

# 24.

Bölüm

## AYAK VE AYAK BİLEĞİ ÇEVRESİ TUZAK NÖROPATİLERİ

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### GİRİŞ

Alt ekstremite tuzak nöropatileri nadir ancak önemli bir morbidite kaynağıdır. Radiküler ağrılardan ve diyabet gibi sistemik hastalıkların neden olduğu periferik nöropatilerden ayırcı tanısının yapılması gereklidir (1).

Ayak ve ayak bileğinin sinirsel innervasyonu beş periferal sinir tarafından sağlanır. Bunlardan dördü (tibial sinir, derin peroneal sinir, yüzeyel peroneal sinir ve sural sinir) siyatik sinirin dallarıyken beşinci (safen sinir) femoral sinirin terminal dalıdır (2).

Tanı koymak için, kapsamlı bir fizik muayene ve ilgili anatominin tam olarak bilinmesi gereklidir. Anatomik çalışmalar, sinirlerin sıkılıkla sıkışlığı alanların belirlenmesine yardımcı olmuştur. Manyetik Rezonans Görüntüleme (MRG) ve ultrasonografi gibi gelişmiş görüntüleme ve sinir iletim hızı çalışmaları, tuzak alanını lokalize etmeyi kolaylaştırmıştır.

### TARSAL TÜNEL SENDROMU

Tarsal tünel sendromu; tibial sinirin ayak bileği çevresinde sıkışması sonucu ortaya çıkar. İlk kez 1932'de tanımlanmış ve 1962'de Keck ve Lam tarafından adlandırılmıştır. Kadınlarda daha sık görülür (3).

Tarsal tünel sendromu, tibial sinirin medial malleol posteriorundan, talus ve kalkaneus medialinden geçerken sıkışmasıdır. Tarsal tünelin ön duvarını

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v. saphena magna ile birlikte ayağa kadar devam eder. Medial malleolün önünde subkutan olarak ilerleyen sinir, iki terminal dal verir. Medial ayak bileği ve orta ayağın duyusunu alır (2).

Safen sinir, ayak ve ayak bileği çevresinden çok, daha proksimalde, Hunter kanalı içinde sıkışmaya eğilimlidir. Ama hastalar genellikle ayak ve ayak bileğinde ağrı ve parestezi ile başvururlar (70). Diz çevresindeki akut travmatik nedenlere bağlı infrapatellar dalda izole sıkışma, lokalize semptomlar verir, ve nispeten tanısı kolaydır. Diz cerrahisi sonrası veya varis ameliyatı sonrası iyatrojenik hasar, perinöral fibrozis ile sıkışmaya neden olabilir.

Klinik semptomlar sıkılıkla medial diz ve baldır ağrısı ile birlikte, ayak ve ayak bileği medialinde, özellikle 1. metatars dorsalinde parestezidir. Sinir boyunca yapılan Tinel testi ile pozitiflik bulunabilir ve tanıyı güçlendiricektir. Lokal anestezik enjeksiyonu tanı koymaya yardımcı olabilir.

Direkt grafi, bilgisayarlı tomografi veya MRG ile bası yapan kemik ve yumuşak doku lezyonları görüntülenir. Sinir ileti çalışmaları tanı koymada yetersizdir (101). Daha proksimal nedenleri veya radikülopatileri dışlamak için yardımcı olabilir.

Cerrahi müdahaleden mümkün oldukça kaçınılmalıdır. Literatürde Hunter kanalı çevresine lokal anestezik ve kortikosteroidlerin akıllica kullanılması önerilmektedir. Konservatif tedavi ile başarı sağlanamazsa dekompresyon, nöroliz ve nörektomi cerrahi seçenekler arasında düşünülebilir. Nörektomi kalıcı duyu kaybına neden olacağı için ilk sırada düşünülmez (92).

