

## FEMUR INTRAMEDÜLLER ÇIVILEME: SUPIN VE LATERAL DEKÜBIT POZİSYONDA MANUEL TRAKSIYONUN KARŞILAŞTIRILMASI

### FEMORAL INTRAMEDULLARY NAILING: COMPARISON OF MANUAL TRACTION IN SUPINE AND LATERAL DECUBITUS POSITION

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**Anahtar Sözcükler:** Supin pozisyon, lateral dekubit pozisyon, femur kırığı, manuel traction

**Keywords:** Supin Position, lateral decubitus position, femur fracture, manual traction

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### ÖZ

**Giriş:** Bu çalışmanın amacı supin veya lateral dekubit pozisyonda manuel traksiyon kullanılarak antegrade intramedüller(im) çivi uygulanan hastaları operasyon zamanı, komplikasyon ve fonksiyonel açıdan karşılaştırmaktır.

**Gereç ve Yöntem:** Çalışmaya; AO/ASIF Type 32 izole femur kırığı ,takip süresi en az bir yıl olan antegrade im çivi uygulanan tüm yaş grubundaki hastalar dahil edildi.Hastalar iki gruba ayrıldı.Grup 1 supin pozisyonda işin geçiren masada elle traksiyon uygulanarak opere edilen hastalardan,Grup 2 ise lateral dekubit pozisyonda standart cerrahi masada elle traksiyon uygulanarak opere edilen hastalardan oluşturuldu.Dahil edilme kriterlerine uyan 124 hasta çalışmaya dahil edildi.Hastaların hastanede kalma süreleri, operasyon süreleri, operasyon esnasında kanama miktarları, insizyonun büyülüğu, kaynama zamanları ve komplikasyonlar kayıt edildi. Hastalara son kontrolde bacak uzunluk grafisi çekilerek her iki ekstremité arasındaki uzunluk farkı kayıt edildi.

**Bulgular:** Hastaların operasyon sürelerine baktığımızda lateral dekubit pozisyonda, supin pozisyonuna kıyasla operasyonun daha kısa sürdüğü görüldü. Hastanede kalma süreleri, operasyon esnasında kanama miktarı, insizyon büyülüğu açısından gruplar arasında fark bulunmadı. Postoperatif takip süreleri ve kaynama zamanı benzer olarak bulundu

**Sonuç:** Sonuç olarak manuel traksiyon hem supin hem de lateral dekubit pozisyonda güvenle kullanılabilir. Lateral dekubit pozisyon giriş yerine kolay ulaşım sağlama ve proksimal yakını kırıklarda proksimal parçaya daha hakim olmaya imkan sağlama açısından operasyon süresini kısaltmayı sağlamaktadır.

### SUMMARY

**Introduction:**The aim of this study was to compare patients who underwent IM-nailing using manual traction in the supine or lateral decubitus position, in terms of surgical times, complications and function.

**Materials and methods:**Patients in all age groups who were diagnosed with AO / ASIF Type 32 isolated femoral shaft fracture with antegrade im nails and a follow-up period of at least one year were included in the study. Patients were divided into two groups; Group 1 comprised patients operated on by manual traction, on the

*radiolucent fracture table in the supine position. Group 2 comprised patients operated on by manual traction on the standard surgical table, in the lateral decubitus position. 124 patients who met the inclusion criteria were included. Hospital stay, surgery times and bleeding rates during surgery, incision size, union times and complications were all recorded. At the last control, x ray was taken to assess limb length discrepancy.*

**Results:** *Surgery times were shorter in the lateral decubitus position (Group 2) when compared to the supine position (Group 1). No differences between groups were observed in terms of hospital stay, bleeding levels during surgery and incision size. Postoperative follow-up and union times were similar for both groups.*

**Conclusion:** *Manual traction can be safely used in both the supine and lateral decubitus positions. Lateral decubitus position generates shorter surgery times, and provides easy access to the entrance, allowing more control of the proximal part of femur fractures.*

## INTRODUCTION

Antegrade carved static locked intramedullary (IM)-nailing is the preferred standard treatment for fastened femoral shaft fractures because it provides stable fixation and facilitates improved patient care and mobilisation(1). However, there is no current consensus regarding the surgical table and patient position when applying the nail (2).

The traction table can perform fixation without assistance, but is restrictive for obese and multiple trauma patients(3). In addition, problems such as pudendal nerve damage, erectile dysfunction and perineal skin lesions may be encountered due to traction table use (4-6). While a femoral distractor on a radiolucent table can be used as an alternative to the traction table, with similar clinical results and reduced complications, however operating times are longer(7).

Manual nailing under manual traction is a preferred method, especially in clinics where no traction tables are available (6,7). Manual traction reduces surgery times when compared to femoral distractor or traction table use(8). As supine or lateral decubitus position can also be applied according to surgeon preference. Patients with a femoral fracture often have multi-trauma, anaesthesiologists previously believed that working on such patients in the lateral position, increased intensive care due to decreased respiratory functions and prolonged intubation times, however lateral decubitus positioning has been shown to decrease intensive care requirements and ventilator duration (9).

