

Comparative Analysis of Complication Rates in Tibiotalocalcaneal Fusion for Osteoarthritis vs. Traumatic Fractures

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INTRODUCTION: Among the vast array of ankle arthrodesis options, tibiotalocalcaneal (TTC) arthrodesis with an intramedullary nail, commonly referred to as TTC nailing, has emerged as a valuable option, particularly for frail patients with unstable fractures and significant comorbidities such as osteoporosis, chronic kidney disease, and diabetes. The primary benefit of TTC nailing lies in its ability to provide immediate weight-bearing post-surgery, which is especially beneficial for osteoarthritic patients requiring joint immobilization as a last resort treatment for chronic pain relief. Although TTC nailing provides a viable option for osteoarthritis, the use of TTC nailing in traumatic fractures raises concerns due to a potentially elevated risk of postoperative complications compared to its application in osteoarthritis-related joint immobilization. This study aims to assess and compare the risks associated with TTC nailing in osteoarthritis (OA) and traumatic fracture (TF) cases, highlighting the unique challenges and risk profiles presented by each patient group. Understanding these distinctions is essential for optimizing patient outcomes and tailoring perioperative care strategies in high-risk populations.

METHODS: A retrospective analysis was conducted using the Healthcare Cost and Utilization Project Nationwide Readmissions Database (HCUP NRD) from 2016-2021. A total of 1,396 cases undergoing TTC nailing were identified and divided into two cohorts: osteoarthritis (OA, n=934) and traumatic fracture (TF, n=462). Patient demographics, length of stay (LOS), and complication rates—including wound dehiscence, thromboembolism, cellulitis, infection, implant-related issues, pseudoarthrosis, and malunion—were analyzed. Statistical analyses were performed using SPSS, with T-tests employed for continuous variables and Z-tests for proportions to determine significance.

RESULTS: The mean age was 62.15 years (SD=12.1) for the OA group and 63.44 years (SD=15.1) for the TF group. LOS was significantly longer in the TF cohort (8.88 days) than in OA cases (3.7 days, $p<0.001$). The TF group also demonstrated a markedly higher rate of complications (39.8% vs. 15% in OA, $p<0.001$), with increased occurrences of wound dehiscence (1.5% vs. 0.1%), cellulitis (5.4% vs. 0.9%), and implant-related complications (5.8% vs. 2%, all $p<0.001$). Malunion rates were notably elevated in TF cases (11.3%) compared to OA (1.7%, $p<0.001$). Results are summarized in Table 1.

CONCLUSION: The findings underscore that TTC nailing, while advantageous for immediate weight-bearing and joint immobilization in arthritic patients, presents a significantly increased risk of complications when applied to traumatic fractures. Patients in the TF cohort demonstrated substantially higher rates of infection, implant-related issues, and malunion, underscoring the need for targeted perioperative strategies to reduce these risks. The significantly higher complication rates in TTC nailing for traumatic fractures (TF) compared to osteoarthritis (OA) cases highlight the impact of trauma-related soft tissue damage and an amplified inflammatory response. These findings suggest that immediate or early surgical intervention may not provide sufficient time for tissue recovery, contributing to complications like infection, cellulitis, and malunion. This raises the question of whether delaying TTC nailing until after initial swelling and inflammation have subsided could improve outcomes. Maintaining patients non-weight-bearing during the early post-injury phase might further support tissue recovery and reduce complication risks. Future studies should investigate the optimal timing for surgery in TF cases, balancing the need for stabilization with tissue healing. Incorporating adjunctive measures, such as local vancomycin powder for infection control, may further reduce infection and improve patient outcomes. A comprehensive approach that includes optimal timing and supportive perioperative strategies could be key to minimizing risks and improving the success of TTC nailing in trauma patients.

CLINICAL SIGNIFICANCE: This study provides essential insights into the risk profiles of TTC nailing in OA versus TF cases, supporting the need for adjunctive measures and enhanced clinical guidelines to optimize patient outcomes and reduce post-operative complications in trauma-related applications.

Table 1. Demographic Characteristics and Complication Rates by Indication for TTC Arthrodesis

Characteristics	Osteoarthritis (OA) (n = 934) ^a	Traumatic Fracture (TF) (n = 462) ^a	p value (two-tailed)
Age (years)	62.15 (12.097)	63.44 (15.052)	
Gender			
Male	519 (55.57)	195 (42.21)	
Female	415 (44.43)	267 (57.79)	
Length of Stay (days)	3.7	8.88	<0.001 ^b
Any Complication	140 (15)	184 (39.8)	<0.001 ^c
Wound Dehiscence	1 (0.1)	7 (1.5)	<0.001 ^c
Thromboembolism	0	1 (0.2)	0.171 ^c
Cellulitis	9 (0.9)	25 (5.4)	<0.001 ^c
Infectious	2 (0.2)	7 (1.5)	0.004 ^c
Implant-related complication	19 (2)	27 (5.8)	<0.001 ^c
Pseudoarthrosis	93 (10)	65 (14.1)	0.023 ^c
Malunion	16 (1.7)	52 (11.3)	<0.001 ^c

^aMean (standard deviation) or n (% of total in OA/TF)

^bT-test for equality of means

^cZ-Test for proportions