

Safety of Tibia Half Pins For Foot and Ankle Fixation in Patients with Diabetic Neuropathy

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STATEMENT OF PURPOSE

- **Primary aim:** Evaluate the rate of tibia fractures with half pin placement in conjunction with tensioned wires in external fixator use.
- **Secondary aim:** Compare the rates of tibia fractures in those who did and did not employ the “perfect circle” technique for placement of tibial half pins.

LITERATURE

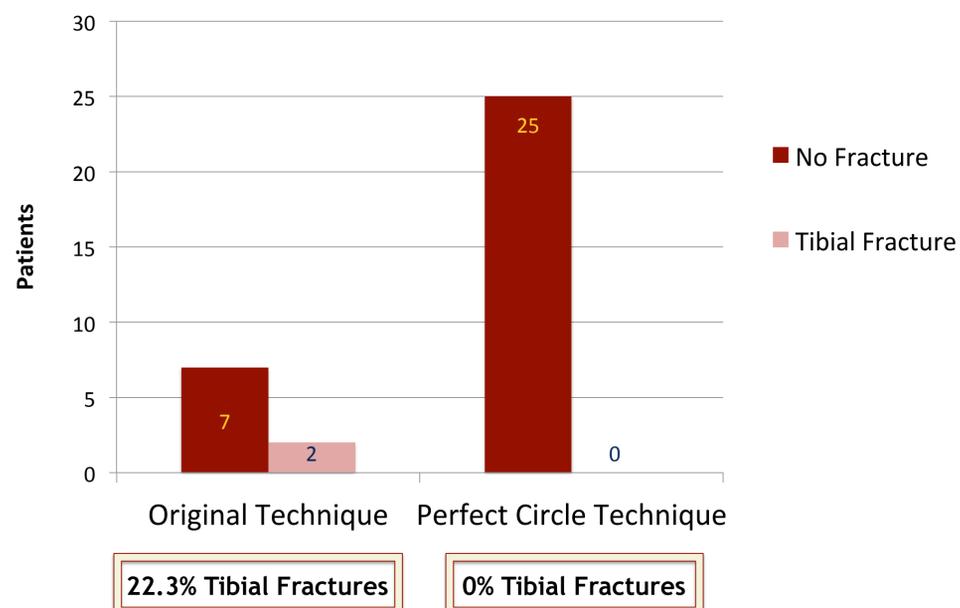
- Tibia fractures are often cited as the primary reason to use solely thin wire fixation with multi-planar static external fixators
- The rate of tibia fractures with use of half pins has been reported as 16.7%, compared to 1.5-4.7% with the use of solely thin wires^{1,2}
- The larger diameter pins have been associated with increased cortical stress and fracture¹
- Hydroxyapatite (HA) coated half pins promote greater stability and are protective against osseous deformation and infection due to the similar modulus of elasticity, osseous incorporation, and tapered design³⁻⁷

METHODOLOGY

- 34 consecutive patients with diabetes underwent foot and ankle osseous reconstruction with use of Ilizarov static external fixator with and hydroxyapatite coated tibial half pins
- Average follow up of 15.9 months
- **LEVEL OF EVIDENCE: IV Retrospective Series**

RESULTS

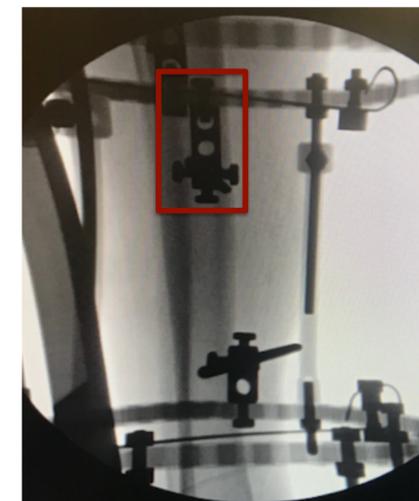
Table 1: Rate of Tibial Fractures in Patients who Perfect Circle Technique Were and Were Not Employed



DEMOGRAPHICS

Variable	Entire Cohort N=34	Perfect Circle Technique Used N=25	Perfect Circle Technique Not Used N=9
Age	57.4 (42-77)	57.2 (42-75)	58 (43-77)
BMI	38.6 (19-67)	40 (19-67)	35 (24-44.7)
HbgA1C	7.2 (5-10.5)	7.3 (6-10.5)	7.2 (5-9.4)
Diabetes	100% (34/34)	100% (25/25)	100% (9/9)
Renal	7.3% (25/34)	84% (21/25)	44.4% (4/9)
ESRD	17.6% (6/34)	24% (6/25)	0% (0/9)
CKD	55.9% (19/34)	60% (15/25)	44.4% (4/9)
HTN	94.1% (32/34)	96% (24/25)	88.9% (8/9)
PAD	55.9% (19/34)	56% (14/25)	55.6% (5/9)
Smoker	44.1% (15/34)	36% (9/25)	66.7% (6/9)
Tibia Fracture	5.88% (2/34)	0% (0/25)	22.2% (2/9)

SURGICAL TECHNIQUE



- The “perfect circle” technique is used under fluoroscopy to safely insert HA coated tibia half pins to avoid pin placement too closely to the cortices. This theoretically reduces the risk of fracturing.
- The rancho cube is attached to the external fixator ring with a bolt, however not tightened to allow for rotation of the rancho cube as needed.
- The anterior, posterior, medial, and lateral cortical borders are visualized through the rancho cube to ensure midline placement of the half pin and adequate bi-cortical bone purchase.

DISCUSSION

- The rate of tibia stress fractures in our study was 5.88% (2/34).
- With the “perfect circle” employed for insertion of the tibia half pin, the rate of tibia fractures was 0% (0/25).
- The perfect circle technique allows for an accurate visual of the cortices of the tibia prior to placement of the half pin and reduces the rate of tibia fractures.
- Despite the use of larger diameter pins (6mm) in the tibia, the proper placement of the pin mitigated the risk of tibia fractures
- This study demonstrates a substantially low rate of tibia stress fracturing with half pins compared to prior literature, and encourages foot and ankle surgeons to utilize the perfect circle technique

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