## SONUÇ

Sık görülmemesi ve anatominin iyi bilinmesi gerekliliği nedeniyle ayak ve ayak bileği çevresi tuzak nöropatiler sıkılıkla atlanabilmektedir. İlgili sinirlerin ve anatominin bilinmesi hem tanı hem de tedavi aşamasında ortopediste yol gösterecektir.

## KAYNAKLAR

1. Pickard JD, Robinson AHN, Bearcroft PWP. Posterior tarsal tunnel syndrome: an unusual unrelated cause of late pain after lumbar spine surgery. Br J Neurosurg. 2006 Jan;20(5):331–2.
2. Williams THD, Robinson AHN. (iii) Entrapment neuropathies of the foot and ankle. Orthop Trauma. 2009;23(6):404–11.
3. Keck C. The Tarsal-Tunnel Syndrome. JBJS. 1962;44(1).
4. Singh G, Kumar VP. Neuroanatomical basis for the tarsal tunnel syndrome. Foot ankle Int. 2012 Jun;33(6):513–8.

5. Frey C, Kerr R. Magnetic resonance imaging and the evaluation of tarsal tunnel syndrome. *Foot Ankle*. 1993;14(3):159–64.
6. Gondring WH, Shields B, Wenger S. An outcomes analysis of surgical treatment of tarsal tunnel syndrome. *Foot ankle Int*. 2003 Jul;24(7):545–50.
7. Ferkel E, Davis WH, Ellington JK. Entrapment Neuropathies of the Foot and Ankle. *Clin Sports Med*. 2015 Oct;34(4):791–801.
8. Cimino WR. Tarsal tunnel syndrome: review of the literature. *Foot Ankle*. 1990 Aug;11(1):47–52.
9. Mann RA, Baxter DE. Diseases of the nerves. *Surg Foot Ankle*. 1993;1:543–73.
10. Radin EL. Tarsal tunnel syndrome. *Clin Orthop Relat Res*. 1983 Dec;(181):167–70.
11. Sammarco GJ, Chang L. Outcome of surgical treatment of tarsal tunnel syndrome. *Foot ankle Int*. 2003 Feb;24(2):125–31.
12. Kinoshita M, Okuda R, Morikawa J, et al. The dorsiflexion-eversion test for diagnosis of tarsal tunnel syndrome. *J Bone Joint Surg Am*. 2001 Dec;83(12):1835–9.
13. TINEL J. “Tingling” Signs with Peripheral Nerve Injuries. *J Hand Surg Am*. 2005 Feb;30(1):87–9.
14. Wallach DM, Katchis SD. Tarsal tunnel syndrome. Disord heel, rear foot, ankle Churchill Livingst. 1999;125–34.
15. Lopez-Ben R. Imaging of nerve entrapment in the foot and ankle. *Foot Ankle Clin*. 2011 Jun;16(2):213–24.
16. Nagaoka M, Matsuzaki H. Ultrasonography in tarsal tunnel syndrome. *J ultrasound Med Off J Am Inst Ultrasound Med*. 2005 Aug;24(8):1035–40.
