Sural Nerve Anatomy and Percutaneous Screw Fixation of Fifth Metatarsal Fractures: A Cadaveric Study

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Disclosure

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Our disclosures are in the Final AOFAS Program Book.

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Introduction

- Proximal 5th metatarsal fractures are a common injury seen by orthopedic surgeons.
- Tuberosity avulsion fracture treatment is generally well agreed upon, but intermetatarsal and proximal diaphyseal fractures are a source of debate.
- There has been a movement toward operative intervention in an increasingly large population of patients.

Image 1: radiographs showing a 5th metatarsal fracture.
Background

- Multiple techniques can be found in the literature
- Percutaneous screw fixation has seen a rise in utilization
- Complications related to this technique are reported to be as high as 45%
  - Most common complications are related to sural nerve
- The sural anatomy is well described in anatomic literature, but little orthopedic literature discussed the position of the sural nerve in relation to the skin incision, guidewire and screw placement at the level of the skin and bone.

Image 2: Lateral dissection around guide pin
Materials and Methods

• 20 Fresh Frozen Cadaver Specimens
  – 6.5mm Cannulated screw guide wire inserted under fluoroscopy
    • “High and Inside” position
  – Dissection performed by both authors
    • Location of sural nerve to guide pin at skin entry level and bone entry level documented
    • Digital caliper used to make measurements
Results

• Distance from guide pin to dorsolateral branch of sural nerve at skin entry:
  – 3.8mm (0 - 8.3mm)

• Distance from guide pin to dorsolateral branch of sural nerve at bone entry:
  – 3.8mm (1.4 - 6.2mm)

• Distance from peroneus brevis tendon to guide pin at level of bone insertion:
  – 2.1mm (0 - 6.1mm)

• Distance from lateral band of plantar fascia to the guide pin:
  – 2.4mm (0.5 - 4.3mm)
Discussion

- Operative intervention for 5th metatarsal fractures is becoming increasingly common.
- Previous studies demonstrate similar findings:
  - Donley et al. studied cadavers fixed with a 4.5 mm screw and noted sural nerve branches within 2 mm 50% of the time and 3 mm 80% of the time.\(^{10}\)
  - Johnson et al. studied retrograde drilled guide pins and found the sural nerve to lie within 5 mm 100% of the time.\(^{5}\)
Image 3: Guide pin with dorsolateral branch of sural nerve and peroneus brevis tendon draped over it.
Conclusion

• The dorsolateral branch of the sural nerve lies on average 3.8mm from the entry point of a guide pin through the skin and bone when performing a percutaneous screw fixation of the 5th metatarsal.

• Caution should observed when performing this procedure to reduce the chance of iatrogenic nerve injury.
References