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# MANAGEMENT OF TARSAL TUNNEL SYNDROME

## REPORT OF SEVEN CASES

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SUMMARY - Seven patients with clinical and electroneurographic evidence of tarsal tunnel syndrome were managed surgically, after failed attempts for non-surgical treatment. Post-operative results were more satisfactory than the previous responses to non-surgical therapies. Tarsal tunnel syndrome appears to respond better to surgical intervention than to conservative management.

KEY WORDS: tarsal tunnel, posterior tibial nerve, tibial nerve compression, surgical decompression.

**Tratamento da síndrome do túnel do tarso: relato de sete casos**

RESUMO - Sete pacientes com evidência clínica e eletroneurográfica de síndrome do túnel do tarso foram tratadas cirurgicamente, após tentativas sem sucesso de tratamento não cirúrgico. Os resultados pós-operatórios foram bem mais satisfatórios que as tentativas prévias com terapêuticas não cirúrgicas. A síndrome do túnel do tarso parece responder melhor à abordagem cirúrgica do que a condutas mais conservadoras.

PALAVRAS-CHAVE: túnel do tarso, nervo tibial posterior, compressão do nervo tibial, descompressão cirúrgica.

Tarsal tunnel syndrome is a well known entity. Studies have described this illness in patients with neurological and electroneurographic evidence of posterior tibial nerve compression[3-8,10].

From the pertinent literature, there seems to be agreement that this syndrome constitutes a disorder primarily amenable to surgical intervention. The present work was carried out in a series of seven prospectively observed patients, in whom clinical management was unsatisfactory. The latter consisted of systemic administration of non-steroid anti-inflammatory agents, local steroid infiltrations, and a variety of podiatric procedures. Patients eventually underwent surgical decompression of the posterior tibial nerve within the tarsal tunnel.

## CASE REPORTS

Case 1. A 43-year-old woman presented with a 12-year history of progressive burning pain over the postero-lateral aspect of the right leg, irradiated to the medial and plantar regions of the right foot. These symptoms were exacerbated on the upright position, and while deambulating. Relief was achieved during rest. Neurological examination disclosed mild deficit on plantar flexion of the right foot and hallux with hypoesthesia on the medial and dorsal aspects of the right foot. Painful symptoms could be triggered by pressure applied to the medial retromalleolar region. Electroneurographic testing revealed marked slowness in neuroconduction of the distal segments of both posterior tibial nerves, more pronounced of the right side. These abnormalities

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suggested bilateral tarsal tunnel syndrome, worse on the right. The patient underwent unilateral exploration of the right tarsal tunnel. At operation a varicose venous plexus was found, which exerted compression on the posterior tibial nerve and its branches. Nerve decompression was uneventfully carried out, and a 2-year follow-up has been asymptomatic.

Case 2. A 45-year-old woman presented with a 19-month history of progressive burning pain on the medial-dorsal aspect of the left foot, associated with numbness of the hallux and second toe. Neurological examination revealed mild deficit on plantar flexion of the left foot and hallux, with associated hypoesthesia over the dorso-medial aspect of the hallux and second toe. Electroneurographic testing disclosed abnormalities consistent with left posterior tibial neuropathy, suggestive of tarsal tunnel syndrome. At operation several varicose venous branches were found to be compressing the left posterior tibial nerve. Nerve decompression was uneventfully carried out, and a 2.5-year follow-up has been asymptomatic.

Case 3. A 46-year-old woman presented with a 1-year history of progressive burning pain and numbness over the posterior face of the right leg and heel. Symptoms were exacerbated with deambulation, and relieved during rest. Neurological examination revealed mild deficit on plantar flexion of the right foot and hallux, with associated hypoesthesia over the entire plantar surface. Painful symptoms could be triggered by pressure over the medial retromalleolar region. Electroneurographic testing showed loss of excitability of plantar nerves, and increased latency on the posterior tibial nerve, suggestive of tarsal tunnel syndrome. At operation, thickening of the retinaculum of the flexor muscles was found, exerting compression on the posterior tibial nerve. Nerve decompression was uneventfully carried out, and the patient was asymptomatic for 18 months. She then presented with the same signs and symptoms on the left side, which were also refractory to clinical management. Surgery was then carried out on the left foot, with the same findings as on the right side. Upon discharge from the hospital she was asymptomatic. The patient was lost for long-term follow-up.

