



Comparison of Supine Position and Traction Table in Surgical Treatment of Unstable Intertrochanteric Fractures with PFNA

İnstabil İntertrokanterik Kırıkların PFNA ile Cerrahi Tedavisinde Supin Pozisyon ile Traksiyon Masasının Karşılaştırılması

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Abstract

Aim: Intertrochanteric femur fractures (IFF) are a major cause of morbidity and mortality in the elderly population. Proximal femoral nail-anti-rotation (PFNA) is one of the most preferred surgical treatment methods. This study aimed to compare the clinical and radiologic results of two different patient positions used during PFNA and to reveal the intraoperative advantages and disadvantages.

Material and Method: Cases operated due to IFF between January 2020 and December 2022 were retrospectively analyzed. The study was conducted with 123 patients meeting the inclusion criteria. The minimum follow-up period was determined as one year. Two groups were formed: those operated on the traction table (operated-TT) and those operated in supine lithotomy without traction table (operated-SP). The groups were compared regarding operative time, reduction quality, type-apex distance (caTAD), and radiologic and clinical results.

Results: There were 76 patients in the operated-TT group and 47 in the operated-SP group. The mean age of the operated-TT group was 81.00±8.52 years, and the mean age of the operated-SP group was 79.30±8.12 years. (p=0.213) Gender, follow-up time, time from trauma to surgery, and fracture classification were similar for the groups. The mean operative time was 95.18±8.54 minutes in the operated-TT group and 88.23±7.12 minutes in the operated-SP group, and the operation was completed in a shorter time in the operated-SP group. (p=0.001) There were no differences between the groups in terms of reduction quality, caTAD, Harris Hip Score, VAS score, infection rates, and cut-out rates.

Conclusion: Based on this study, the radiologic and clinical results of the cases operated with manual traction in the supine position and those operated using a traction table in treating IFF with PFNA are similar. In addition, it was concluded that shorter operation time was an advantage of the operated-SP group.

Keywords: Intertrochanteric fracture, proximal femoral nail anti-rotation, position

Öz

Amaç: İntertrokanterik femur kırıkları (IFF) yaşlı popülasyonda önemli morbidite ve mortalite sebebidir. Cerrahi tedavisinde proksimal femoral nail-antirotation (PFNA) en sık tercih edilen yöntemlerden biridir. Çalışmanın amacı; PFNA uygulanırken kullanılan iki farklı hasta pozisyonunun klinik ve radyolojik sonuçlarını karşılaştırmak, intraoperatif avantaj ve dezavantajlarını ortaya çıkarmaktır.

Gereç ve Yöntem: Ocak 2020 ile Aralık 2022 yılları arasında IFF nedeni ile opere edilen olgular retrospektif olarak incelendi. Dahil edilme kriterlerine uyan 123 olgu ile çalışma yürütüldü. Minimum takip süresi bir yıl olarak belirlendi. Traksiyon masasında opere edilenler (operated-TT) ile traksiyon masasız supin litotomi pozisyonunda opere edilenler (operated-SP) olarak iki grup oluşturuldu. Gruplar ameliyat süresi, redüksiyon kalitesi, type-apex distance (caTAD), radyolojik ve klinik sonuçlar açısından karşılaştırıldı.

Bulgular: Operated-TT grubunda 76, operated-SP grubunda 47 hasta yer aldı. Operated-TT grubunun yaşı ortalama 81.00±8.52 yıl, operated-SP grubunun yaşı ortalama 79.30±8.12 yıl idi. (p=0.213) Cinsiyet, takip süresi, travmadan ameliyata kadar geçen süre ve kırık sınıflaması gruplar için benzerdi. Ameliyat süresi operated-TT grubunda ortalama 95.18±8.54 dakika, operated-SP grubunda ortalama 88.23±7.12 dakika olarak tespit edildi ve operated-SP grubunda ameliyatın daha kısa sürede tamamlandığı görüldü. (p=0.001) Reduction quality, caTAD, Harris Hip Score, VAS skoru, enfeksiyon oranları, cut-out oranları açısından gruplar arasında fark tespit edilmedi.

Sonuçlar: Bu çalışmaya göre; IFF'nin PFNA ile tedavisinde supin pozisyonunda manuel traksiyon ile opere edilen olgular ile traksiyon masası kullanarak opere edilen olguların radyolojik ve klinik sonuçları benzerdir. Bunun yanında ameliyat süresinin daha kısa olmasının operated-SP grubunun avantajı olduğu sonucuna ulaşılmıştır.

