph forces like motor vehicle accidents5.

In daily orthopaedic practice the most frequent fractures are of femoral shaft6, specially in young dynamic society these injuries are more common resulting from an accident by vehicle, accidents in the industries, or plunge from height, and due to traumatic scenery of these lesions, thorough demanding surgery is always required and soft tissue damage is frequent7,8.

The most favorite technique to treat these fractures is intramedullary nailing.9 The greater trochanter & the fossa piriformis offered the changeable preliminary points for antegrade
nailing. Otherwise, retrograde nailing is arranged. There are various indications, advantages and disadvantages of each method. The position of the patient also plays a role and can give ease in the process and may result in malalignment. The systemic complications can be reduced by curtailing the time of the procedure. When the starting point is determined the allied co morbidities, the body physique, and related injuries should be well thought-out. The procedure establish a stable fixation by using indirect reduction technique, obtaining high union rates and low complication when strict attention is given during whole management.9

The goal of treatment is reliable anatomical stabilization, allowing early mobilization.

If the alignment is not done properly, there are various short and long term effects of femoral fracture on hip and knee joints. These problems are can be reduced by interlocking intramedullary nailing.11

There are others options for treatment of fracture shaft of femur, including skin traction, which mostly applied at field in emergency in order to oviod further damage to soft tissues and alleviate the patient problems. In young children and adults skeleton traction is applied on interim, but it has many negative aspects including infection in the pin tract, pulmonary insufficiency can develop, nursing care is difficult, the control is not satisfactory on alignment and length of fracture bone, supine position of patient results in joint stiffness, rehabilitation is limited, and the quadriceps muscle can be tethered. Skin and skeletal traction, casting & cast brace are nonsurgical options for the treatment which are infrequently used outside of young pediatric patients. Spica casting is also used in children having weight under 80lb. Most of the closed & some open injuries are managed by internal fixation as the treatment of choice, as there are less complications, morbidity is low, control of alignment is better, union rate is high and hospital stay is less12-14.

Closed interlocking nailing required appropriate pre-operative management, pre-operative planning, preventive antibiotics together with excellent operative techniques and skills decrease the intra-operative and post-operative complications15.

Keeping these facts in view we conduct the current study to determine to assess and to compare the hospital stay, union time, and functional outcome of the closed and open intramedullary interlocking nailing in our setup.

MATERIALS AND METHODS
This experimental, comparative study was arranged in the Department of Orthopaedic, Peoples University of Medical & Health Sciences, Nawabshah, from April 2013 to March 2014. 40 cases of femoral fractures were included in the study.

Inclusion criteria
2. Gustilo I, II. Open femoral diaphyseal fracture.
3. Non infective delayed union of femoral diaphyseal fracture for more than four months duration.
4. Non-infective non-union of femoral diaphyseal fracture for more than nine months duration.

Exclusion criteria
1. Infected non union of femoral diaphyseal fracture
2. Pathological femoral diaphyseal fracture.
5. Diaphyseal femoral fracture with associated major neurological, chest, abdomen or pelvic injuries
6. Diaphyseal femoral fracture in patients under 18 years and over 65 years of age.

All the patients fulfilling the criteria were admitted through either emergency or OPD of PUMHS
Hospital. Informed consent of the patients was obtained for the procedure. All the data were recorded on well structured proforma. The baseline investigations were done and the fracture was classified depending on the X-ray findings, site, comminution and the character of wound. The cases were divided into two groups A and B. Group A was open nailing (n = 20) and group B was close nailing (n = 20).

The operation was performed in all cases during 48 hours of admission. Nailing was performed in supine position with help of traction table, using as close method intramedullary interlocking nail femur, the lateral position was preferred exclusive of fracture table by physical traction on the flexed hip & knee when were using as open method of intramedullary interlocking nail femur.

The supine position was used for patients having multiple injuries and in patients with bilateral fractures. Open reduction was favored by a minimum incision and suturing prior to reaming if achievable.

After 3, 6, 12 weeks, and 6 months, radiographies were obtained in serial & additional X-rays were also obtained postoperatively if necessary. On the 2nd postoperative day the movements of knee, hip & ankle were begun and the protected weight bearing was increased progressively to full weight bearing depending on callus formation detected on X-ray. The follow up of all the cases was done and complications were noted during this period.

**DATA ANALYSIS**

The SPSS 16.0 was used for data analysis., the qualitative data (Frequency & percentage) like gender, mode of injury, wound condition at the time of arrival, Gustilo classification (GI & GII), range of movement (knee & ankle joints) and complications are shown as n(%), the Chi-square test was used in the comparison of proportions.

Numerical data like age (in years), time between injury and arrival procedure (hour), time between arrival & primary procedure (hour), time between primary procedure & fixation, time of full weight bearing, time of dynamization, time of union and hospital stay (in days) shown as mean ± standard deviation, the student t test (2 tailed) was used while comparing the means in the both groups. Calculation of the data was done on 95% confidence interval and the p value ≤ 0.05 was considered as statistically significant.

