Hereditary aspects of accessory deep peroneal nerve

C. A. CRUTCHFIELD AND L. GUTMANN

From the Department of Neurology, West Virginia University Medical Center, Morgantown, West Virginia, U.S.A.

SUMMARY Hereditary aspects in the anomalous innervation of the extensor digitorum brevis muscle by the accessory deep peroneal nerve, were investigated. Utilizing electrophysiological techniques, 22% of 100 healthy unrelated individuals demonstrated this variation in innervation of one or both extensor digitorum brevis muscles. The study of family members of five of these subjects with the variation showed that 78% of relatives also had this anomalous innervation. These data suggest that hereditary factors may be significant in the occurrence of this variation and a dominant mode of inheritance may be the case.

The accessory deep peroneal nerve, a branch of the superficial peroneal nerve, may partially innervate the extensor digitorum brevis muscle (EDB) of the foot. This has not been widely known and standard textbooks of anatomy report this muscle to be supplied only by the deep peroneal nerve (Gray, 1959). This anomalous variation has been reported to occur in as many as 28% of people and an awareness of it is important in the evaluation of common and deep peroneal neuropathies (Winckler, 1934; Lambert, 1969; Gutmann, 1970; Infante and Kennedy, 1970).

The present study was undertaken to investigate the occurrence of this anatomical variation in families and compare this with a control population using electrophysiological techniques.

METHODS

One hundred apparently healthy, unrelated persons, 50 males and 50 females, were studied to determine the innervation of EDB. All were students, faculty members, and employees of West Virginia University. Ages ranged from 17 to 63 years with a mean age of 22 years. These individuals served as the control population. Five members of this original group, showing the anomalous innervation of the EDB, served as the probands for the family study.

Nerves were stimulated with a single rectangular electrical pulse from a Grass S-4 stimulator. The common peroneal nerve was stimulated at the knee above the head of the fibula, the deep peroneal nerve

FIGURE Pedigrees of families with accessory deep peroneal nerve innervating EDB.

at the dorsum of the ankle, and the accessory deep peroneal nerve over the posterolateral aspect of the ankle, just behind the lateral malleolus. Nerves were stimulated supramaximally at all sites using percutaneous stimulating electrodes. The surface recording electrodes were placed over the mid-point of the

EDB and a reference electrode over the base of the fifth toe.

The action potentials were amplified and displayed using Tektronix amplifier Type 3A74, differential amplifier Type 2A61, time base Type 2B67, and cathode ray oscilloscope Type 561A. Data were recorded on Kodak Tri-X panchromatic 35 mm film. The presence of a visible EDB twitch and an amplitude of the evoked muscle action potential of 0.2 mV or greater upon stimulation of the accessory deep peroneal nerve were taken as indications that an individual nerve contained a sufficient number of axons to be considered a positive identification in the study.

RESULTS

The study showed that the EDB is at least partially innervated by the peroneal nerve in 22 of 100 individuals tested (five of these bilaterally). The pedigrees of five of these individuals showing this variation in the innervation of the EDB served as the basis for the family study as shown in Fig. 1. In family no. 1, four subjects were tested. Three siblings showed the variation, while one parent studied did not. In family no. 2, it was found in one parent (both were tested) and in the only offspring tested. Four siblings and both parents were tested in family no. 3 and all showed evidence of the accessory deep peroneal nerve. Both offspring and the husband of one of the siblings in this family were tested and only one of the offspring showed the variation. In family no. 4, two siblings were tested and both demonstrated the variation. In family no. 5, five siblings were studied and all demonstrated the variation.

DISCUSSION

The finding that the EDB is partially innervated by the accessory deep peroneal nerve in 22% of individuals indicates that this is a common anatomical variant. This supports the conclusions of earlier investigators that this variation in the innervation of the EDB occurs in 21% to 28% of individuals (Winckler, 1934; Lambert, 1969; Infante and Kennedy, 1970).

In studying the family members of five involved subjects, 14 of 18 individuals (78%) also showed the variation. The variation was present in more than one generation in the two families in which this could be satisfactorily evaluated. Using this data, a hypothesis that the presence of the variation is independent of familial relationships would be rejected ($P < 0.01$) in favour of an alternative that hereditary factors may be significant. The data involving more than one generation in each family are not sufficiently complete to warrant any definite conclusions regarding mode of inheritance. Nonetheless, the possibility of an autosomal dominant mode is suggested by the available data.

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