17. Patel AT, Gaines K, Malamut R, et al. Usefulness of electrodiagnostic techniques in the evaluation of suspected tarsal tunnel syndrome: an evidence-based review. *Muscle Nerve*. 2005 Aug;32(2):236–40.
18. Beskin JL. Nerve Entrapment Syndromes of the Foot and Ankle. *J Am Acad Orthop Surg*. 1997 Oct;5(5):261–9.
19. Baba H, Wada M, Annen S, et al. The tarsal tunnel syndrome: evaluation of surgical results using multivariate analysis. *Int Orthop*. 1997;21(2):67–71.
20. Pfeiffer WH, Cracchiolo A 3rd. Clinical results after tarsal tunnel decompression. *J Bone Joint Surg Am*. 1994 Aug;76(8):1222–30.
21. Takakura Y, Kitada C, Sugimoto K, et al. Tarsal tunnel syndrome. Causes and results of operative treatment. *J Bone Joint Surg Br*. 1991 Jan;73(1):125–8.
22. Nagaoka M, Satou K. Tarsal tunnel syndrome caused by ganglia. *J Bone Joint Surg Br*. 1999 Jul;81(4):607–10.
23. Rask MR. Medial plantar neurapraxia (jogger’s foot): report of 3 cases. *Clin Orthop Relat Res*. 1978;134:193–5.
24. Donovan A, Rosenberg ZS, Cavalcanti CF. MR imaging of entrapment neuropathies of the lower extremity. Part 2. The knee, leg, ankle, and foot. *Radiogr a Rev Publ Radiol Soc North Am Inc*. 2010;30(4):1001–19.
25. Schon LC, Reed MA. Disorders of the nerves. *Mann’s Surg Foot Ankle*. 2014;1:675–82.
26. Symeonidis PD, Iselin LD, Simmons N, et al. Prevalence of interdigital nerve enlargements in an asymptomatic population. *Foot ankle Int*. 2012 Jul;33(7):543–7.
27. Schon LC, Glennon TP, Baxter DE. Heel pain syndrome: electrodiagnostic support for nerve entrapment. *Foot Ankle*. 1993;14(3):129–35.
28. McCrory P, Bell S, Bradshaw C. Nerve Entrapments of the Lower Leg, Ankle and Foot in Sport. *Sport Med*. 2002;32(6):371–91.
29. Fredericson M, Standage S, Chou L, et al. Lateral plantar nerve entrapment in a competitive gymnast. *Clin J Sport Med Off J Can Acad Sport Med*. 2001 Apr;11(2):111–4.
30. Baxter DE, Thigpen CM. Heel pain--operative results. *Foot Ankle*. 1984;5(1):16–25.
31. Davis PF, Severud E, Baxter DE. Painful heel syndrome: results of nonoperative treatment. *Foot ankle Int*. 1994 Oct;15(10):531–5.