**RESULTS**

A total 40 cases having femoral fracture were analyzed in current study based on inclusion criteria. The patients were divided into two groups of method, 20 patients in group A (open interlocking nails) and 20 in group B (close interlocking nails).

The mean age in group A was 29.40 years and the mean age in group B was 30.45 years. Out of 40 cases, 32(80.0%) were males with male to female ratio 1:4.

Mean ± SD hospital stay was 19.80 ± 14.60 days, median was 16.0 days and mode was 12 days in group A (OPEN, n = 20) and Mean ± SD hospital stay was 17.90 ± 5.95 days, median was 17.0 days and mode was 17 days in group B (CLOSED, n = 20) (p value 0.55). (Table No.I)

<table>
<thead>
<tr>
<th>Hospital Stay (In Days)</th>
<th>A: Open Nailing N = 20</th>
<th>B: Close Nailing N = 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>19.80</td>
<td>17.90</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>14.76</td>
<td>5.95</td>
</tr>
<tr>
<td>Mode</td>
<td>12.0</td>
<td>17.0</td>
</tr>
<tr>
<td>Median</td>
<td>16.0</td>
<td>17.0</td>
</tr>
</tbody>
</table>

Table-I. Hospital Stay (in days) in Both Groups (n = 40)

*P value = 0.55, calculated by student t test (2 tailed)*

Average of time in getting injury and having admission was 1.53 days (n = 40). The average of time between injury and admission in the group A (OPEN, n = 20) was 1.05 days, standard deviation was 0.22, median 1.0 and mode 1.0 days and average of time between injury and admission in the group B (CLOSED, n = 20) was 2.0 days, standard deviation was 1.97, median was 1.0 and mode was 1.0 days (p value 0.03). (Table No.II)
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Table-II. The duration between Injury & admission (Days) in Both Groups (n = 40)

<table>
<thead>
<tr>
<th>Duration between Injury &amp; Admission (days)</th>
<th>A: Open Nailing n = 20</th>
<th>B: Close Nailing n = 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>1.05</td>
<td>2.0</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.22</td>
<td>1.97</td>
</tr>
<tr>
<td>Mode</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Median</td>
<td>1.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Table-II. The duration between Injury & admission (Days) in Both Groups (n = 40)

P value = 0.03, calculated by student t test (2 tailed)

The average of time between injury and operation in the group A (OPEN, n = 20) was 8.75 days, standard deviation was 4.94, median 7.0 and mode 7.0 days and average of time between injury and operation in the group B (CLOSED, n = 20) was 8.20 days, standard deviation was 4.46, median was 7.0 and mode was 5.0 days (p value 0.71).

The average of time between admission and discharge in the group A (OPEN, n = 20) was 11.0 days, standard deviation was 3.24, median 6.50 and mode 12.0 days and average of time between admission and discharge in the group B (CLOSED, n = 20) was 9.15 days, standard deviation was 4.63, median was 8.50 and mode was 17.0 days (p value 0.55). (Table No. III)

Table-III. Time Between Admission and Discharge (in days) in Both Groups (n = 40)

<table>
<thead>
<tr>
<th>Time between admission and discharge (in days)</th>
<th>A: Open Nailing n = 20</th>
<th>B: Close Nailing N = 20</th>
</tr>
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<tbody>
<tr>
<td>Mean</td>
<td>11.0</td>
<td>9.15</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>3.24</td>
<td>4.63</td>
</tr>
<tr>
<td>Mode</td>
<td>12.0</td>
<td>17.0</td>
</tr>
<tr>
<td>Median</td>
<td>6.50</td>
<td>8.50</td>
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</table>

Table-III. Time Between Admission and Discharge (in days) in Both Groups (n = 40)

P value = 0.55, calculated by student t test (2 tailed)

Mean ± SD union time was 11.70 ± 6.45 weeks, mode was 4.0, and median was 12.0 in group A and Mean ± SD was 11.90 ± 5.77 weeks, mode 13.0 and median was 12.50 in group B. (p value 0.91) (Table No.IV).

Table-IV. Time of Union (in weeks) in Both Groups (n = 40)

<table>
<thead>
<tr>
<th>Time of union (in weeks)</th>
<th>A: Open Nailing n = 20</th>
<th>B: Close Nailing n = 20</th>
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<tbody>
<tr>
<td>Mean</td>
<td>11.70</td>
<td>11.90</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>6.45</td>
<td>5.77</td>
</tr>
<tr>
<td>Mode</td>
<td>4.0</td>
<td>13.0</td>
</tr>
<tr>
<td>Median</td>
<td>12.0</td>
<td>12.50</td>
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Table-IV. Time of Union (in weeks) in Both Groups (n = 40)

P value = 0.91, calculated by student t test (2 tailed)

All the patients had full ranged of hip motion and 2 (10.0%) patients of group A had mild limitation of knee motion with a flexion ranges between 80 and 110 degrees.

Final functional results based on Thoresen BO criteria\textsuperscript{16}. Excellent results were observed in 19 (47.5%) cases, out of them 5(25.0%) were in group A and 14(70.0%) were in group B. Good results were found in 13(32.5%) patients, out of these 7(35.0%) were in group A and 6(30.0%) were in group. Fair and poor results were detected in 4(10.0%) cases of group A (Table-V).

