

CASE REPORT

The accessory deep peroneal nerve and anterior tarsal tunnel syndrome: case report

OSMAN SINANOVIĆ^{1,2}, SANELA ZUKIĆ^{1,2}, ALMA ŠAKIĆ¹ AND MIRSAĐ MUFTIĆ³

¹ Department of Neurology, University Clinical Center Tuzla, ² Faculty of Medicine University of Tuzla, Tuzla, ³ Faculty of Health Studies University of Sarajevo, Sarajevo, Bosnia and Herzegovina

The accessory deep peroneal (ADPN) nerve has been regarded as an anomalous nerve derived from the superficial peroneal nerve or its branch and supplies motor innervations for extensor digitorum brevis (EDB) and sensory innervations for the lateral part of the ankle and foot regions. The EDB is usually innervated exclusively by the deep peroneal nerve, a major branch of the the common peroneal nerve, however, in as many as 28% of patients (with same male/female frequency), one or both of the EDB muscles are (partially or exclusively) innervated by the ADPN nerve. This anomaly appears to be inherited in autosomal dominant fashion with incomplete gene penetrance. ADPN existence is of great clinical and surgical importance, and the aim of this study is to describe a very rare case of coexistence ADPN and anterior tarsal tunnel syndrome.

Key words: accessory deep peroneal nerve, anterior tarsal tunnel syndrome

The different anatomical anomalies of peripheral nerves occur with various frequencies in the population. The most widely recognized are Martin-Gruber anastomosis (MGA), accessory deep peroneal nerve (ADPN), and complete innervations of the intrinsic hand muscles by the ulnar nerve (“all ulnar hand”). Awareness of such anomalies may be important in order to avoid misdiagnoses during electrophysiological study, such as a conduction block involving the ulnar nerve or carpal tunnel syndrome or axonal lesion of the peroneal nerve (1).

The accessory deep peroneal nerve has been regarded as an anomalous nerve derived from the superficial peroneal nerve or its branch and supplies motor innervations for extensor digitorum brevis (EDB) and sensory innervations for the lateral part of the ankle and foot regions (2).

ADPN arises from the superficial peroneal nerve on the lateral aspects of the leg, descends along the posterior border of the peroneus brevis muscle near to the Achilles tendon and sural nerve and winds around the lateral malleolus (Fig. 1) (3).

