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A Proximal Tibial Neuropathy Mimicking Tarsal Tunnel Syndrome in an Indoor Rock Climber : A Case Report

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Introduction

- Peripheral nerve injuries in sports are increasingly recognized, yet proximal tibial neuropathy in rock climbers has not been previously reported.
- Proximal tibial nerve lesions pose diagnostic challenges due to their potential to mimic distal entrapments such as tarsal tunnel syndrome (TTS).
- We report the first case of climbing-associated proximal tibial neuropathy, highlighting the diagnostic and etiologic challenges encountered.

Case Report

- A 36-year-old male recreational indoor rock climber presented with a nine-month history of progressive left medial plantar paresthesia and first toe flexor weakness.
- Upon reviewing his clinical course, he had been diagnosed with TTS at an outside clinic four years prior without response to multiple steroid injections. Notably, symptoms followed a relapsing-remitting pattern closely tied to climbing activity, with partial improvement during cessation and recurrence upon resumption.
- Physical examination revealed marked atrophy of the left lower leg and intrinsic foot muscles, with grade 0 left first toe flexor strength and preserved ankle plantarflexion and inversion. Sensory examination showed medial plantar hypoesthesia with lateral plantar and sural sparing. However, a negative Tinel sign at the tarsal tunnel, lower leg muscle atrophy, and unilateral left calf tightness during lumbar flexion indicated a more proximal lesion.
- Electrodiagnostic studies (EDX) demonstrated extensive denervation in proximal tibial-innervated muscles (tibialis posterior, flexor digitorum longus, flexor hallucis longus, and soleus) with gastrocnemius sparing, localizing the lesion between the gastrocnemius branching point and the soleus arch (Table 1). Polyphasic motor unit action potentials in the soleus indicated chronic partial denervation with ongoing remodeling.
- Neuromuscular MRI revealed diffuse T2 high signal intensity of the left tibial nerve extending from the mid-thigh to the tarsal tunnel, with preserved fascicular architecture and no focal compressive lesion (Figure 1).
- The patient was diagnosed with proximal tibial neuropathy and advised to cease climbing. At 6-month follow-up, symptoms remained stable without further deterioration.

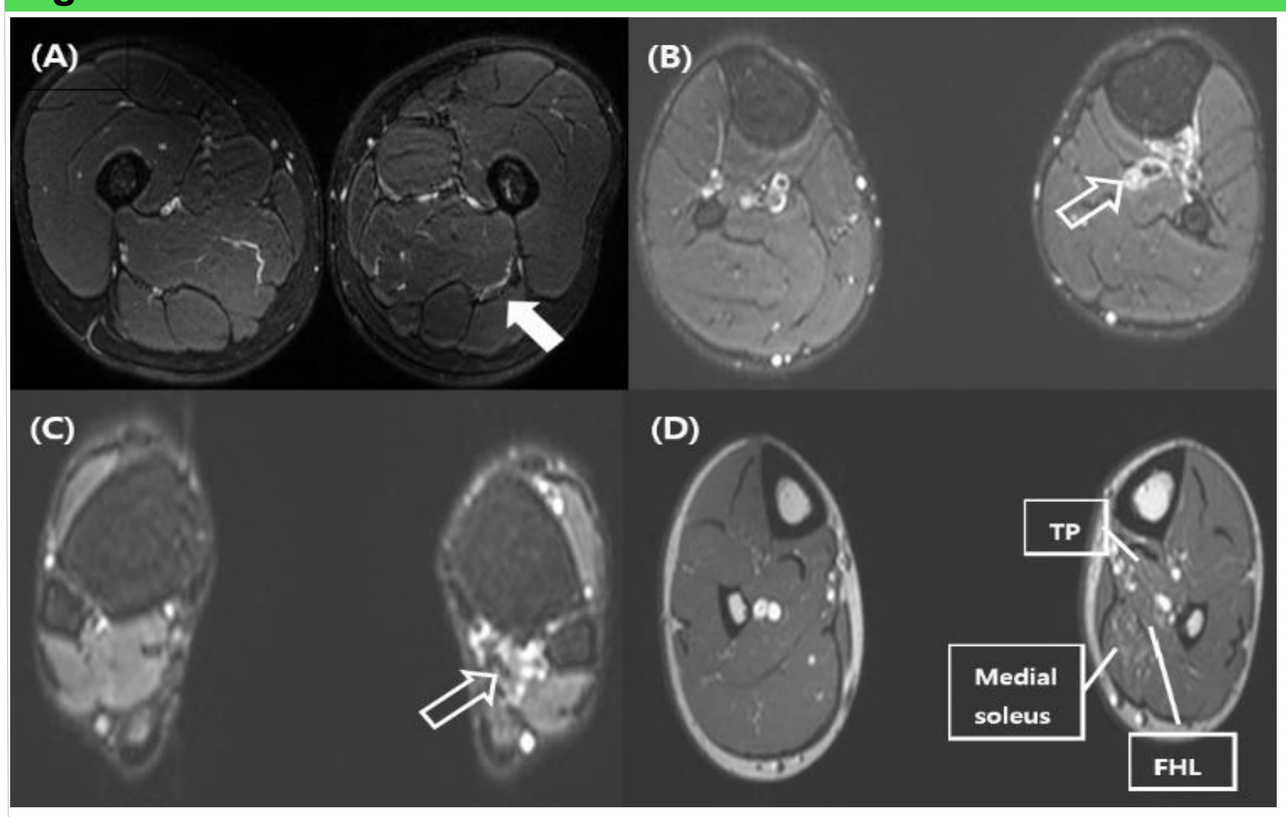
Table 1. Nerve Conduction Study & Needle Electromyography

