INTRODUCTION

A hip fracture is a fracture of femur that occurs in the proximal end of the femur near the hip\(^1\). A hip fracture is one of the most devastating conditions with a high rate of complications including serious threat to the patient’s future mobility, death, quality of life, social functioning and autonomy.\(^2\) Approximately 340,000 hip fractures occur every year. It is estimated that by the year 2040, nearly 500,000 hip fractures will occur in individuals having age \(\geq 65\) years and\(^3\). Even though the overall number of hip fractures is increasing, the increase in not equally distributed among different types of hip fracture. Over the last 3 decades, there has been an increase in the trochanteric fracture/femoral neck fracture incidence ratio and a further substantial increase, especially in male trochanteric fractures, is expected\(^2,3\).

Fractures of proximal femur are classified as intracapsular, which includes femoral neck and head fractures, or extracapsular, which includes intertrochanteric, trochanteric, and subtrochanteric fractures\(^4\). Fractures of proximal femur are very dangerous and if left untreated, then the prognosis is very poor\(^5\).

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The best management for proximal femur fractures is debatable. Various implants are available to facilitate fracture fixation, obtain early ambulation and reduce the risk of complications in management of these fractures\(^6\). There are two main types of devices to fix proximal femur fractures, intra-medullary devices and extra-medullary devices. Extramedullary device (Dynamic Condylar Screw) is easier to insert, provide more inter-fragmentary compression across an inter-condylar fracture and correct sagittal plane malalignment\(^7\). In year 2004, PFNA was introduced by the AO/ASIF as an alternative to the proximal femoral nail. It has a small distal shaft diameter, resulting in less stress concentration of the tip\(^8\).

As there were very limited randomized controlled trials available on these two techniques and also no local study was available on this, so we had planned to conduct this study to compare the mean union time between PFNA and DCS in the management of unstable proximal femur fractures. This study would help us to evaluate the better technique between these two in terms of early union of the fracture and these particular patients could be mobilized and returned to their routine life as soon as possible. Then on the basis of these results, the technique with less mean healing time could be opted in our routine practice guidelines in order to reduce the morbidity of these patients.

Comparrison between Proximal Femoral Nail Antirotation (PFNA) and Dynamic Condylar Screw (DCS) in the Management of Unstable Proximal Femur Fractures in Term of Mean Union Time

MUHAMMAD SALEEM AKHTAR\(^1\), HAROON UR REHMAN GILLANI\(^2\), KASHIF RAZA KHAN\(^3\)

ABSTRACT

**Aim:** To compare the mean union time between proximal femoral nail antirotation (PFNA) and dynamic condylar screw (DCS) in the management of unstable proximal femur fractures.

**Methods:** Total 60 patients were selected from Department of Orthopedic Surgery, DHQ Hospital Sahiwal for this randomized control trial. The duration of the study was 6 months from September 2015 to March 2016. Patients with unstable proximal femur fracture of 31A2 and 31A3 within 7 days were included in the study. The patients were divided into two groups. Group A included 30 patients managed with PFNA and Group B included 30 patients managed with Dynamic Condylar Screw (DCS).

**Results:** In group A, mean age of cases was 55.40 ± 8.00 years and in group B was 55.53 ± 7.70 years. Out of these 60 patients, 35 (58.33%) were male and 25 (41.67%) were females. Male and these particular patients could be managed with PFNA. Mean age of cases in group A (PFNA) was 55.40 ± 8.00 years and in group B (DCS) was 55.53 ± 7.70 years. Out of these 60 patients, 35 (58.33%) were male and 25 (41.67%) were females with male to female ratio of 1.4:1. Mean union time in group A (PFNA) was 16.17 ± 3.33 weeks and in group B (DCS) was 25.93 ± 3.19 weeks with statistically significant p value of <0.0001.

**Conclusion:** This study concluded that mean union time is less in proximal femoral nail antirotation (PFNA) as compared to dynamic condylar screw (DCS) in the management of unstable proximal femur fractures. So, we recommend that proximal femoral nail antirotation (PFNA) should be used routinely in the management of unstable proximal femur fractures for early union of the fracture which will result in early mobilization and return of these particular patients to their routine life.