The aim of this study was to compare patients who underwent IM-nailing using manual traction

in the supine or lateral decubitus position, in terms of surgical times, complications and function.

## MATERIALS AND METHODS

After protocol approval from our hospital ethics committee, patients with a femoral shaft fracture having undergone antegrade nailing in our clinic, were retrospectively analysed between January 2012 and January 2018. All participants provided written informed consent approved by the Hospital Human Research Ethics Committee.

Patients in all age groups who were diagnosed with AO / ASIF Type 32 isolated femoral shaft fracture with antegrade im nails and a follow-up period of at least one year were included in the study. Patients with pathological fractures, concomitant ipsilateral or contralateral tibia or femur fractures, and under one year follow-up were excluded.

Patients were divided into two groups; Group 1 comprised patients operated on by manual traction, on the radiolucent fracture table in the supine position. Group 2 comprised patients operated on by manual traction on the standard surgical table, in the lateral decubitus position.

## Surgical procedures

Antegrade nailing was applied to patients in Group 1, accompanied by scopy and supine positioning on the radiolucent fracture table. For easier access, a 30 cm sandbag was placed under the affected hip. Traction was manually provided by an assistant. The entire leg was prepared and included in the sterile field. After

entering the priform from the fossa, the fracture was reduced by manipulating longitudinal traction with the help of an assistant. In cases where fracture reduction was difficult, a small nail was placed in the proximal fragment, and used as a joystick to generate reduction. Rotation was compared with the opposite leg, as described by Krettek *et al* by the relationship between trochanter minor and patella (10). After reamiring of suitable length and thickness, im nail were placed into the femur, the system was fixed in place with two locking screws from the level of the trochanter minor, and two from the distal femur.

Patients in Group 2 were placed on the operating table in the lateral decubitus position. A beanbag placed below the patient and patient safely turned to a lateral position. Reduction of the fracture was provided by manuel longitudinal traction. The quality of the reduction was confirmed using an image intensifier positioned in a lateral mode to take images for both anteroposterior and lateral views. The im nail was inserted after a classical 4 cm entry incision 4 to 5 cm proximal to the trochanteric tip. After nail insertion the same steps were followed as for patients in the supine position group. In both groups, nails were statically locked.

All patients were administered 2 g cefazolin before and after surgery. Surgical prophylaxis was also performed. In addition, 0.4mL low molecular weight heparin was also applied, starting from the first day of hospitalisation, until the 14<sup>th</sup> day after surgery. After surgery, active

contraction exercises were commenced as ankle dorsiflexion plantar flexion and isometric quaudricep contraction. The next day, hip and knee passive joint movement exercises were also started. Patients were radiographed every four weeks until postoperative union was achieved. Hospital stay, surgerytimes and bleeding rates during surgery,incision size, union times and complications were all recorded. At the last control, x ray was taken to assess limb length discrepancy.

### Statistical analysis

Dara were analyzed using Pearson Chi-Sqaure and Wilcoxon test. For akk tests, P values <0.05 were considered to be significant. Statistical analysis was performed using the SPSS statistical package, version 22.0 for Windows.

## RESULTS

124 patients (38 women (30%) and 64 men (70%) who met the inclusion criteria were included. In Group 1, there were 64 patients and in Group 2, 60 patients. No differences were observed between the groups in terms of demographic characteristics and fracture types (Table 1).

Surgery times were shorter in the lateral decubitus position (Group 2) when compared to the supine position (Group 1). No differences between groups were observed in terms of hospital stay, bleeding levels during surgeryand incision size. Postoperative follow-up and union times were similar for both groups (Table 2).

**Table 1.** Baseline charecteristics in the lateral decubitis and supine position

		Grup 1 n(%)	Grup 2 n(%)	P
Sex	Female	20(31,3)	18(30)	0,880
	Male	44(68,8)	42(70)	
Age (year)		41,4	37,9	0,333
Fracture side	Left	31(48,4)	31(51,7)	0,719
	Right	33(51,6)	29(48,3)	
AO/OTA Fracture Type	A1	7(10,9)	4(6,7)	0,280
	A2	11(17,2)	15(25)	
	A3	15(23,4)	16(26,7)	
	B1	5(7,8)	8(13,3)	
	B2	5(7,8)	9(15)	
	B3	7(10,9)	4(6,7)	
	C1	9(14,1)	2(3,3)	
	C2	2(3,1)	1(1,7)	
	C3	3(4,7)	1(1,7)	

(Summary: A – Simple; A1 - Spiral, A2 - Oblique, angle > 30degrees, A3 - Transverse, angle < 30 degrees, B – Wedge; B1 - Spiral wedge, B2 - Bending wedge, B3 - Fragmented wedge, C – Complex; C1 – Spiral, C2 – Segmental, C3 – Irregular)