32. Recht MP, Grooff P, Ilaslan H, et al. Selective atrophy of the abductor digiti quinti: an MRI study. *AJR Am J Roentgenol.* 2007 Sep;189(3):W123-7.
33. Chundru U, Liebeskind A, Seidelmann F, et al. Plantar fasciitis and calcaneal spur formation are associated with abductor digiti minimi atrophy on MRI of the foot. *Skeletal Radiol.* 2008 Jun;37(6):505-10.
34. Sinnaeve F, Vandepitte G. Clinical outcome of surgical intervention for recalcitrant infero-medial heel pain. *Acta Orthop Belg.* 2008 Aug;74(4):483-8.
35. Williams EH, Williams CG, Rosson GD, et al. Anatomic site for proximal tibial nerve compression: a cadaver study. *Ann Plast Surg.* 2009 Mar;62(3):322-5.
36. Chhabra A, Williams EH, Subhawong TK, et al. MR Neurography Findings of Soleal Sling Entrapment. *Am J Roentgenol.* 2011 Mar;196(3):W290-7.
37. Williams EH, Rosson GD, Hagan RR, et al. Soleal Sling Syndrome (Proximal Tibial Nerve Compression): Results of Surgical Decompression. *Plast Reconstr Surg.* 2012;129(2).
38. Chhabra A, Williams EH, Wang KC, et al. MR Neurography of Neuromas Related to Nerve Injury and Entrapment with Surgical Correlation. *Am J Neuroradiol.* 2010 Sep;31(8):1363 LP – 1368.
39. Giannini S, Bacchini P, Ceccarelli F, et al. Interdigital neuroma: clinical examination and histopathologic results in 63 cases treated with excision. *Foot ankle Int.* 2004 Feb;25(2):79-84.
40. Mann RA, Reynolds JC. Interdigital neuroma--a critical clinical analysis. *Foot Ankle.* 1983;3(4):238-43.
41. Kim J-Y, Choi JH, Park J, et al. An anatomical study of Morton's interdigital neuroma: the relationship between the occurring site and the deep transverse metatarsal ligament (DTML). *Foot ankle Int.* 2007 Sep;28(9):1007-10.
42. Peters PG, Adams SB, Schon LC. Interdigital neuralgia. *Foot Ankle Clin.* 2011;16(2):305-15.
43. Lassmann G. Morton's toe: clinical, light and electron microscopic investigations in 133 cases. *Clin Orthop Relat Res.* 1979;(142):73-84.
44. Levitsky KA, Alman BA, Jevsevar DS, et al. Digital Nerves of the Foot: Anatomic Variations and Implications Regarding the Pathogenesis of Interdigital Neuroma. *Foot Ankle.* 1993 May;14(4):208-14.
45. Jones JR, Klenerman L. A study of the communicating branch between the medial and lateral plantar nerves. *Foot Ankle.* 1984;4(6):313-5.
46. Mulder JD. The Causative Mechanism In Morton's Metatarsalgia. *J Bone Joint Surg Br.* 1951 Feb;33-B(1):94-5.
47. Kankanala G, Jain AS. The Operational Characteristics of Ultrasonography for the Diagnosis of Plantar Intermetatarsal Neuroma. *J Foot Ankle Surg.* 2007;46(4):213-7.
48. Bencardino J, Rosenberg ZS, Beltran J, et al. Morton's neuroma: is it always symptomatic? *AJR Am J Roentgenol.* 2000 Sep;175(3):649-53.
49. Sharp RJ, Wade CM, Hennessy MS, et al. The role of MRI and ultrasound imaging in Morton's neuroma and the effect of size of lesion on symptoms. *J Bone Joint Surg Br.* 2003 Sep;85(7):999-1005.
50. Rasmussen MR, Kitaoka HB, Patzer GL. Nonoperative treatment of plantar interdigital neuroma with a single corticosteroid injection. *Clin Orthop Relat Res.* 1996 May;(326):188-93.
51. Markovic M, Crichton K, Read JW, et al. Effectiveness of ultrasound-guided corticosteroid injection in the treatment of Morton's neuroma. *Foot ankle Int.* 2008 May;29(5):483-7.
52. Hughes RJ, Ali K, Jones H, et al. Treatment Of Morton's Neuroma With Alcohol Ablative Injection Under Sonographic Guidance: Follow-Up Of 101 Cases. *Orthop Proc.* 2009 May;91-B(SUPP\_II):361.
53. Espinosa N, Seybold JD, Jankauskas L, et al. Alcohol sclerosing therapy is not an effective