**Keywords:** Intercondylar, fracture, nail, screw, union.
MATERIAL AND METHODS

Total 60 patients were selected from Department of Orthopedic Surgery, DHQ Hospital Sahiwal for this randomized control trial. The duration of the study was 6 months from September 2015 to March 2016. Patients with unstable proximal femur fracture of 31A2 and 31A3 within 7 days of fracture having age 40-70 years of both genders were included in this study. Unstable Proximal Femur Fractures was defined as: Fracture is the breach in the continuity of bone and unstable proximal femur fracture are those which includes extracapsular (trochanteric, intertrochanteric, and subtrochanteric) fractures. These fractures are classified as 31A by AO classification. Proximal femur fractures are named 31 (3 for femur; 1 for proximal) and subdivided into A1 (pertrochanteric simple), A2 (pertrochanteric multifragmentary) and A3 (intertrochanteric). In this study we had only included 31A2 and 31A3 fractures.

Patients with 31A1 type fracture, pathological fractures, presence of neurovascular injury, inability to work before injury, significant medical co-morbidity like diabetes mellitus, CLD, CRF, chronic steroid use and patients not fit for anesthesia were excluded from the study.

Before starting the study, an approval was taken from institution review committee and written informed consent was taken from every patient.

Cases were divided into two groups i.e., A & B. All selected cases were offered to pick up a slip from total mixed up slips (half-slips was contain letter ‘A’ and other half slips was contain letter ‘B’) and he/she was placed in that respective group. In group A patients, proximal femoral nail antirotation (PFNA) was done for the fractures while in group B, dynamic condylar screw (DCS) was done. All patients were followed on regular intervals post-operatively till union of fracture and this time from day of operation till union of fracture was noted in weeks.

Union Time was defined as the time from day of operation to obvious radiological union (evidence of bridging of three of the four cortices in standard anteroposterior and lateral radiographs) and was noted at 10th & 12th weeks. Final outcome was assessed at 12th week. All the data was noted in pre-designed proforma.

The collected data was entered in computer software SPSS version 20.0. Mean and standard deviation was calculated for age and union time (in weeks). Frequency and percentage was calculated for the gender and type of fracture. Student ‘t’ test was used to compare mean union time in both groups and p-value ≤0.05 was taken as significant. Effect modifiers like age, gender, type of fracture (31A2 / 31A3) were controlled through stratification and post stratification student ‘t’ test was applied. P-value ≤0.05 was considered as significant.

RESULTS

Total 60 patients (30 patients in each group) were selected for this study. Age range was from 40 to 70 years with mean age 55.47±7.89 years. Mean age of cases of group A was 55.40±8.00 years and of group B was 55.53±7.70 years.

Mean union time in group A (PFNA) was 16.17±3.33 weeks and in group B (DCS) was 25.93±3.19 weeks. The difference between the mean union time between the both groups was significant (P=<0.05) (Table 1).

Patients of both groups were divided into 3 age groups i.e., age group 40-50 years, age group 51-60 years and age group 61-70 years. Total 12(40%) patients of group A (PFNA) and 13 (43.33%) patients of group B (DCS) were belonged to age group 40-50 years. Total 10(33.33%) patients of group A (PFNA) and 13(36.67%) patients of group B (DCS) were belonged to age group 51-60 years. Total 8(26.67%) patients of group A (PFNA) and 6(20%) patients of group B (DCS) were belonged to age group 61-70 years.

In age group 40-50 years, mean union time of patients of group A (PFNA) was 15.90±3.60 weeks and in group B (DCS) was 25.44±3.05 weeks and the difference between mean union time of group A (PFNA) and group B (DCS) was significant (P=<0.05). In patients of age group 51-60 years, mean union time of patients of group A (PFNA) was 16.05 ± 3.27 weeks and in group B (DCS) was 25.63 ± 3.58 weeks and the difference between mean union time of group A (PFNA) and group B (DCS) was significant (p=<0.05). In patients of age group 61-70 years, mean union time of patients of group A (PFNA) was 16.40±3.63 weeks and in group B (DCS) was 26.05±3.12 weeks and the difference between mean union time of group A (PFNA) and group B (DCS) was significant (p=<0.05) (Table 2).

Stratification of mean union time in relation to gender was done. In group A (PFNA), male patients were 17(56.67%) female patients were 13(43.33%). In group B (DCS), male patients were 18 (60%) female patients were 12(40%). In male patients of group A (PFNA), mean union time was 16.29±3.65 weeks and 24.72±2.89 weeks in group B (DCS) and the difference was significant (p=<0.05). In female patients of group A (PFNA) mean union time was 16.00±3.00 weeks and 27.75±2.83 weeks in group B (DCS) and the difference was significant (p=<0.05). (Table 3).