Case 4. A 72-year-old woman presented with a 10-year history of progressive burning pain on the left plantar region. Three years after onset of symptoms, she developed the same problem on the right side. Pre-morbid history was remarkale for a fracture of the left ankle five years before onset of the left-sided symptoms. Neurological examination revealed mild deficit on plantar flexion of both feet and halluces, with bilateral plantar hypoesthesia. Painful symptoms could be triggered by pressure over both medial retromalleolar regions. Electroneurographic testing showed absent sensory conduction on both posterior tibial nerves, with otherwise normal findings. Bilateral tarsal tunnel syndrome was therefore suggested. The patient underwent bilateral exploration of the tarsal tunnel, which revealed thickening of the retinaculum of the flexor muscles on both sides. Decompression of both posterior tibial nerves was uneventfully carried out, and a 3-year follow-up has been essentially asymptomatic, except for slight numbness on the left foot.

Case 5. A 53-year-old woman presented with a 2-year history of progressive numbness of all toes on the right side, associated with burning pain over the plantar and dorsal regions of the foot. Similar symptoms had subsequently and gradually developed on the left side, over an 8-month period. Neurological examination disclosed hypoesthesia over the dorso-lateral aspect of both feet, without motor deficit. Electroneurographic testing showed sensory potentials on both posterior tibial nerves, in response to medial-plantar stimuli. This was suggestive of bilateral tarsal tunnel syndrome. The patient underwent exploration of the right tarsal tunnel, which disclosed multiple compression of the posterior tibial nerve by large varicose veins. Nerve decompression was uneventfully carried out, with complete relief of painful symptoms and persistent hypoesthesia on the right foot, over a 10-month follow-up period.

Case 6. A 69-year-old woman presented with a 1-year history of progressive burning pain in both plantar regions, without irradiation, exacerbated during deambulation, and relieved during rest. Due to gradual worsening, she lately was unable to walk two blocks. Pre-morbid history was remarkable for a 20-year long diabetes mellitus. Neurological examination was normal. Electroneurographic testing revealed marked decrease of neuroconduction in distal segments of both posterior tibial nerves, suggestive of tarsal tunnel syndrome. The patient underwent bilateral exploration of the tarsal tunnel, which revealed thickening of the retinaculum of the flexor muscles on both sides, and marked venous varicose compression of the posterior tibial nerve on the left. Upon discharge from the hospital she was asymptomatic, with complete relief of the painful symptoms. A long-term follow-up is pending.

Case 7. A 61-year-old woman presented with a 1-year history of numbness of the left toes, sparing the hallux only. Over the past six months, painful symptoms were superimposed to the previous sensory abnormalities.

Neurological examination was normal. Electroneurographic testing revealed a predominance of moderately neurogenic motor unit potentials of the abductor hallux and gastrocnemius muscles on the left, in contrast to normal motor unit potentials on the right. A complete blockage in neuroconduction of the left posterior tibial nerve was also documented. These findings were consistent with tarsal tunnel syndrome on the left. The patient underwent surgical decompression of the left posterior tibial nerve. At operation, pressure was being applied to the posterior tibial nerve by the laciniate ligament, which was satisfactorilly relieved. A 3-month follow-up has been asymptomatic.

## COMMENTS

*Anatomical features.* The tarsal tunnel is an osseofibrous structure, comparable to the carpal tunnel. Its floor is formed by the calcaneal and talar bones, and tendons of the following muscles: posterior tibial, long flexor of the hallux, and long flexor of the small toes. Its roof is formed by the retinaculum of the flexor muscles of the foot, a thin layer of fibrous tissue which extends from the medial malleolus to the heel and proximal border of the abductor muscle of the hallux[4].

