

## Dynamic Screw Configuration and Fibular Osteotomy Decrease Healing Time in Tibia Nonunion Exchange Nailing

Bryan Abadie, BA<sup>1</sup>; Daniel Leas, MD<sup>2</sup>; Lisa Cannada, MD<sup>3</sup>; Peter Malm, BS, MS<sup>3</sup>; Michael Morwood, MD<sup>4</sup>; Cameron Howes, MD<sup>4</sup>; Robert Zura, MD<sup>4</sup>; Kaitlin Healy, MPH<sup>5</sup>; Matthew Avery, MD<sup>5</sup>; **Anna Miller, MD, FACS<sup>1</sup>**;

<sup>1</sup>Wake Forest Baptist Hospital, Winston-Salem, North Carolina, USA;

<sup>2</sup>Carolinas Medical Center, Charlotte, North Carolina, USA;

<sup>3</sup>Saint Louis University, St. Louis, Missouri, USA;

<sup>4</sup>Duke University Medical Center, Durham, North Carolina, USA;

<sup>5</sup>UNC Chapel Hill North Carolina, USA;

**Background/Purpose:** Intramedullary (IM) nailing is the most common method for surgical management of tibial fractures, yet nonunion still occurs in up to 16% of patients. Several studies have shown that reamed tibial exchange nailing is an acceptable technique to manage tibial nonunions. Some IM nails can be locked in a static or dynamic configuration depending on the shape of the screw hole. By placing the proximal screws in a dynamic configuration, fracture impaction may be possible while still controlling rotation and limiting shortening. In some cases, the fibula may heal prior to the tibia and keep the tibia in a distracted position, necessitating a fibular osteotomy. The study hypothesis is that a dynamic screw configuration will facilitate union faster than a static configuration. Additionally, the use of a fibular osteotomy in conjunction with exchange nailing will also facilitate faster time to union.

**Methods:** A retrospective chart review was conducted at six participating medical centers to identify patients with tibia fractures treated with IM nails that progressed to nonunion. Those who were subsequently treated with an exchange nail procedure that went on to union were included in the study. Patients who qualified for the study were characterized based on the configuration of the screws in their IM nailing procedures and whether they had a fibular osteotomy. The primary outcomes were to analyze time to heal from the date of the exchange nail for the various configurations. Patients who underwent more than one exchange nail procedure were included in the study population, but direct comparisons were only made between patients with one exchange nail procedure.

**Results:** 87 patients were identified, of whom 80 had only one exchange nail procedure. Fractures were classified as open (82%), closed (15%), or unknown (2%). Patients with dynamically locked nails proceeded to union 7 months after revision surgery compared to 8 months for those with statically locked nails. Patients with a fibular osteotomy proceeded to union 2.7 months faster than those without a fibular osteotomy.

**Conclusion:** Patients who had a dynamic screw configuration for exchange nailing had improved time to union compared with static screws. Patients who underwent fibular osteotomy proceeded to union faster than those without an osteotomy.