Anahtar Kelimeler: İntertrokanterik kırık, proksimal femoral çivi anti-rotasyon, pozisyon



INTRODUCTION

The rate of intertrochanteric femur fractures (IFF) has increased with the aging population, especially in older individuals.^[1] Surgical treatment allows patients to reach their functional capacity earlier. In this way, complications and mortality caused by prolonged bed rest are significantly reduced.^[2] Although there are different implant options in surgical treatment, cephalomedullary nails are the most preferred method, especially in unstable fractures.^[3] Today, proximal femoral nail-anti-rotation (PFNA) is the most commonly used intramedullary nail.^[4] The most important complication after PFNA is implant-related mechanical complications requiring reoperation. The most important way to prevent this is to ensure a successful reduction and correct placement of the nail.^[5] In addition to successful implant placement, the duration of surgery also has a significant effect on complications. Different surgical positions have been described for successful reduction and implant placement. The most commonly used ones are traction table, lateral position, and operating in the supine position.^[6,7] Each position has advantages and disadvantages. Significant complications of the commonly used traction table have been described, including pudendal nerve palsy, sciatic nerve palsy, common peroneal nerve palsy, erectile dysfunction, soft tissue contusions, pressure sores, compartment syndrome, and vascular injuries.^[8] The aim of this study was to compare the clinical and radiologic results of performing surgery with manual traction in the supine lithotomy position without a traction table versus the commonly used traction table in the surgical treatment of IFF with PFNA.

MATERIAL AND METHOD

Patient Selection

The study was carried out with the permission of Umraniye Training and Research Hospital Clinical Researches Ethics Committee (Date: 24.04.2023, Decision No: 136). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. Informed consent was obtained from the patients included in the study. Between January 2020 and December 2022, 396 patients treated for IFF were retrospectively analyzed. Fracture classification was made according to the Arbeitsgemeinschaft für Osteosynthesefragen/Orthopaedic Trauma Association classification (AO/OTA). Patients who were operated on using short proximal femoral nail-anti-rotation (PFNA), aged 65 years or older, with a follow-up period of more than one year, and fracture types A2.2, A2.3 and A3 as per AO classification were included in the study. Patients treated conservatively, operated using a method other than PFNA, operated using a long nail, required open reduction, did not comply with follow-up, had a follow-up period of less than one year, underwent general anesthesia, previously operated on the same extremity, had a pathological fracture, and were A1 and A2.1 according to the AO classification were excluded

from the study. Two groups were formed: those operated with manual traction in a supine lithotomy position without a traction table (operated-SP) and those operated with a traction table (operated-TT).

Surgical technique

All patients included in the study were operated on under spinal anesthesia. Two different surgeons performed the operations. The surgeon preferred the choice of patient position. In the Operated-TT group, the patients were placed on the traction table after anesthesia without any reduction maneuver. Internal rotation, adduction, and traction were applied. The reduction was checked on anteroposterior and lateral radiographs by fluoroscopy. In Operated-SP, the intact extremity was suspended with a leg sling with the hip and knee flexed. In this way, it was aimed to obtain an accurate lateral radiograph. Internal rotation, adduction, and traction were applied with the help of an assistant throughout the operation. The reduction was checked on anteroposterior and lateral radiographs with fluoroscopy. The same incision and surgical technique were used in both groups. An incision was made proximal to the trochanter major, then a short PFNA with a trochanteric groove was inserted (TST-PROFIN-Proximal Femur Nail, 9-11 millimeters (mm) in diameter, 170-220 mm in length). Two proximal screws and one distal locking screw were placed, and the operation was finalized.

Postoperative Follow-up

Standard physical therapy protocol was applied to all patients postoperatively. They were instructed to perform quadriceps, ankle dorsiflexion, and knee and hip stretching exercises in the early period. On the first or second postoperative day, all patients were ambulated without any load on the operated extremity. Radiographs were taken on the first postoperative day, the first, third, sixth month, and one year postoperatively. X-ray control during the first postoperative month was awaited for weight-bearing instruction.

Clinical and Radiological Evaluation

AO classification was used for fracture classification. Demographic data, side of the injured extremity, fracture mechanism, time from fracture to surgery, and duration of surgery were analyzed. Surgery duration was considered the time from the completion of anesthesia to wound closure. The results were determined from the operating room records and analyzed. The reduction quality, type apex distance (calTAD), union time, and union problems were compared radiologically. Reduction quality was measured on anteroposterior and lateral radiographs taken on the first postoperative day as described by Chang et al.^[9] and recorded as good, fair, and poor. calTAD was measured on radiographs taken on the first postoperative day and on nails with double proximal screw design as described by Buyukdogan et al.^[10] Clinically, Harris Hip Score (HHS) and VAS scores were compared between the groups. Clinical scores were obtained from the first-year follow-up data.