**Table 2.** Comparison of scores in the lateral decubitus position and supine position groups after treatment

	Grup 1 Ort.	Grup 2 Ort.	P
Operation time (min)	93,5±34,4	72,1±24	0,003
Hospital stay (days)	8±2,3	10,2±3,8	0,310
Blood loss (mL)	159±26	191±33	0,350
Length of incision (cm)	8,2±1,7	6,3±1,2	0,260
Day of operation (day)	4,2±6,1	4,9±2,2	0,410
Follow-up time (month)	36,1±27	29,5±12,9	0,100
Union time (month)	6,5±2,1	7,4±3,2	0,560
Limb-lengthdiscrepancy (mm)	-1,2±0,4	+1,8±0,7	0,320

**Table 3.** Complications

	Group 1	Group 2	Total
DVT(Deep Vein Thrombosis)	2	1	3
Pulmonary Embolism	1	1	2
Superficial wound infection	3	4	7
Nonunion	2	1	3

Union was achieved in all patients except three (3.7%) cases. In Group 1, seven cases underwent dynamisation due to delayed union, at an average of  $10,2 \pm 2,1$  weeks. Five cases had full union, while one case developed non-union. In Group 2, dynamisation was applied to 10 cases due to delayed union, at an average of  $11,3 \pm 2,2$  weeks. Non-union developed in one case, and union occurred in other two cases. Nail replacement and grafting were applied to patients who did not have union. For length differences between extremities, we observed no statistically significant differences between groups.

In terms of complications, deep vein thrombosis (DVT) occurred in three (3.7%) patients, pulmonary embolism in two (2.4%), and superficial wound infection occurred in seven (8.6%). Patients who developed superficial infections were treated with intravenous antibiotic therapy. We observed no statistically significant differences between groups in terms of complications.

## DISCUSSION

We compared the nailing method in two different positions, in patients with femur shaft fractures. Surgery were shorter in the lateral decubitus position, while no differences were noted in terms of union time, functional scores, limb length discrepancy and complications. Although antegrade nailing is the gold standard treatment for femoral shaft fractures, there is no consensus

regarding the surgical table and patient position while performing this procedure(2). Several factors influence position choice; the fracture type, patient features, accompanying injuries, hospital resources, available assistants, and surgeon preference and experience. Each factor has its advantages and disadvantages.

For antegrade femur IM-nail applications, the traction table is frequently used in the supine position. The table fixes the injured limb by applying a mechanical traction during surgery. This technique is effective in providing length, but if anatomical reference points are not considered, the most common difficulty during surgery is femoral rotation evaluation (11). Traction table leads to complications such as perineal nerve palsy, erectile dysfunction, pudendal nerve palsy, ipsilateral leg compartment syndrome, contralateral thigh life-threatening inferior epigastric artery injury, perineal peeling and crush syndrome (12-17). While these complications are uncommon, they are serious and importantly, they are avoidable. No complication other than superficial infection, dvt and pulmonary embolism was observed in both groups. Also, as these tables are expensive, they are not routinely found in all hospitals.

According to the literature, lateral decubitus positioning for IM-nailinghas been in use for 30 years(15-17). Technical advantages include ease of reaching the nail entry point, especially in obese patients, and preventing the proximal fragment from positioning incorrectly in the siyon

exion and abduction position, in proximal fractures (4). In the lateral decubitus position, the patient can be accessed from both sides, while in the supine position on the traction table, there is unilateral access to the surgical field (4). We believe that surgery times in the lateral decubitus position are shorter for these reasons. The lateral decubitus position is a versatile surgical approach that allows the treatment of proximal femur fractures close to the hip joint (4).

Using a traction table in the supine position does not require long installation times, and complications arising due to traction are prevented (2). Since the foot is not in a boat, the whole leg is in a sterile area, and when necessary, the leg is positioned and all fragments can be manipulated as desired. However, an assistant is required during surgery to assist with traction (2).

Several studies have compared manual traction with the traction table (1-4), but none have compared manual traction in two different positions. In their prospective randomised study comparing manual traction with the traction table, Stephen *et al.* observed that surgeries were

shorter and rotational deformity developed less in patients who underwent manual traction (2).

In terms of complications, manual traction is safer than the traction table (2). In our study, we observed no significant differences in complications in the supine or lateral decubitus position.

According to the literature, non-union rates after IM-nailing have been reported at 0.9%–4.1% for femoral shaft fractures(17). In our study, non-union rates were 3.7%. We observed that supine or lateral decubitus positions did not change non-union rates; they were similar in both groups.

Our study had limitations; it was retrospective in nature, computerised tomography was not evaluated, rotational deformity was not evaluated.

Manual traction can be safely used in both the supine and lateral decubitus positions. Lateral decubitus position generates shorter surgery times, and provides easy access to the entrance, allowing more control of the proximal part of femur fractures.

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