Table-V. Functional Outcome According to Thoresen B et al. Classification\textsuperscript{16} (n = 40)

<table>
<thead>
<tr>
<th>Functional outcome</th>
<th>Open Nailing (n = 20)</th>
<th>Close Nailing (N = 20)</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>5</td>
<td>14</td>
<td>19</td>
</tr>
<tr>
<td>n(%)</td>
<td>25.0%</td>
<td>70.0%</td>
<td>47.5%</td>
</tr>
<tr>
<td>Good</td>
<td>7</td>
<td>06</td>
<td>13</td>
</tr>
<tr>
<td>n(%)</td>
<td>35.0%</td>
<td>30.0%</td>
<td>32.5%</td>
</tr>
<tr>
<td>Fair</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>n(%)</td>
<td>20.0%</td>
<td>0</td>
<td>10.0%</td>
</tr>
<tr>
<td>Poor</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>n(%)</td>
<td>20.0%</td>
<td>0</td>
<td>10.0%</td>
</tr>
</tbody>
</table>

Table-V. Functional Outcome According to Thoresen B et al. Classification\textsuperscript{16} (n = 40)

Pearson’s chi square value = 12.34, df = 3, p value = 0.006

DISCUSSION

In the present study, most of the patients were male. Shafi MK. and Basumallick MN et al. reported the same results in their studies\textsuperscript{17,18}.

The time for union is a very controversial topic. It is not possible to assess healing of fracture by usual orthopaedic criteria. Since after operation,
stability is obtained immediately and patient becomes pain free in the ensuring 3-4 weeks. Time to healing could not be assessed accurately either clinically or radio logically since such large intramedullary nails were used. Clawson et al have reported an average time for appearance of bridging callus at 6 weeks with partial obliteration of fracture site as the time of union. Rockaen et al have used the time elapsing between the accident and ability to walk without stick and return to work as the criteria for the progress of fracture healing. In this study nature of bridging callus with partial obliteration of fracture site has been used as time for union. Assessment on return to work cannot be taken as a sign for progress of fracture healing since the majority of patients involved in the present series are usually heavy manual laborer who require solid union before they can go back to work in contrast to the western countries where patients usually have sedentary jobs and hence can be put to work earlier as compared to a manual laborer.

In the present study, the mean time of Union + SD, 11.70 + 6.45 (ranging 4 to 20 weeks) in group A and 11.90 + 5.77 (ranging 3 to 21 weeks) in Groups B, whereas Botchu R et al. reported the average time of fracture healing was 16 weeks both methods (open vs close). Basumallick MN et al. reported union between 13 to 28 weeks (average 19.2 weeks) weeks in open intramedullary nailing in his study of 50 cases. While in a local study conducted by Umer M et al. reported the same figure of mean time of union was 11.5 weeks in his study on close method. In another study described by Arpacioğlu MO et al. who reported 16.5 weeks average time of union in his study on femoral shaft fractures by interlocking intramedullary nailing in adults whereas Eldeen MA et al. described the average time of clinical healing was 12 weeks, these results are similar to this series.

In this study, the commonest cause of femur fractures was road traffic accidents by motorcycle noted in 47.5% fractures. In the local study described by Mahmood T et al. showed the most common causes of the femoral shaft fracture being road traffic accident (RTA). There were 18 (45%) cases of fractures of femur by road traffic accident. The same observations was also observed in the study of Umer M et al. who reported that Road Traffic Accidents (RTA) was common cause of femur fracture in his study. while Iqbal MJ et al. also described the same results in his study.

The rate of non union in this study was 5.0% in the group A, associated with deep and superficial infection. Bhandari has reported 7% nonunion rate in a systemic review while Gharehdaghi M et al. revealed 5% nonunion cases in his study of 126 cases, 4% rate of non union by Umer M et al. whereas Gharehdaghi M et al. showed 4.41% rate of non union in his study, these results are similar to this study.

In this series 1(5.0%, n = 20) patient had delayed union in group A, while Umer M et al. observed 7.8% delayed union in his study of 89 cases and Shafi MK et al. showed 4.0% of delayed union. While in another study conducted by Yilmaz E et al revealed 6.6% delayed union in their study, these results are comparable to this study.

Infection rate in this study was found 10.0% in group A. Similarly, Mahmood T et al. found the rate of infections in his study, 10.0% for intramedullary interlocking nailing. Naeem-Ur-Razaq M showed 12.0% rate of infection in his study. Ali MA et al. described 10.3% rate of infection, Iqbal MJ et al. also described the same results in his study. these results correlates well to the present study, while Whittle et al. showed 4% infection rate.

CONCLUSIONS
Few complications were observed in open interlocking nailing as compared to closed interlocking nails.

REFERENCES
2. Bucholz, R, Brumback, R. Fractures of the shaft of the


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“"It is during our darkest moments that we must focus to see the light.”

Aristotle Onassis

AUTHORSHIP AND CONTRIBUTION DECLARATION

<table>
<thead>
<tr>
<th>Sr. #</th>
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