Statistical analysis

SPSS 22.0 for the Windows program was used for statistical analysis. Descriptive statistics were expressed as numbers and percentages for categorical variables and mean, standard deviation, minimum, and maximum for numerical variables. Two independent groups were compared with Student's t-test when numerical variables met the normal distribution condition and with the Mann-Whitney U test when they did not. Rates in independent groups were compared using the Chi-Square Test. The statistical significance level was accepted as $p < 0.05$.

RESULTS

The study was conducted with 123 patients fulfilling the inclusion criteria. There were 76 patients in the operated-TT group and 47 in the operated-SP group. The mean age of the operated-TT group was 81.00 ± 8.52 years, while the mean age of the operated-SP group was 79.30 ± 8.12 years. ($p = 0.213$) There were 51 females and 25 males in the operated-TT group and 29 females and 18 males in the operated-SP group. ($p = 0.540$) The time from trauma to surgery and AO classification were similar for the groups. The mean follow-up time was 19.68 ± 3.90 months in the operated-TT group and 20.45 ± 3.98 months in the operated-SP group. ($p = 0.262$) (Table 1) The mean operative time was 95.18 ± 8.54 minutes in the operated-TT group and 88.23 ± 7.12 minutes in the operated-SP group, and the operation was completed in a shorter time in the operated-SP group. ($p = 0.001$) There was no difference between the groups regarding reduction quality, calTAD, HHS, and VAS scores. Superficial infection was detected in four patients in the operated-TT group and two patients in the operated-SP group. ($p = 0.800$) After oral antibiotic treatment, the infection resolved spontaneously without requiring additional surgical intervention. Cut-out occurred in four cases in the operated-TT group and three cases in the operated-SP group ($p = 0.790$). Revision surgery was performed by removing the PFNA and applying hemiarthroplasty. No additional intervention was required in these four cases. (Table 2)

Table 1. Descriptive statistics and comparison results for demographic and general characteristics of the groups.

| | Group | | p |
|----------------------------------|------------|------------|-------|
| | SP (n=47) | TT (n=76) | |
| Gender (n,%) | | | 0.540 |
| Male | 18 (38.30) | 25 (32.89) | |
| Female | 29 (61.70) | 51 (67.11) | |
| Age(years)(mean±sd) | 79.30±8.12 | 81.00±8.52 | 0.213 |
| Follow up (Month) (mean±sd) | 20.45±3.98 | 19.68±3.90 | 0.262 |
| Surgical time (minute) (mean±sd) | 88.23±7.12 | 95.18±8.54 | 0.001 |
| AO Type (n,%) | | | 0.900 |
| A2.2 | 17 (36.17) | 25 (32.89) | |
| A2.3 | 12 (25.53) | 22 (28.95) | |
| A3 | 18 (38.30) | 29 (38.16) | |

sd:standard deviation

Table 2. Descriptive statistics and comparison results of radiological and clinical measurements of the groups

| | Group | | p |
|------------------------------|------------|------------|-------|
| | SP (n=47) | TT (n=76) | |
| calTAD (milimeter) (mean±sd) | 23.83±2.08 | 24.22±2.00 | 0.096 |
| Reduction Quality (n,%) | | | 0.780 |
| Successfull | 26 (55.32) | 46 (60.53) | |
| Moderate | 19 (40.43) | 26 (34.21) | |
| Poor | 2 (4.26) | 4 (5.26) | |
| Cut-out (n,%) | 3 (6.38) | 4 (5.26) | 0.790 |
| VAS score (mean±sd) | 3.06±2.25 | 2.67±1.64 | 0.320 |
| Harris Hip Score (mean±sd) | 81.66±8.24 | 84.07±7.10 | 0.229 |
| Superficial Infection (n,%) | 2 (4.26) | 4 (5.26) | 0.800 |

calTAD:calculated tip apex distance, VAS: visual analogue scale, sd:standard deviation

DISCUSSION

IFF most commonly affects the elderly population. The morbidity and mortality that may occur due to this population's high number of comorbidities are alarming.^[11] One of the main goals in treating IFF is to operate as soon as possible and mobilize the patient as quickly as possible. PFNA is considered an advantageous method in treating intertrochanteric femur fracture because it requires the shortest operation time and the least blood loss compared to other implant options.^[12] Nevertheless, the search for obtaining more successful clinical and radiological results with PFNA, shortening the operation time, reducing blood loss, and obtaining a more stable fixation is still ongoing. The surgical position is one of these searches. Each position has its own advantages and disadvantages.