- treatment for interdigital neuroma. *Foot & ankle Int.* 2011;32(6):576—580.
- 54. Gurdezi S, White T, Ramesh P. Alcohol Injection for Morton's Neuroma: A Five-Year Follow-Up. *Foot Ankle Int.* 2013 May;34(8):1064–7.
  - 55. Thomson CE, Gibson JNA, Martin D. Interventions for the treatment of Morton's neuroma. *Cochrane database Syst Rev.* 2004;(3):CD003118.
  - 56. Title CI, Schon LC. Morton Neuroma: Primary and Secondary Neurectomy. *JAAOS - J Am Acad Orthop Surg.* 2008;16(9).
  - 57. Womack JW, Richardson DR, Murphy GA, et al. Long-term evaluation of interdigital neuroma treated by surgical excision. *Foot ankle Int.* 2008 Jun;29(6):574–7.
  - 58. Johnson JE, Johnson KA, Unni KK. Persistent pain after excision of an interdigital neuroma. Results of reoperation. *J Bone Joint Surg Am.* 1988 Jun;70(5):651–7.
  - 59. Barrett SL, Rabat E, Buitrago M, et al. Endoscopic decompression of intermetatarsal nerve (EDIN) for the treatment of Morton's entrapment—multicenter retrospective review. *Open J Orthop.* 2012;2(02):19–24.
  - 60. Villas C, Florez B, Alfonso M. Neurectomy versus neurolysis for Morton's neuroma. *Foot ankle Int.* 2008 Jun;29(6):578–80.
  - 61. Barrett SL. Endoscopic nerve decompression. *Clin Podiatr Med Surg.* 2006;23(3):579–95.
  - 62. Shapiro SL. Endoscopic decompression of the intermetatarsal nerve for Morton's neuroma. *Foot Ankle Clin.* 2004;9(2):297–304.
  - 63. Zelent ME, Kane RM, Neese DJ, et al. Minimally invasive Morton's intermetatarsal neuroma decompression. *Foot ankle Int.* 2007;28(2):263–5.
  - 64. Sarrafian SK. Anatomy of the foot and ankle: descriptive, topographic, functional. Lippincott Williams & Wilkins; 1993.
  - 65. Rosson GD, Dellen AL. Superficial Peroneal Nerve Anatomic Variability Changes Surgical Technique. *Clin Orthop Relat Res.* 2005;438:248–52.
  - 66. Johnston EC, Howell SJ. Tension neuropathy of the superficial peroneal nerve: associated conditions and results of release. *Foot ankle Int.* 1999;20(9):576–82.
  - 67. Styf J, Morberg P. The superficial peroneal tunnel syndrome: results of treatment by decompression. *J Bone Joint Surg Br.* 1997;79(5):801–3.
  - 68. Styf J. Diagnosis of exercise-induced pain in the anterior aspect of the lower leg. *Am J Sports Med.* 1988;16(2):165–9.
  - 69. Redfern DJ, Sauvé PS, Sakellariou A. Investigation of incidence of superficial peroneal nerve injury following ankle fracture. *Foot ankle Int.* 2003;24(10):771–4.
  - 70. Flanigan RM, DiGiovanni BF. Peripheral nerve entrapments of the lower leg, ankle, and foot. *Foot Ankle Clin.* 2011;16(2):255–74.
  - 71. Peck E, Finnoff JT, Smith J. Neuropathies in runners. *Clin Sports Med.* 2010;29(3):437–57.
  - 72. Schepsis AA, Fitzgerald M, Nicoletta R. Revision surgery for exertional anterior compartment syndrome of the lower leg: technique, findings, and results. *Am J Sports Med.* 2005;33(7):1040–7.
  - 73. Styf J. Entrapment of the superficial peroneal nerve. Diagnosis and results of decompression. *J Bone Joint Surg Br.* 1989;71(1):131–5.
  - 74. Chiodo CP, Miller SD. Surgical treatment of superficial peroneal neuroma. *Foot ankle Int.* 2004;25(10):689–94.
  - 75. Marinacci AA. Neurological syndromes of the tarsal tunnels. *Bull Los Angels Neurol Soc.* 1968;33:90–100.
  - 76. Kopell HP, Thompson WAL. Peripheral entrapment neuropathies of the lower extremity. *N Engl J Med.* 1960;262(2):56–60.
  - 77. Ikiz ZAA, Ucerler H, Uygur M. Dimensions of the anterior tarsal tunnel and features of the deep peroneal nerve in relation to clinical application. *Surg Radiol Anat.* 2007;29(7):527–30.