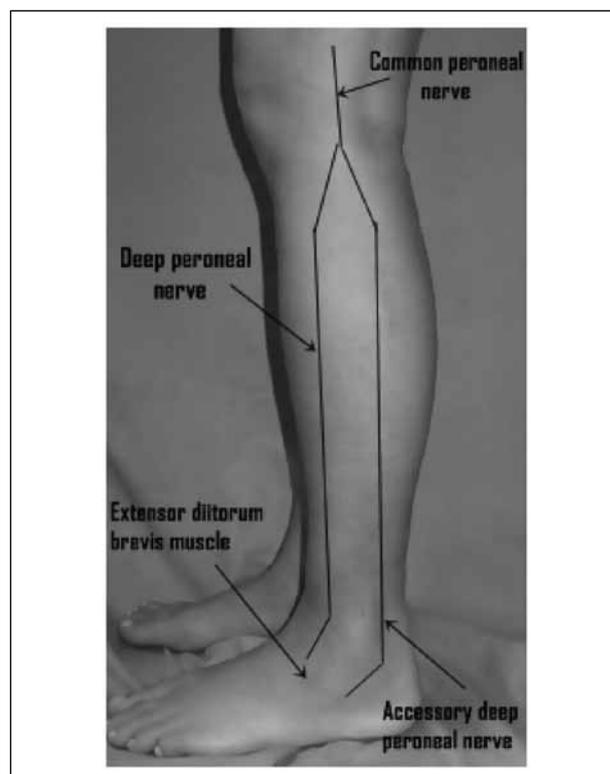


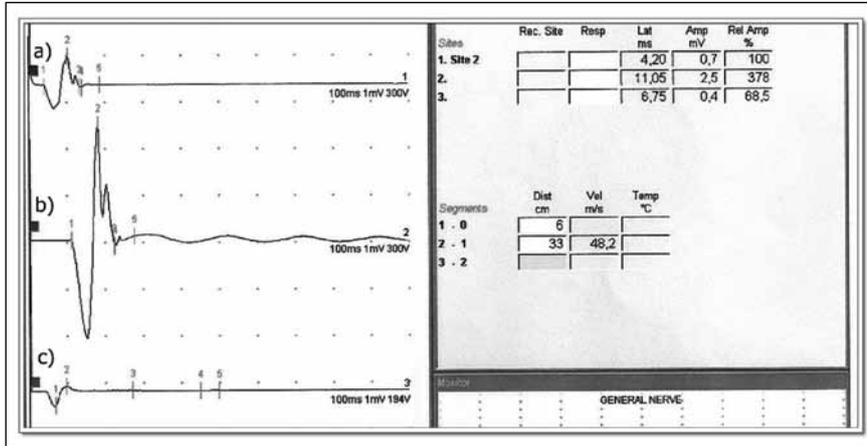
Figure 1. The accessory deep peroneal nerve.

ADPN was reported initially by Ruge in 1878, and the first anatomical description was provided by Bryce (1891, 1901). Winckler published in 1934 a more detailed analysis of this nerve and reported a more frequent occurrence in man (1). From the late 1960s, this anomalous variation has been reported to occur in as many as 28% of people (3-4). This anomaly has an autosomal dominant pattern of inheritance (5-6).

Case report

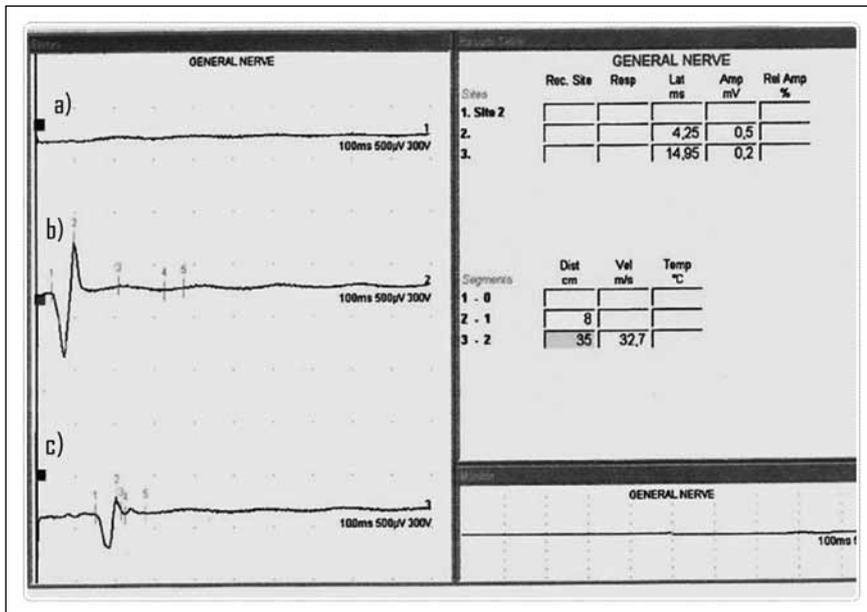
A 25-year-old women presented at our out-patient department for neuromuscular disorders and clinical neurophysiology of a vague pain over the dorsomedial aspect of the foot with occasional radiation into the first web space, for second opinion. At times, the main complaint is numbness within this area. Symptoms started nine months ago during last trimester of pregnancy. The symptom complex often is aggravated by activities but in some cases is more bothersome when she increased activity of the leg. She was diagnosed as “atypical left L5/S1 radiculopathy”.

Examination showed no sensory loss and mild atrophy of left EDB. Electrophysiological studies showed moderate denervation in EDB. The motor conduction velocity of the left deep peroneal nerve proximal to the ankle was normal with prolongation of distal latency and presence of ADPN with partially innervated EDB (Fig. 2). Our diagnostic conclusion was anterior tarsal tunnel syndrome, and she was operated at our Department of Neurosurgery resulting with reduction of the pain.



a) action potential evoked when stimulating the deep peroneal nerve at the ankle; b) action potential evoked when stimulating the common peroneal at the knee; c) action potential evoked when stimulating the accessory deep peroneal nerve

Figure 2. Muscle extensor digitorum brevis partially innervated by accessory deep peroneal nerve.



a) no action potential when stimulating the deep peroneal nerve at the ankle; b) action potential evoked when stimulating the common peroneal at the knee; c) action potential evoked when stimulating the accessory deep peroneal nerve.

