Frequency of Accessory Deep Peroneal Nerve based on Nerve Conduction Studies

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ABSTRACT

Introduction: Accessory deep peroneal nerve (ADPN) is an anatomic variation that is separated from surface peroneal nerve (SPN). ADPN anomalies must be considered along with unnatural presentation in the peroneal nerve injury, otherwise it will lead into incorrect diagnoses. The purpose of this study was to evaluate the frequency of ADPN by electro-diagnostic in our population. Materials and methods: In a cross-sectional-descriptive study that was conducted in electro-diagnosis clinics of Physical Medicine in medical school of Isfahan University, 165 patients (330 limbs) were investigated based on inclusion and exclusion criteria of the study. Then, recorded responses of extensor digitorum brevis (CMAP) muscle was examined by stimulating the anterior ankle deep peroneal nerve, the posterior fibula as well as back of foreign malleolus, in terms of presence of ADPN. The statistical analysis was performed on data. Results: Among the 165 studied adults, 63(37/6%) of them were male and 103(62/4%) of them were female. The mean age of them was 46+13/2 with a minimum and a maximum of 18 and 80 years, respectively. Among them, 20 (12/1%) had ADPN that in 6 of them (30%) ADPN was in the right side and in 12 (60%) of them ADPN was in left side, and in two cases (10%) this variation was observed bilaterally. Conclusion: Although the prevalence of ADPN can be more in Kadavr studies, but based on the results of EDX, we can obtained the prevalence of about 12% that can be result of genetic problems in the studied population.

Introduction

Accessory deep peroneal nerve (ADPN) is a common anatomic variation that is separated from surface peroneal (SPN) (1) and after passing beside foreign malleolus inner vesextensor digitorum brevis muscle and exterior surfaces of the foot and ankle (2). The presence of accessory deep peroneal nerve was reported in 1896 for the first time and it was included in the long branch of musculocutaneus nerve of foot (3). The degree of appearance of this nerve has been reported in various studies so that Rayeghani et al reported its degree as 12 % and his colleagues reported it as 35%, based on electro-physiological studies (6). The presence of ADPN is clinically is important since in people who have this variations, unnatural results have been reported, based on electro-diagnostic studies. For example, if one person has complete damage to deep peroneal nerve (DPN), it is falsely shown as incomplete injury, because denervation is seen in all muscles that is innervated by deep peroneal nerve, except extensor digitorum brevis (7,8). In addition, surface peroneal nerve injury is considered as the shared peroneal injury, because we observe also denervation of extensor digitorum brevis in addition to sensory disorder or denervation in longus and peroneus muscles and brevis, depending on this issue that if injury is on the distal or proximal part of ankle. Therefore, this suggests DPN is also involved in addition to SPN, so it is said that injury is in the shared peroneal nerve (9).

Thus, this anomaly should be considered be considered in the peroneal nerve injury along with abnormal presentations. When suspect this anomaly when the potential action of muscle compound (CMAP) obtained from extensor digitorum
brevis in the stimulation of peroneal nerve in the anterior part of ankle is lower than stimulation of head part of fibula or its not obtained.
The aim of this study was to evaluate the frequency of ADPN based on electro-diagnostic studies in the target population, as well as reemphasizing on the issue that this anomaly must be considered in the normal electro-diagnostic studies.

Materials and Methods

The study was conducted in the Department of Physical Medicine and Rehabilitation of Medical Sciences of Isfahan in a way that patients who had referred to electro-diagnosis centers due to their upper limb disorders. After giving needed explanations about the actions that would be done on them, written consent was obtained of them. Then, both lower limbs of them were examined and those patients who had neurological problems were excluded from the study and only those who were normal in terms of sensory-nerve examination of lower limb and lack of chronic diseases such as diabetes were included in the study that their number was 165.

First, we attached the surface record electrode on extensor digitorum brevis muscle and stimulated the deep peroneal nerve of three areas through surface stimulating electrode as mentioned below (surface stimulating electrode has been commonly used to stimulate and surface recording electrode has been sued to record).

