

**Role of the Fibula in Predicting Tibial Nonunions After Intramedullary Nailing**

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**Purpose:** The role of a co-existing fibula fracture in early prediction of tibial nonunion has been poorly studied to this point. Data has suggested that fibula healing may be related to tibia healing, but it has also been hypothesized that an intact, fixed, or healed fibula may reduce compressive loads on the tibia leading to nonunion. The purpose of this study was to examine the relationship between fibula fracture characteristics and healing status on tibial nonunion.

**Method:** A retrospective analysis was performed on 181 tibia fractures treated with intramedullary nailing from 2006-2013. Baseline data included the presence of an open fracture, compartment syndrome, location of the fibula fracture, relationship of the fibula fracture to the tibia fracture, fibula fracture pattern, and fibula fixation. Tibia and fibula healing was scored with the RUST and RUSf (Radiographic Union Score for Fibula), respectively, for each follow-up radiograph. Statistical analysis was utilized to determine the association of all predictive variables with tibial nonunion, defined as undergoing nonunion repair at any follow-up time point.

**Results:** The average age was 43.3 years, 46% were open fractures, and 7% were associated with compartment syndrome. Closed fractures were associated with a lower tibial nonunion rate compared to open fractures (10.2% vs 24.1%, p=0.01). At both the 3-month and 6-month time points, higher RUST and RUSf score means were seen in patients that did not develop tibial nonunion. A positive correlation was seen between RUSf and RUST scores at all follow-up time points (r=0.51, p<0.01). Intact fibulae (5.6% vs 17.8%), spiral fibula fractures (9.1% vs 20.0%), proximal fibula fractures vs middle and distal (5.1% vs 23.4% and 20.8), and fibula fractures at a different level from the tibia fracture (9.3% vs 20.8%) trended toward a lower nonunion rate but were not statistically significant (p>0.05). No relationship was seen between fibula fixation and tibial nonunion (17.6% vs 17.4%, p>0.05). Compartment syndrome also exhibited a non-significant trend toward increased tibial nonunion (33.3% vs 15.4%, p=0.11).

**Conclusion:** Increased fibula healing was associated with higher RUST scores and lower rates of tibial nonunion. Although not statistically significant, the observed trend toward lower tibial nonunion rates for intact fibulae, spiral fibula fractures, proximal fibula fractures, and fibula fractures at a different level from the tibia fracture may warrant additional investigation.

Table 1: Means of RUST and RUSf at 3 and 6 months, with p values of associated rank sum testing

	Tibia Nonunion	Tibia Union	p-value (Mann-Whitney U)
<b>3-Months</b>			
RUST	5.9	6.9	0.04
RUSf	6.1	6.9	0.04
<b>6-Months</b>			
RUST	6.4	9.0	<0.01
RUSf	7.9	9.1	0.17

The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device he or she wishes to use in clinical practice.