The posterior tibial nerve runs inferiorly to the medial malleolus and anteriorly to the Achilles tendon, crossing the tarsal tunnel. At the distal end of the tarsal tunnel, the posterior tibial nerve gives off three branches: (a) medial calcaneal branch; (b) medial plantar branch; an (c) lateral plantar branch. Figure 1 illustrates the anatomical landmarks of the tarsal tunnel.

*Pathophysiology.* Any lesion occupying space inside the tarsal tunnel may result in the tarsal tunnel syndrome, either because of direct compression of the posterior tibial nerve, or because of ischemic neuropathy.

Common etiologic sources in this syndrome are those leading to pathological modification of the spatial configuration of the anatomical elements, secondary to fracture, displacement, or direct pressure as in forced plantar flexion, and acute or chronic eversion of the foot or heel.

Other frequent etiologic sources are lipomas, neuromas, post-traumatic fibrosis, synovial hypertrophy in reumathoid arthritis, excessive weight, post-traumatic edema, chronic stasis of the posterior tibial veins, thrombophlebitis, and venous ectasis.

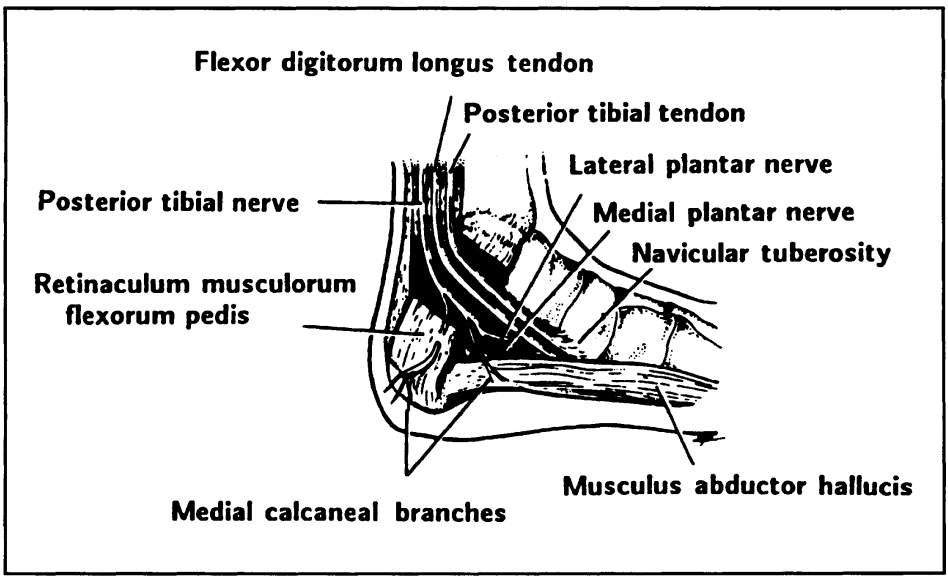


*Figure 1. Anatomical landmarks of the tarsal tunnel.*

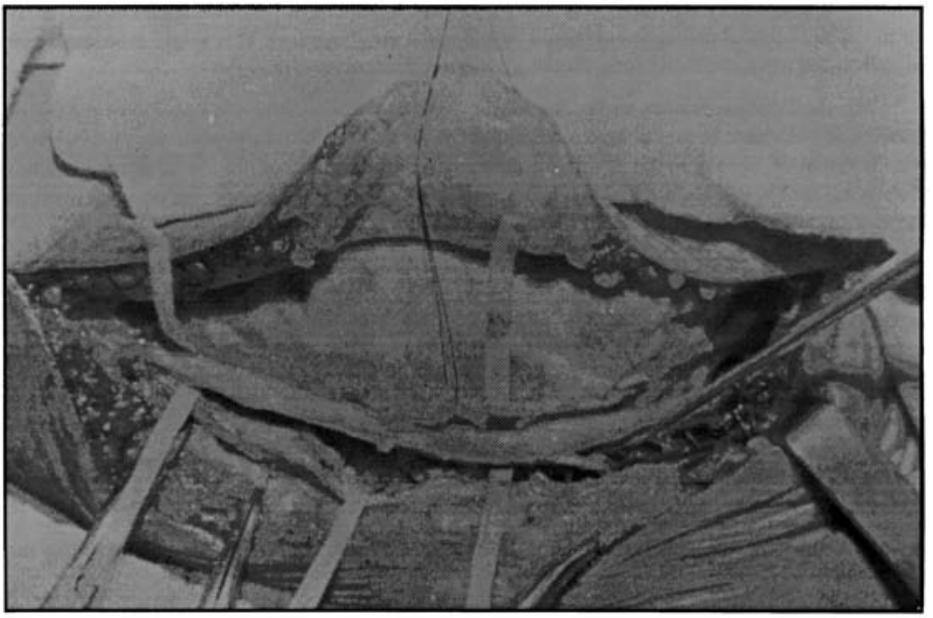

*Figure 2. Surgical exposure of the posterior tibial nerve within the tarsal tunnel. The retinaculum of the flexor muscles was sectioned allowing decompression of the nerve.*

Anatomopathological findings are generally typical of a chronic lesion, which sometimes leads to the formation of neuroma secondary to compression of the posterior tibial nerve or its branches. Neuroma formation is most frequently located underneath the retinaculum, behind the malleolus.

Denny-Brow and Brenner[2] have demonstrated, experimentally, that pathophysiologic alterations of peripheral nerves occur when mild or moderate nerve compression is applied, mostly during the initial phase of compression.

*Differential diagnosis.* Before definitive confirmation of tarsal tunnel syndrome, it is important to rule out other pathologic processes that may mimic this syndrome. Among those are: plantar fasciitis, interdigital neuroma, prolapse of metatarsal head, plantar callus, and reumathoid disease of the foot. In addition to these entities, different sources of sciatic pain, peripheral neuropathy, and peripheral vasculopathy must be excluded as well.