1. Anterior part of ankle (distal)
2. Around the fibula (proximal)
3. Back of foreign malleous

In all three points, we increased the intensity of stimulation and we increased its level to supera maximal level so that we can record the maximum CMAP by muscle of extensor digitorum brevis, and all responses are reserved for analysis. In people which the mean of sural sensory of potential action was higher mean of sural sensory of CMAP stimulated from anterior part of ankle and by stimulating in the foreign malleous that potential action was obtained, the presence of accessory peroneal nerve was confirmed. If the amp of proximal was higher than distal but no response was recorded by stimulating the lateral malleous area or amp of proximal was lower than distal but no response was recorded by stimulating the lateral malleous area, test should be repeated so that both cases are confirmed. All stages are done by physical medicine and rehabilitation specialist or under his direct supervising.

Information included age, sex and amp of CMAP of EDB muscle resulting from proximal and distal stimulation that were recorded for analysis. Finally, all data were included in SPSS 19 software and they stated by descriptive statistical indices.

Result

Among the 165 studied adults, 63(37/6%) of them were male and 103(62/4%) of them were female. The mean age of them was 45/99 +/- 13/22 with a minimum and a maximum of 18 and 80 years, respectively. The age mean of males and females were not significantly different in a way that their age was reported as 44/58 +/- 13/40 and 48/32 +/- 12/69, respectively. Among them, 20 (12/1%) had ADPN that in 6 of them (30%) ADPN was in the right side and in 12 (60%) of them ADPN was in left side, and in two cases (10%) this variation was observed bilaterally. The frequency of this variation was not significantly different in the male and female groups in a way that it was reported as 6 and 14, respectively. Details of frequency findings of presence of ADPN in the left and right lower limb.
Figure 1: ADPN frequency of left and right lower limb based on gender

Figure 2: ADPN frequency circle in the studied population
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Discussion

The presence of ADPN is importance clinically that its main reason is due to innervation of EDB nerve, complete or incomplete. In addition, this variation can take the sense of ankle joint and ligaments of this area that can respond problems resulting from this nerve (10). This variation causes that some faults to be created in the electro-diagnostic studies, for example, complete injury of deep peroneal nerve may be shown as incomplete or surface peroneal nerve injury may be considered as shared peroneal injury. The results of our study show frequency of ADPN as 12 % among 165 people, 10 % of them have bilateral ADPN, 30% of them have right ADPN, and remaining 60 % of them have left ADPN. Other studies conducted in this regard have shown different statistics, for example, in the anatomical studies conducted on cadavers, Bryce has reported this amount as 14/5 % among the 55 studied people (11). In this line, Wincker examined 19 lower limbs in which he found 36/8% ADPN (12), while Kudoh et al observed it in 100% feet (24 feet) they examined (13). In addition, several electro-physiological studies have been conducted, for example, reported its amount as 28% by investigating 50 people (14). By examining 200 feet of 100 people, Crutchfield and Gutmann showed 22% frequency of ADPN. Among 52% right lower limbs that Neundorfer and Seibirth examined, they observed that half of them have this variation (16), while Mapelli et al examined 52 people and they reported the same amount (25%) (17). Gonenc and Budak conducted this study on 108 feet and 216 people, and finally they found out that 21% of them have accessory nerve and have the highest bilateral ADPN (74%) among the conducted investigations (18). Azouvi et al showed that 17.9 % of 67 patients have this variation (19) and Mathis et al studied 400 lower limbs of 200 people and found unilateral ADPN as 13/5%, while they reported bilateral ADPN as 22 % (19). Finally, these differences could be due to genetic differences or the techniques used since Kayal et al claimed that more ADPN was reported in centers where lateral malleous is stimulated to investigate peroneal motor (20).
Conclusion

The frequency of ADPN is clinically important because its presence is very important for foot and ankle surgeons. Therefore, based on findings of this study, while the prevalence of ADPN may be high in cadaver studies, based on findings of EDX, we obtained its prevalence 12% that can be due to genetic issues of studied population.

References