There are studies reporting that the stress exposure of soft tissues increases with prolonged surgical time, and the risk of surgical site infection increases with a decreased systemic defense of the organism.^[13-15] As the surgical time increases, the amount of stress to which soft tissues are exposed increases, the systemic defense of the organism decreases, and the error rate increases due to fatigue in the team.^[16,17] Since patients with intertrochanteric fractures are mostly elderly and have more comorbidities, it is inevitable that infection and surgical risks increase with prolonged operation time.^[18] In one of the studies aimed at decreasing the operation time, Celik et al.^[19] suggested the use of dual scopes in the treatment of intertrochanteric femur fractures with PFNA by using a fixed scope for anteroposterior radiography and a fixed scope for lateral radiography. They reported that this resulted in a significant reduction in operative time. Du et al.^[20] compared PFNA cases operated with manual traction in the supine position with IFF cases operated with PFNA using a traction table and reported that the operation time was shorter in supine positions. In addition, they found similar clinical and radiologic results. In our study, the operative time was shorter in the operated-SP group compared to the operated-TT group. The short operative time is the most important advantage of the operated-SP group in treating intertrochanteric fractures with PFNA. In our study, the

preparation time after anesthesia, until the incision was made, was not evaluated separately, and the time from anesthesia to wound closure was considered the operative time. The reason for the shorter operation time in the Operated-SP group is thought to be the faster preparation phase.

Intraoperative blood loss is known to increase mortality and morbidity.^[21,22] Yang et al.^[23] reported that intraoperative blood loss in treating intertrochanteric fractures with PFNA might be higher than estimated. They emphasized that increased blood loss is associated with longer hospital stays and complications. In this study, there was no difference in the amount of intraoperative bleeding between the groups in treating intertrochanteric femur fractures with PFNA when the supine position or traction table operations were compared. One of the shortcomings of our study is that the amount of bleeding was not measured. We did not find any study showing a direct relationship between the duration of surgery and the amount of bleeding in treating intertrochanteric femur fractures with PFNA. Considering that the reason for the short operative time is due to the pre-incision preparation phase, it is understandable that the position preference is not directly related to the amount of bleeding.

The most important success indicator in the surgical treatment of intertrochanteric fractures with PFNA is the quality of reduction and correct positioning of the implant. Many open or closed techniques have been described to improve the quality of reduction.^[24] In addition, the type-apex distance measured after placement of the proximal screws, as described by Baumgaertner et al.^[25] increases the probability of implant success. In addition, the position of the proximal screws and the quality of the reduction are also important parameters that determine the success of the treatment.^[26] In one of the studies investigating position selection and quality of reduction, Sahin et al.^[7] compared patients operated on in a supine lithotomy position without a traction table with patients operated on using a traction table. They found a poor reduction in 2.9% of 30 patients operated in a supine position with manual traction and 6.7% of 34 patients operated with a traction table and found no difference between the groups in terms of reduction quality. They also found similar clinical results between the groups. Our study included only patients undergoing closed reduction. We aimed to evaluate the adequacy of two different positions in achieving a reduction in closed cases. Accordingly, poor reduction was observed in 4% of operated-SP cases and 5% of operated-TT cases. The reduction quality was similar for the groups. In addition, the fact that there was no difference between the groups in terms of calTAD, another important radiologic parameter, is an important indicator suggesting that the preference for supine position does not increase the possibility of poor reduction and implant failure.

This study has several limitations, including its retrospective design. Additionally, other significant limitations include the lack of evaluation of intraoperative bleeding and fluoroscopy

amounts. Furthermore, the failure to separately evaluate the preparation time from the completion of anesthesia until the incision was made in measuring operative time can also be considered a limitation.

CONCLUSION

There are ongoing efforts to improve clinical and radiologic results, reduce complications, and improve perioperative surgery in the treatment of intertrochanteric femoral fractures with PFNA. In the study in which we compared the cases we operated with manual traction in the supine position without a traction table and the IFF cases we operated with a traction table, we concluded that although the radiologic and clinical results were similar between the groups, the advantage of the operated-SP group was the shorter operation time.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Umraniye Training and Research Hospital Clinical Researches Ethics Committee (Date: 24.04.2023, Decision No: 136).

Informed Consent: The data were obtained retrospectively from electronic medical records.

Referee Evaluation Process: Externally peer-reviewed.

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