Stratification of mean union time according to Type of fracture was done i.e. fracture type 31A2 and
fracture type 31A3. Total 21 (70%) patients of group A (PFNA) and 22 (73.33%) patients of group B (DCS) found with fracture type 31A2. Total 9 (30%) patients of group A (PFNA) and 8 (26.67%) patients of group B (DCS) found with fracture type 31A3.

In patients with fracture type 31A2, mean union time in group A (PFNA) was 16.00±3.70 weeks and in group B (DCS) was 25.32±3.11 weeks and the difference was significant (p<0.05). In patients with fracture type 31A3 mean union time in group A (PFNA) was 16.56 ± 2.40 weeks and group B (DCS) was 27.62 ± 2.97 weeks with p value <0.05. (Table 4)

Table 1: Comparison of Mean Union Time between both groups.

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>SD</th>
<th>P= value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>16.17</td>
<td>3.33</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>25.93</td>
<td>3.19</td>
<td>&lt;0.05</td>
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</table>

Table 2: Stratification of mean union time according to age

<table>
<thead>
<tr>
<th>Age</th>
<th>Group A (n=30)</th>
<th>Group B (n=30)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Union time (weeks)</td>
<td>Union time (weeks)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>40-50</td>
<td>15.90</td>
<td>3.60</td>
<td>25.44</td>
</tr>
<tr>
<td>51-60</td>
<td>16.05</td>
<td>3.27</td>
<td>25.63</td>
</tr>
<tr>
<td>61-70</td>
<td>16.40</td>
<td>3.63</td>
<td>26.05</td>
</tr>
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</table>

Table 3: Stratification of mean union time according to gender.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Group A (n=30)</th>
<th>Group B (n=30)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Union time (weeks)</td>
<td>Union time (weeks)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Male</td>
<td>16.29</td>
<td>3.65</td>
<td>24.72</td>
</tr>
<tr>
<td>Female</td>
<td>16.00</td>
<td>3.00</td>
<td>27.75</td>
</tr>
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</table>

Table 4: Stratification of mean union time according to Type of fracture.

<table>
<thead>
<tr>
<th>Type of fracture</th>
<th>Group A (n=30)</th>
<th>Group B (n=30)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Union time (weeks)</td>
<td>Union time (weeks)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>31A2</td>
<td>16.00</td>
<td>3.70</td>
<td>25.32</td>
</tr>
<tr>
<td>31A3</td>
<td>16.56</td>
<td>2.40</td>
<td>27.62</td>
</tr>
</tbody>
</table>

**DISCUSSION**

This randomized controlled study has compared the mean union time between PFNA and DCS in the management of unstable proximal femur fractures.

In our study, mean union time in group A (PFNA) was 16.17±3.33 weeks and in group B (DCS) was 25.93±3.19 weeks. In a study, the mean union time was shown significantly less for PFNA compared to DCS (15.71±5.49 versus 22.59±10.21 weeks) in the treatment of proximal femur fracture.9

Halwai MA et al10 in their study has found the mean union time of 19.7 weeks after dynamic condylar screw of proximal femoral fractures. Ali I et al11 reported this mean union as 15 weeks. Christodoulou A et al12 reported an average time of union of 20 weeks. In another study at Addenbrook’s Hospital Cambridge, the average time of union was 11.3 weeks.13 In a local study it is 12 weeks.14 Huang HT et al reported average time of union of 18.5 weeks.14 Fu HD et al reported an average union time of 18.6 weeks.15 In some studies the time of union is quite early12 and in some it is very late.11 This might be due to differences in post-operative mobilization protocol and criteria for union.

Xu Y et al16 in his study has found the mean union time of 9.65±2.19 weeks after proximal femoral nail antirotation. In 2003, a study concluded that PFN is an excellent implant for management of unstable fractures of proximal femur.17 On the whole it is concluded that mean union time is less in PFNA and DCS in the management of unstable proximal femur fractures.

**CONCLUSION**

This study concluded that mean union time is less in proximal femoral nail antirotation (PFN) as compare to dynamic condylar screw (DCS) in the treatment of unstable proximal femur fractures. So, we recommend that proximal femoral nail antirotation (PFN) should be used routinely in the treatment of unstable proximal femur fractures for early union of the fracture which will result in early mobilization and return of these particular patients to their routine life.

**REFERENCES**


