

## Foot and Ankle Injuries: Review Questions

Francis H. Shen, MD

Anjan P. Kaushik, BS

### QUESTIONS

Choose the single best answer for each question.

- A 47-year-old woman presents to an orthopaedic surgeon with a 3-month history of progressive edema in her right medial foot and ankle. There is no history of trauma, but the woman was a long-distance runner in college. The initial pain has subsided, but she now has difficulty walking because of an acquired progressive flatfoot. Which of the following findings would best support your diagnosis?

  - Equal strength in both feet for the single heel raise test
  - More toes seen lateral to the heel from a posterior view
  - Decreased posterior tibiocalcaneal angle
  - Swelling below the lateral malleolus
- A 22-year-old ballet dancer presents with pinpoint pain in her left forefoot in the third intermetatarsal space, which radiates to her toes when she walks. Manipulation of the third and fourth metatarsal heads elicits a slight click (positive Muldor sign), which confirms a diagnosis of Morton's neuroma. All of the following are considered helpful therapies for this condition EXCEPT

  - Customized foot orthotics and wide-toed athletic shoes to avoid compression
  - Dorsal or plantar surgical neurectomy upon failure of conservative treatments
  - Increased heel height to improve forefoot circulation and space redistribution
  - Local anesthetics and corticosteroid injections to reduce pain and inflammation
  - Metatarsal pad with ice treatment to reduce neural irritation
- A 28-year-old man in a motor vehicle accident sustains a hyperdorsiflexion injury to his foot. A radiograph reveals a Hawkins type II talar neck fracture with dislocation of the subtalar joint. Open reduction with internal fixation is performed, and the patient returns for follow-up radiographs 8 weeks later. A radiograph shows well-placed hardware and a radiolucent band in the dome of the talus (Hawkins sign). Based on these findings, which of the following is LEAST likely to occur in this patient?

  - Ankle stiffness
  - Avascular necrosis (AVN) of the talus
  - Subtalar and talonavicular arthritis
  - Talus nonunion or delayed union
  - Varus malunion
- Which of the following statements regarding appropriate therapy for tarsal tunnel syndrome (TTS) is correct?

  - There is no role for the use of local tarsal canal and anti-inflammatory agent injections in the symptomatic treatment of TTS
  - If the bifurcation of the tibial nerve beneath the lacinate ligament is enlarged, surgically cutting the ligament provides space for nerve expansion
  - It is important to preserve the fibrous tethers of tibial nerve branches to the fascia of the abductor hallucis muscle during surgical release of the tarsal tunnel
  - Resection of the flexor retinaculum is associated with poor surgical outcome
  - Wide-cushioned shoes and arch supports have not been shown to be effective for relieving compression
- A 63-year-old man lands awkwardly while skiing and hears a loud pop in his left ankle. He cannot bear weight on the ankle, and edema ensues soon after the injury. Which of the following fractures would be missed if only radiographs of the ankle are taken without knee examination or radiographs of the entire lower leg?

  - Calcaneal fracture
  - Maisonneuve fracture

---

Dr. Shen is an assistant professor, Department of Orthopaedic Surgery, and Mr. Kaushik is a medical student; both are at the University of Virginia School of Medicine, Charlottesville, VA.

