



## Retrospective Comparison of Talon or Conventional Locking Nailing for Tibial Shaft Fractures

Tibia Gövde Kırıklarında Talon ve Geleneksel Kilitli Çivilemenin Retrospektif Karşılaştırması

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### Abstract

**Objective:** Tibial shaft fractures are common orthopedic injuries that present challenges in treatment selection. The primary aim of this retrospective study was to compare the clinical outcomes of tibial shaft fractures treated with Talon and conventional locking nails.

**Materials and Methods:** Ninety-four patients who underwent tibial intramedullary nailing between 2019 and 2021 were included in the study. The patients were divided into two groups based on the type of distal locking used: Group 1 received conventional screw locking, and Group 2 received Talon locking. Patient age, gender, trauma mechanism, fracture type, and surgery data were analyzed. The complications and bone union processes during follow-up were evaluated and compared between the two nail designs.

**Results:** The age and gender of the patients included in the study were statistically similar in both groups. Furthermore, the Talon group demonstrated significantly shorter union times ( $p < 0.001$ ). According to the OTA classification, there was a preference for screw-locking systems in more complex fractures ( $p = 0.017$ ).

**Conclusion:** The results of this retrospective study suggest that Talon locking nails may offer advantages over conventional screw locking, especially in younger patients, resulting in earlier bone union. Further research is needed to investigate Talon nails' biomechanical stability and suitability for specific fracture types.

**Keywords:** Tibial Shaft Fractures, Locking Nails, Talon Nail, Conventional Locking Nail.

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### Öz

**Amaç:** Tibia gövde kırıkları, ortopedik tedavilerde yaygın ve zorlayıcı yaralanmalardır. Bu retrospektif çalışma, Talon ve geleneksel vida kilitleme çivileriyle tedavi edilen hastaların klinik sonuçlarını karşılaştırmayı hedeflemektedir.

**Gereç ve Yöntemler:** 2019-2021 yılları arasında tibia shaft kırığı nedeniyle intramedüller çivi operasyonu geçiren 94 hasta bu çalışmaya dâhil edildi. Hastalar, uygulanan distal kilitleme yöntemine göre iki gruba ayrıldı: Birinci grup geleneksel vida, ikinci grup ise Talon kilitleme yöntemi ile ameliyat edilen hastalar olarak belirlendi. Hastaların yaş, cinsiyet, travma mekanizması, kırık tipi ve cerrahi bilgileri incelendi. İyileşme sürecindeki komplikasyonlar ve kemik birleşme durumları her iki çivi tasarımı için değerlendirildi.

**Bulgular:** Çalışmaya alınan hastaların yaş ve cinsiyetleri her iki grupta da istatistiksel olarak benzerdi. Talon grubunda anlamlı derecede daha kısa kaynama süresi gözlemlendi ( $p < 0.001$ ). OTA sınıflandırmasına göre daha karmaşık kırıklarda vida kilitleme sistemlerinin daha sık tercih edildiği gözlemlendi ( $p=0.017$ ).

**Sonuç:** Özellikle genç hastalarda, Talon kilitleme çivilerinin geleneksel vida kilitlemeye göre bazı avantajlar sunduğu ve daha hızlı kırık kaynamasına katkıda bulunduğu gözlemlenmiştir. Talon çivilerinin biyomekanik stabilitesi ve özel kırık tiplerine uygunluğu üzerine daha fazla araştırma yapılması önerilmektedir.

**Anahtar Kelimeler:** Tibia Shaft Kırığı, Kilitli Çivi, Talon Çivi, Geleneksel Kilitli Çivi.

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## Introduction

Tibial shaft fractures are common injuries that pose significant challenges in orthopedic practice. The choice of fixation method plays a crucial role in achieving optimal outcomes for these fractures. In recent years, there has been growing interest in locking nails for tibial shaft fractures due to their biomechanical advantages and potential clinical benefits. The conventional locking nail technique has been widely utilized to treat tibial shaft fractures (1, 2). This technique involves using a non-locking nail with interlocking screws placed proximally and distally to provide stability. While this method has shown satisfactory outcomes in many cases, concerns have been raised regarding the risk of screw backout, rotational instability, and delayed fracture healing (3). The Talon nail, a newer generation locking nail system, has been introduced in response to these concerns. Despite the growing popularity of the Talon nail, limited comparative studies have been conducted to evaluate its efficacy and compare it with conventional locking nails. Therefore, this retrospective study aims to fill this knowledge gap by retrospectively comparing the clinical outcomes of tibial shaft fractures treated with either the Talon nail or conventional locking nails.