Figure 3. Muscle extensor digitorum brevis exclusively innervated by accessory deep peroneal nerve.

Discussion

Neurophysiology of accessory deep peroneal nerve

In a neurographic examination, presence of ADPN should be suspected if the amplitude and area of a response recorded from the EDB is higher after supramaximal stimulation of the peroneal nerve at a proximal (head of the fibula) than at a distal (dorsum of the foot) point (6-8). Or if we have no response of EDB following peroneal nerve stimulation at distal part of the nerve. In such case it is necessary stimulate the nerve behind the lateral malleolus.

ADPN may innervate EDB together with the deep peroneal nerve (Fig. 2), and in rare case it may innervate the muscle exclusively (Fig. 3) (3-4).

If ADPN exists, in case of deep peroneal nerve (DPN) lesion, denervation in all of DPN innervated muscles could be seen except for EDP (4). In case of superficial peroneal nerve (SPN) lesion at distal part of leg there is only impaired sensory SPN response, however in case of ADPN variation, denervation of EDB is also present. In addition, lesions in proximal part of SPN causes usually denervation in peroneus longus and peroneus brevis muscle plus finding of impaired sensory response of SPN. In case of ADPN these findings are accompanied by denervation potentials in EDB (6, 8).

Clinical significance of accessory deep peroneal nerve

In clinical electromyography EDB is known as “the marker” for L5/S1 radiculopathy. The EDB is usually innervated exclusively by the deep peroneal nerve, a major branch of the the common peroneal nerve, however, in as many as 28% of patients (with same male/female frequency), one or both of the EDB muscles are (partially or exclusively) innervated by the accessory deep peroneal nerve, a branch of the superficial peroneal nerve (9). This anomaly appears to be inherited in autosomal dominant fashion with incomplete gene penetrance (10).

According to reviewed literature and personal experience, ADPN existence is of great clinical (diagnostics as well as physical therapy) and surgical importance (1). Namely, superficial peroneal nerve and its branches (including ADPN) are risk for iatrogenic damage while performing arthroscopy, local anesthetic block, surgical approach to the fibula, open reduction and internal fixation of lateral malleolar fractures, application of ex-

ternal fixators, elevation of a fasciocutaneous or fibular flaps for grafting, surgical decompression of neurovascular structures, or miscellaneous surgery on leg, foot and ankle. Furthermore, in the presence of the ADPN, the lesion of the deep peroneal nerve spare the lateral portion of the whole of the EDB, leading to the possibility of an incorrect conclusion (6, 10), as it was case in our patient.

References

1. Owsiak S, Kostera-Pruszczyk A, Rowinska-Maracinska K. Accessory deep peroneal nerve - a clinically significant anomaly? *Neurol Neurochir Pol* 2008;42:112-5.
2. Tzika M, Paraskevas GK, Kitsoulis P. The accessory deep peroneal nerve: a review of the literature. *Foot (Edinb)* 2012;22:232-4.
3. Crutchfield CA, Gutmann L. Hereditary aspects of accessory deep peroneal nerve. *J Neurol Neurosurg Psychiatry* 1973;36:989-90.
4. Ubogu EE. Complete innervation of extensor digitorum brevis by accessory deep peroneal nerve. *Neuromusc Disord* 2005;15:562-4.
5. Kuruvilla A. Accessory deep peroneal nerve. *Neurol India* 2004;52:135.
6. Koo YS, Cho CC, Kim B-J. Pitfalls in using electrophysiological studies to diagnose neuromuscular disorders. *J Clin Neurol* 2012;8:1-14.
7. Mathias S, Ciron J, du Boisqeheneuc F, et al. Study of accessory deep peroneal nerve motor conduction in a population of healthy subjects. *Neurophysiol Clin* 2011;41:29-33.
8. Rayegani SM, Daneshtalab E, Bahrami MH, et al. Prevalence of accessory deep peroneal nerve in referred patients to an electrodiagnostic medicine clinic. *J Brach Plexus Periph Nerve Injury* 2011;6:1-5.
9. Dessi F, Durand G, Hoffman J-J. The accessory deep peroneal nerve. A pitfall for the electromyographer. *J Neurol Neurosurg Psych* 1992;55:214-215.
10. Andersen BL, Wertsch JJ, Stewart WA. Anterior tarsal tunnel syndrome. *Arch Phys Med Rehabil* 1992;73 (811):1112-7.