78. Deller AL. Deep peroneal nerve entrapment on the dorsum of the foot. *Foot Ankle*. 1990 Oct;11(2):73–80.
79. Nakase T, Fukuhara K, Adachi N, et al. Painful os intermetatarsale in athletes: report of four cases and review of the literature. *Arch Orthop Trauma Surg*. 2007;127(4):261–4.
80. Knackfuss IG, Giordano V, Nogueira M, et al. Compression of the medial branch of the deep peroneal nerve, relieved by excision of an os intermetatarsale. A case report. *Acta Orthop Belg*. 2003 Dec;69(6):568–70.
81. Noguchi M, Iwata Y, Miura K, et al. A Painful Os Intermetatarsale in a Soccer Player: A Case Report. *Foot Ankle Int*. 2000 Dec;21(12):1040–2.
82. Tennant JN, Rungprai C, Phisitkul P. Bilateral anterior tarsal tunnel syndrome variant secondary to extensor hallucis brevis muscle hypertrophy in a ballet dancer: a case report. *Foot ankle Surg Off J Eur Soc Foot Ankle Surg*. 2014 Dec;20(4):e56–8.
83. Reed SC, Wright CS. Compression of the deep branch of the peroneal nerve by the extensor hallucis brevis muscle: a variation of the anterior tarsal tunnel syndrome. *Can J Surg*. 1995 Dec;38(6):545–6.
84. Melendez MM, Glickman LT, Deller AL. Peroneal nerve compression in figure skaters. *Clin Res Foot Ankle*. 2013;1–3.
85. Kanbe K, Kubota H, Shirakura K, et al. Entrapment neuropathy of the deep peroneal nerve associated with the extensor hallucis brevis. *J foot ankle Surg Off Publ Am Coll Foot Ankle Surg*. 1995;34(6):560–2.
86. Akyüz G, Üs O, Türan B, et al. Anterior tarsal tunnel syndrome. *Electromyogr Clin Neurophysiol*. 2000 Mar;40(2):123–8.
87. Schon LC, Baxter DE. Neuropathies of the Foot and Ankle in Athletes\*. *Clin Sports Med*. 1990;9(2):489–509.
88. Dreyer MA, Gibboney MD. Anterior Tarsal Tunnel Syndrome. In Treasure Island (FL); 2020.
89. Yassin M, Garti A, Weissbrot M, et al. Treatment of anterior tarsal tunnel syndrome through an endoscopic or open technique. *Foot (Edinb)*. 2015 Sep;25(3):148–51.
90. Hirose CB, McGarvey WC. Peripheral nerve entrapments. *Foot Ankle Clin*. 2004;9(2):255–69.
91. Gessini L, Jandolo B, Pietrangeli A. The anterior tarsal syndrome. Report of four cases. *JBJS*. 1984;66(5).
92. Pomeroy G, Wilton J, Anthony S. Entrapment Neuropathy About the Foot and Ankle: An Update. *JAAOS - J Am Acad Orthop Surg*. 2015;23(1).
93. Ducic I, Felder JM 3rd. Minimally invasive peripheral nerve surgery: peroneal nerve neurolysis. *Microsurgery*. 2012 Jan;32(1):26–30.
94. Lui TH. Endoscopic anterior tarsal tunnel release: a case report. *J foot ankle Surg Off Publ Am Coll Foot Ankle Surg*. 2014;53(2):186–8.
95. Swathi, Nellithala GG, Athavale SA. Mid-foot retinaculum: an unrecognized entity. *Anat Cell Biol*. 2017 Sep;50(3):171–4.
96. Murphy PC, Baxter DE. Nerve entrapment of the foot and ankle in runners. *Clin Sports Med*. 1985 Oct;4(4):753–63.
97. Seror P. Sural nerve lesions: a report of 20 cases. *Am J Phys Med Rehabil*. 2002;81(11):876–80.
98. Yuebing L, Lederman RJ. Sural mononeuropathy: a report of 36 cases. *Muscle Nerve*. 2014;49(3):443–5.
99. Fabre T, Montero C, Gaujard E, et al. Chronic Calf Pain in Athletes Due to Sural Nerve Entrapment. *Am J Sports Med*. 2000 May;28(5):679–82.
100. Pringle RM, Protheroe K, Mukherjee SK. Entrapment neuropathy of the sural nerve. *J Bone Joint Surg Br*. 1974 Aug;56B(3):465–8.
101. Buschbacher RM. Sural and saphenous 14-cm antidromic sensory nerve conduction studies. *Am J Phys Med Rehabil*. 2003;82(6):421–6.