## Materials and Methods

This study was conducted in accordance with the Declaration of Helsinki and received approval by the Clinical Researches Ethics Committee of Mersin University on May 8, 2023 (approval no: 215040260). We retrospectively analyzed 94 patients (81 males and 13 females) who underwent tibial intramedullary nailing for tibial shaft fractures between 2019 and 2021. The study included patients aged 18 and older who required surgical intervention with an intramedullary nail for tibial shaft fractures. Exclusion criteria were previous fractures at the same site, segmental tibial fractures, metabolic bone diseases, or prior surgeries on the affected limb.

The minimum follow-up period was 12 months, allowing for adequate assessment of post-surgical outcomes and long-term bone union. Surgeries were carried out by multiple surgeons with comparable levels of expertise, all adhering to the center's standardized surgical protocols to minimize variability in the outcomes. Patients were divided into two groups based on the distal locking method used: Group 1 received conventional screw locking, while Group 2 underwent Talon-locking.

Data on participants' age, gender, trauma mechanism, fracture type, and surgical details were collected. We also monitored complications and the bone union process during follow-up. Statistical analyses were performed using SPSS for Windows 25.0 (Armonk, NY: IBM Corp.). We used the Kolmogorov-Smirnov/Shapiro-Wilk tests to assess the normality of continuous variable distributions, with p-values above 0.05 indicating normal distribution. Descriptive statistics were presented as means, standard deviations, medians with ranges for quantitative variables, and frequencies and percentages for qualitative variables. The Mann-Whitney U test was utilized for quantitative comparisons and the chi-square test for qualitative data, with a significance threshold set at  $p < 0.05$ . Radiological images of tibial shaft fractures treated with conventional and Talon-locking nails were reviewed to support the comparative analysis (Figure 1).