Electroneurographic evaluation of muscles innervated by the posterior tibial nerve, with emphasis on the conduction velocity and latency period, have been reported as of diagnostic value[5]. In fact, the following parameters have been proposed by Distefano and co-workers[3] as indicative of nerve compression: a latency period greater than 6.1 m/sec for the medial plantar branch, and greater than 6.7 m/sec for the lateral plantar branch. According to Kaplan and Kernohan[6], the lateral plantar branch is more frequently affected than the medial branch.

*Treatment.* Non-surgical therapeutic measures, such as local infiltration with steroid anti-inflammatory agents, use of elastic stockings, and a variety of podiatric measures, frequently promote just a short-lasting relief os symptoms.

On the other hand, surgical treatment appears to be the most effective alternative, for satisfactory long term results. In fact, because of the progressive features of this syndrome, and in light of so

remarkably satisfactory results in response to surgical treatment, it becomes apparent that *early* diagnosis and surgical management should be adopted more frequently. This would avoid potential complications associated with long-standing palliative procedures.

Surgical decompression within the tarsal tunnel, by sectioning the retinaculum of the flexor muscles, is indicated. In addition, exploration of the three branches of the posterior tibial nerve[1,9] with removal of fibrous tissue involving them, as well as distal exploration of these branches underneath the muscle abductor of the hallux, appear to be important supplementary maneuvers in the surgical approach of the tarsal tunnel syndrome.

Exposure of the retinaculum of the flexor muscles is easily accomplished through a curvilinear incision, starting 2.5 to 3 cm above and behind the medial malleolus, and extending inferiorly and anteriorly to this structure by approximately 4.5 to 5 cm[4]. Figure 2 illustrates the surgical approach in one of the patients.

*Results.* The seven female patients above-described presented with immediate post-operative relief of symptoms, which was documented as being long-lasting in four of them. None of these patients had previously experienced a sustained relief of symptoms by non-surgical therapies. Thus, the present results, as well as the pertinent literature, strongly reinforce the notion that the tarsal tunnel syndrome is, up to current days, a primarily surgical entity.

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