Tibial Stress Fracture Secondary to Half-Pins in Circular Ring External Fixation for Charcot Foot

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Abstract

Background: There is an increasing trend for surgical correction of the deformity associated with Charcot neuroarthropathy of the foot and ankle (Charcot foot) in order to allow ambulation with commercially available therapeutic footwear. The significant rate of surgical and medical morbidity associated with extensive conventional operative correction has led many surgeons to use limited surgical dissection and stabilization with circular ring external fixation.

Methods: A retrospective chart review was performed on 254 patients at 2 academic medical centers who underwent surgical correction for diabetes-associated Charcot foot deformity with limited soft tissue dissection and stabilization accomplished with a statically applied circular external fixator. Tibial stress fractures developed in 10 of the patients.

Results: Seven of the fractures developed in the 42 patients in whom tibial block fixation was accomplished with half-pins (16.7%), and 3 fractures developed in the 202 patients in whom tibial block fixation was accomplished with tensioned fine wires (1.5%). Three of the tibial stress fractures were successfully treated with extension of the circular frame above the level of the stress fracture. Four fractures were successfully treated with closed intramedullary nailing and 3 with weight-bearing total contact casts. Two tibial fractures occurred through pin sites (all half-pins) in 120 nonneuropathic patients who underwent application of circular ring external fixators during the same 6-year period.

Conclusion: Tibial stress fracture is an unusual complication associated with the use of circular ring external fixation. This investigation highlights the significantly greater risk for the development of this complication in diabetic patients undergoing surgical correction for Charcot foot deformity when half-pins are used for tibial block stabilization, compared with tensioned fine wires. We now recommend the universal use of tensioned fine wires for tibial block fixation when circular ring fixation is performed in patients with Charcot foot arthropathy.

Level of Evidence: Level IV, retrospective case series.
Examples of tibial mounting block
Half-pins (left)       Fine wires (right)
This patient complained of vague pain several months following removal of external fixator. He did not remember an injury.
Radiographs after failed treatment with a cast
Radiographs after successful IM nailing
Learning Points From this Observational Study:

1. Longstanding diabetics are likely to have severe osteoporosis

2. The use of circular ring fixation in surgical correction of Charcot Foot deformity is growing.

3. Tibial Stress fracture is an unusual complication associated with circular external fixation.

4. The risk for tibial stress fracture in this high risk population is greatly increased when half-pins are used for tibial block fixation.

5. Tibial stress fracture is less likely to develop when treating diabetes-associated Charcot Foot when fine wire fixation is used for tibial block fixation.