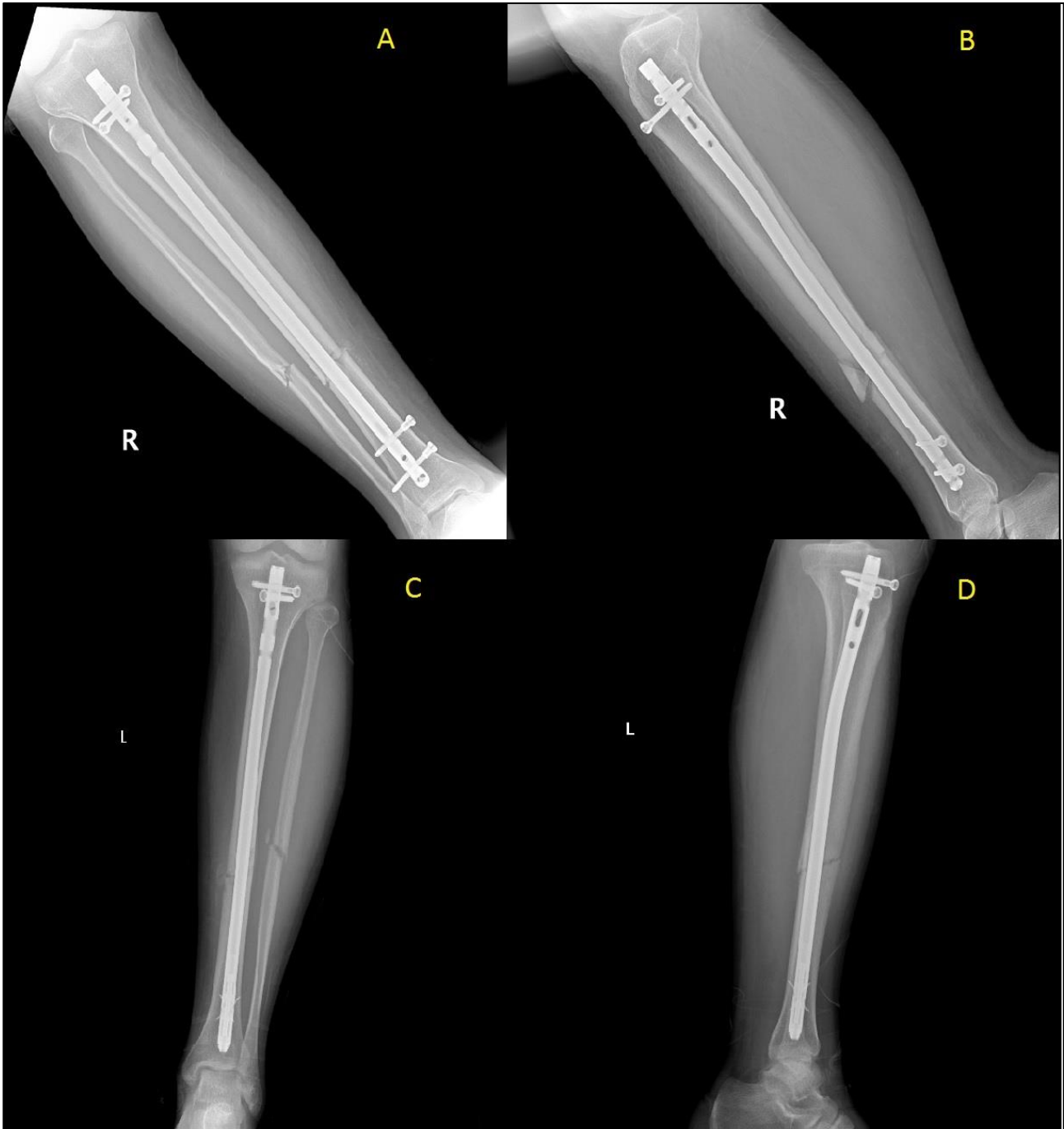
## Results

A total of 94 patients were analyzed. Group 1 included 56 male patients, while Group 2 included 25 male patients. The average age was 34 years in Group 1 and 32 years in Group 2. There was no statistically significant difference in smoking habits between the groups.

The distribution of trauma mechanisms was similar between the groups, with falls from height, motorcycle accidents, and non-vehicular traffic accidents being equally represented. The incidence of open fractures was 30.3% in Group 1 and 20% in Group 2 ( $p = 0.368$ ).

Reduction types varied significantly between the groups. All patients in Group 2 underwent closed reductions, while in Group 1, 60.6% of patients underwent open reductions ( $p < 0.001$ ).

Alignment outcomes showed normal alignment in 87.9% of patients in Group 1 and 100% in Group 2 ( $p = 0.108$ ). Complications were observed in Group 1, including screw breakage (6.1%) and pseudoarthrosis (3%), while no complications were reported in Group 2 ( $p = 0.376$ ).



A) AP radiograph of the patient with conventional screw locking, B) Lateral radiograph of the patient with conventional screw locking, C) AP radiograph of the patient with talon distal locking, D) Lateral radiograph of the patient with talon distal locking

**Figure 1.** Patient X-rays operated with Talon and conventional locking nails

Healing times indicated a faster recovery for Group 2, with 70% achieving bone union by 3 months, compared to 18.2% in Group 1 within the same timeframe ( $p < 0.001$ ).

The AO classification showed different preferences for the treatment methods, with the screw-locking system being used more frequently for managing more complex fractures.

A retrospective analysis was conducted on 94 patients. In Group 1, there were 56 male patients, while Group 2 consisted of 25 male patients, indicating a predominance of male gender in both groups. The average age was 34 years in Group 1 and 32 years in Group 2, with similar age distributions across the groups. No

statistically significant difference was found in smoking habits between the groups. The mechanisms of trauma, including falls from height, motorcycle accidents, and non-vehicular traffic accidents, were similarly distributed between the groups. Table 1 summarizes the general characteristics of the patients.

**Table 1**

General Characteristics of Patients

	Locking Screw	Talon	p-value
Age, Median (min-max)	34 (17-58)	32 (18-58)	0.345
Gender, n (%)			0.417
Female	10 (15.2%)	3 (10.7%)	
Male	56 (84.8%)	25 (89.3%)	
Smoking habits, n (%)			0.258
No	22 (33.3%)	12 (42.9%)	
Yes	44 (66.7%)	16 (57.1%)	
Trauma type, n (%)			0.703
Fall down	22 (33.3%)	9 (32.1%)	
Motorcycle accident	22 (33.3%)	8 (28.6%)	
Pedestrian vehicle accident	22 (33.3%)	11 (39.3%)	

n: Number of Individuals. For statistical comparison, The chi-square test was used

The incidence of open fractures did not significantly differ between the groups, with 30.3% in Group 1 and 20% in Group 2 ( $p=0.368$ ). Reduction type varied significantly; all patients in Group 2 underwent closed reductions, in contrast to Group 1, where 60.6% underwent open reductions ( $p<0.001$ ).