Nerve	Stimulation	Right			Left		
		Latency[a] (msec)	Amplitude[b]	CV (m/sec)	Latency[a] (msec)	Amplitude[b]	CV (m/sec)
Motor Nerve Conduction Study							
Peroneal	Ankle	4.9	14.91	-	4.0	12.92	-
	Fibular head	12.0	14.75	50.1	10.8	11.88	51.4
Tibial	Ankle	3.7	39.37	-	NR	NR	-
	Knee	10.6	32.70	55.6	NR	NR	NR
Sensory Nerve Conduction Study							
Sural	Ankle	2.7	26.41	-	2.9	25.06	-
Med.plantar	Foot	4.1	3.93	-	NR	NR	-

Muscle	Spontaneous activity			Motor unit action potential			
	IA	Fibs	PSW	Amp.	Dur.	PPP	Recruitment pattern
Lt. S1 PSP	N	N	N				
Lt. BF (SH)	N	N	N	N	N	N	Reduced
Lt. TA	N	N	N	N	N	N	Complete
Lt. PL	N	N	N	N	N	N	Complete
Lt. GCM	Increased	N	N	N	N	N	Reduced
Lt. GCL	N	N	N	N	N	N	Reduced
Lt. soleus	N	+	+	N	N	+	Reduced
Lt. FDL	N	+	+	-	-	-	Nill
Lt. TP	N	+	++	N	N	N	Reduced
Lt. FHL	N	+	+	-	-	-	Nill
Lt. AH	N	+	++	Uncheckable due to poor volition			

FH : fibular head, EMG : Electromyography, IA : insertional activity, Fibs : Fibrillation potential, PSW : positive sharp wave, Amp : amplitude, Dur : duration, PP : polyphasic, TA : tibialis anterior, PL : peroneus longus, GCM : gastrocnemius medial head, GCL : gastrocnemius lateral head, TP : Tibialis posterior, AH : abductor hallucis, FHL : flexor hallucis longus, FDL : flexor digitorum longus, BF (SH) : biceps femoris (short head), PSP : Paraspinalis

Figure 1. Non-contrast MRI of lower extremities



(A) T2 weighted axial image at mid-thigh level showed fascicular signal change and enlargement at the left sciatic nerve. (white arrow)
(B) T2 weighted axial image at lower leg level showed T2 hyperintensity and enlargement of the left tibial nerve. (empty arrow)
(C) T2 weighted axial image at showed T2 hyperintensity and enlargement of the tibial nerve (empty arrow) at the tarsal tunnel level.
(D) T1 weighted axial image showed atrophy of TP, FHL, and medial soleus.

Figure 2. Footwork techniques of Climbing

(A) Smearing technique : A climber presses the sole of the shoe flat against the wall, relying on maximal dorsiflexion of the ankle to create friction when no distinct foothold is available
(B) Edging technique : A climber uses the edge of their climbing shoe - typically with ankle in mild plantarflexion and inversion - to stand on small or precise holds rather than the flat sole
(C) Heel hooking technique : A climber secures the hold using the heel of the shoe, placing the ankle in dorsiflexion and the knee in flexion, and then actively pulls with the heel for upward movement or body stability.

Conclusions

- This case highlights two important clinical lessons for managing sports-related tibial neuropathy.
- First, although the clinical presentation closely mimicked TTS, comprehensive EDX and MRI evaluation of the entire nerve course enabled accurate localization of the proximal lesion.
- Second, in rock climbers, repetitive biomechanical demands during heel hooks, edging, and smearing (Figure 2) may create transient nerve compression at the proximal tibial nerve.
- Thus, clinicians should maintain a high index of suspicion for proximal tibial nerve lesions in climbers with medial plantar symptoms, particularly when clinical findings are inconsistent with TTS or symptoms follow an activity-related relapsing-remitting course.