Neuropathies in Runners

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KEYWORDS

• Neuropathy • Sports • Running • Athletes

Nerve entrapment is an uncommon source of lower limb pain in runners, but has received increasing attention since Massey and colleagues[1] published a report of peroneal (PN) and lateral femoral cutaneous (LFCN) neuropathies in runners. Neurologic conditions currently account for 10% to 15% of all exercise-induced leg pain among runners, representing the highest frequency of foot and ankle neurologic conditions among all athletes.[2–5] Most nerve entrapments occur secondary to nonpenetrating trauma. Specific causes include contusion, compression, stretch, and iatrogenic injury from surgery.[2,5–10] The running motion produces complex, forceful, and repetitive lower limb movements that may compress, stretch, or dislocate nerves as they traverse relatively unyielding musculotendinous or fibro-osseous compartments and tunnels. Repetitive trauma produces demyelination (neuropraxia), and potentially some degree of axonal loss (axonotmesis); nerve dysfunction and neuropathic pain ensues.[11] Neurotmesis (complete nerve transection) does not occur in runners without major trauma.

In order of decreasing frequency, the most common nerves affected in runners include the interdigital nerve (interdigital or Morton neuroma), first branch of the lateral plantar nerve (FB-LPN), medial plantar nerve (MPN), tibial nerve (TN), peroneal nerve (common [CPN], as well as deep [DPN] and superficial [SPN]), sural nerve (SN), and saphenous nerve.[5] This article reviews the causes, diagnosis, and treatment of entrapment neuropathies that may be encountered by clinicians caring for runners.

DIAGNOSTIC PRINCIPLES

Clinicians should consider several general principles to facilitate the diagnosis and management of entrapment neuropathies: (1) maintain a high index of suspicion for neurologic syndromes, (2) recognize common presentations of neuropathic pain, (3) perform a meticulous physical examination, including postexercise examination when necessary, (4) consider a broad differential diagnosis (neurologic and nonneurologic), (5) use diagnostic testing appropriately, and (6) make rational clinical decisions,

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Clin Sports Med 29 (2010) 437–457
doi:10.1016/j.csm.2010.03.002 **sportsmed.theclinics.com**
0278-5919/10/$ – see front matter

including referral for second opinion when indicated.[5] **Figs. 1–7** depict the relevant neuroanatomy as it pertains to entrapment or injury sites. **Fig 8** presents the neuroanatomic relationship of nerves in the lower limb.

COMMON NERVE ENTRAPMENT SYNDROMES

Interdigital Neuroma (Morton Neuroma)

Definition

Interdigital neuromas produce neuropathic pain in the distribution of the interdigital nerve (see **Fig. 1**). The condition most commonly affects the third web space, and rarely affects the first or fourth web spaces. Multiple coexistent neuromas are uncommon and suggest an alternative diagnosis such as polyneuropathy. Interdigital neuromas typically affect runners in their 20s or older, show a predilection for women (possibly secondary to wearing tight-fitting and high-heeled dress shoes), and are believed to be caused by repetitive trauma and biomechanical factors.[2,5,7,10,12]

Anatomy, pathophysiology, and risk factors

The plantar interdigital nerve in the third intermetatarsal space is comprised of communicating branches from the LPN and MPN (see **Figs. 8** and **2**). At the level of the metatarsal heads, the interdigital nerve passes plantar to the intermetatarsal ligament. During push-off, forceful toe dorsiflexion may compress and stretch the nerve beneath the intermetatarsal ligament, resulting in demyelination, scarring, and hypertrophy.[2,10] Subsequently, a tumorous mass may develop just distal to the intermetatarsal ligament, proximal to the interdigital nerve's bifurcation into the deep digital

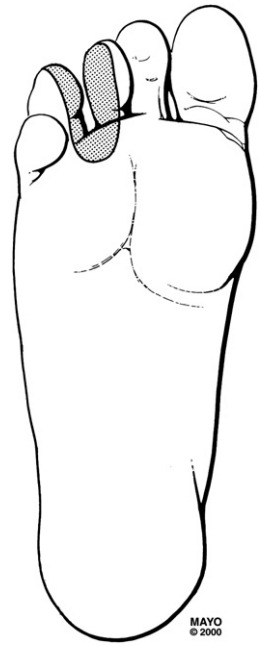

Fig. 1. Interdigital neuroma. Shaded area demonstrates typical area of pain or sensory loss. (By permission of Mayo Foundation for Medical Education and Research. All rights reserved.)