Regarding alignment and complications, both groups reported high rates of normal alignment, 87.9% in Group 1 and 100% in Group 2, though this difference was not statistically significant ( $p=0.108$ ). Group 1 experienced some complications, such as screw breakage (6.1%) and pseudoarthrosis (3%), whereas Group 2 reported no complications, but these differences were not statistically significant ( $p=0.376$ ). Additional pathologies and trauma causes were similar across groups, with no significant differences observed in the presence of additional injuries or the causes of trauma.

Healing times indicated a faster recovery for Group 2, with 70% achieving bone union by 3 months, compared to 18.2% in Group 1 within the same timeframe ( $p<0.001$ ).

The AO classification showed different preferences for the treatment methods, with the screw-locking system being used more frequently for managing more complex fractures.

Table 2 shows the comparison of the fractures and the findings between the groups after treatment.

**Table 2**

Comparative Analysis of Fracture Types and Treatment Outcomes Between Groups

	Locking Screw	Talon	p-value
OTA Classification (n%)			0.017
42a	26 (39.4%)	20 (71.4%)	
42b	28 (42.4%)	5 (17.9%)	
42c	12 (18.2%)	3 (10.7%)	
Trauma type (n%)			0.703
Fall down	22 (33.3%)	9 (32.1%)	
Motorcycle accident	22 (33.3%)	8 (28.6%)	
Pedestrian vehicle accident	22 (33.3%)	11 (39.3%)	
Open Fracture (n%)			0.269
No	46 (69.7%)	22 (78.6%)	
Yes	20 (30.3%)	6 (21.4%)	
Union time (months)			< 0.001*
Median (min-max)	5 (2-11)	3 (3-5)	
Alignment (n%)			
Normal	58 (87.9%)	28 (100%)	0.052
Valgus	8 (12.1%)	-	
Varus	-	-	
Other Trauma (n%)			
None			
2 Fracture	46 (69.7%)	17 (60.7%)	
3 Fracture	14 (21.2%)	6 (21.4%)	0.257
Head Trauma	2 (3%)	2 (7.1%)	
	4 (6.1%)	3 (10.7%)	

n: Number of Individuals. For statistical comparison, The chi-square test and \*Mann-Whitney U test were used

## Discussion

The patients who participated in our study were similar in age, gender, smoking, and fracture type, which may be related to fracture union. Additionally, our study corroborates previous literature, showing male dominance in both the Screw and Talon groups (4-6).

The most intriguing finding of our study is the significantly earlier union time observed in the Talon group. While the younger age of our study population may contribute to an expectation of earlier union regardless of the treatment type, it is noteworthy that this result contradicts some published data. For instance, Tekin et al. (4) reported earlier union in the Screw locking group compared to the Talon locking group. Similarly, Yalkın et al. (5) found longer union times in the Talon group. A study on Talon and conventional screw-locking nails in femur fractures also reported longer union time in the Talon group (6). However, with its younger patient population, our study demonstrated a shorter union time in the Talon group compared to conventional screw locking, which the age factor could explain.

Moreover, according to the OTA classification, we observed a preference for screw-locking systems in more complex fractures. In our study, eight patients in the screw-locking system group exhibited valgus malalignment, while no malalignment was observed in any patient in the Talon group. This discrepancy is likely due to the variation in fracture classes between the two groups.

Limitations of the study:

- Retrospective design
- Lack of randomization
- Single-center study
- Heterogeneity of fractures
- Limited follow-up duration
- Lack of biomechanical data
- Lack of control group

## Conclusion

In the surgical treatment of tibial shaft fractures, intramedullary nails equipped with Talon distal locking have demonstrated advantages over conventional screw locking nails, including shorter healing times and lower complication rates. Further biomechanical studies and randomized prospective trials are essential to deepen our understanding of these outcomes. Such research will provide more definitive evidence on the efficacy of Talon locking systems, potentially leading to optimized treatment protocols for these common injuries.

**Ethics Committee Approval:** Approval was granted by the Clinical Researches Ethics Committee of Mersin University (date: 08.05.2023 and approval number: 215040260).

**Informed Consent:** Consent was not obtained as it was a retrospective study.

**Conflict of Interest:** Authors declared no conflict of interest.

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