- (C) Pilon fracture
- (D) Pott fracture
- (E) Talar neck fracture

#### ANSWERS AND EXPLANATIONS

1. **(B) More toes seen lateral to the heel from a posterior view.** This finding is known as the “too many toes” sign and indicates tibialis posterior tendon (TPT) dysfunction. The patient presents subacutely with nontraumatic, degenerative inflammation of the TPT, which causes pain initially, edema below the medial malleolus, and loss of the medial longitudinal arch. This presentation is commonly seen in patients with acquired flatfoot, resulting in heel valgus and forefoot abduction. As a result, the posterior tibiocalcaneal angle, the angle formed by the heel and the longitudinal axis of the lower leg, is increased. Posterior tibial strength is decreased, so the patient cannot invert her foot effectively nor can she raise her body for the single heel raise test.<sup>1</sup>
2. **(C) Increased heel height to improve forefoot circulation and space redistribution.** This treatment option is not useful for Morton’s neuroma, and in fact, would increase the pressure in the intermetatarsal spaces and amplify the pain by compression of the neuroma. Conservative treatments include metatarsal padding, icing, and arch taping to redistribute weight away from the neuroma and to avoid irritation. Custom-fitted orthotics and shoes with wide toe boxes are recommended, particularly for athletes and dancers. Local anesthetics are used for pain relief as are corticosteroid injections to reduce inflammation. When conservative therapies fail, neurectomy or decompression can be performed using either a plantar or a dorsal approach.<sup>2</sup>
3. **(B) AVN of the talus.** AVN of the talus is least likely to occur in patients who demonstrate radiographic evidence of Hawkins sign at 6 to 8 weeks postinjury. Hawkins type II talar neck fractures have a 20% to 50% risk of AVN. However, the increased subchondral radiolucency in the dome of the talus represents an increase in bone reabsorption, which indicates active hyperemia in the bone and the presence of vascular perfusion, making AVN unlikely. After surgical open reduction with internal fixation, non-union and delayed union can occur, but the rates are low (4% and 10%, respectively).<sup>3</sup> Persistent slight displacement of the talus after open reduction with internal fixation is difficult to recognize and occasionally results in varus malunion with poor joint mechanics. One common postsurgical complication is ankle stiffness, which can be mini-

mized with range of motion exercises. Another common result is subtalar, ankle, and talonavicular arthritis due to initial traumatic osteoarticular damage to the joints of the proximal foot.<sup>3</sup>

4. **(B) If the bifurcation of the tibial nerve beneath the lacinate ligament is enlarged, surgically cutting the ligament provides space for nerve expansion.** Most cases of TTS occur from idiopathic entrapment and compression of the tibial nerve by the lacinate ligament. The bifurcation of the tibial nerve and medial and lateral plantar nerves occurs just below the lacinate ligament in 93% of cases, and cutting the ligament frees space for the enlarged nerve.<sup>4</sup> Fibrous fascial tethers of tibial nerve branches to the abductor hallucis muscle must be completely removed, and removal of a section of the flexor retinaculum over the neurovascular bundle is highly recommended to reduce compression. Before surgical treatment, conservative trials of anti-inflammatory agents (non-steroidal anti-inflammatory drugs, corticosteroids) often successfully relieve discomfort. Custom-fit orthotics, wide-cushioned shoes, and arch supports can also effectively treat TTS.<sup>4</sup>
5. **(B) Maisonneuve fracture.** Maisonneuve fracture is a complex injury that includes medial malleolar fracture, disruption of the tibiofibular syndesmosis and interosseous membrane, and fracture of the proximal third of the fibula. Identification of this injury is important because missed or late diagnoses are associated with poor outcomes.<sup>5</sup> Pilon fracture would be identified on radiographs of the ankle, as it involves fractures of the distal tibia and fibula. Calcaneal and talar neck fractures are localized to the calcaneus and talus bones of the foot, respectively, and would be seen on radiographs of the ankle. Pott fracture is a type of bimalleolar fracture that can also be visualized without complete lower leg radiographs.<sup>5</sup>

#### REFERENCES

1. Lee MS, Vanore JV, Thomas JL, et al. Diagnosis and treatment of adult flatfoot. *J Foot Ankle Surg* 2005;44:78–113.
2. Bennett GL, Graham CE, Mauldin DM. Morton’s interdigital neuroma: a comprehensive treatment protocol. *Foot Ankle Int* 1995;16:760–3.
3. Vallier HA, Nork SE, Barei DP, et al. Talar neck fractures: results and outcomes. *J Bone Joint Surg Am* 2004;86-A:1616–24.
4. Aldridge T. Diagnosing heel pain in adults. *Am Fam Physician* 2004;70:332–8.
5. Duchesneau S, Fallat LM. The Maisonneuve fracture. *J Foot Ankle Surg* 1995;34:422–8.