Frequency of Type-1 Berrettini’s Connection in a Neurophysiology Laboratory

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Introduction

Electromyographic and nerve conduction studies of the upper limbs are routine procedures in clinical neurophysiology laboratories to diagnose different peripheral nerves’ disorders. Several connections between the median and ulnar nerves, outside the brachial plexus, have been identified: the Martin–Grüber communication, Marinacci communication, Riché–Cannieu communication, and Berrettini communication. The latter consists of communication of sensory fibers, most frequently between the fourth palmar digital common nerve (coming from the ulnar nerve) and the third palmar digital common nerve (coming from the median nerve). The importance of its recognition is the potential intrasurgical injury.1 Also, 16% of iatrogenic injury cases occur due to the superposition of the sensory innervation with that of the ulnar nerve or by a motor branch to the thumb’s abductor brevis muscle, originating from the deep distal branch of the ulnar nerve.2 The Berrettini connection can be injured during endoscopic surgery for carpal tunnel syndrome, or secondary to the surgical release of Dupuytren’s contracture.3,4 It can even be potentially injured during open surgery.5 A study that evaluated the adverse effects of median nerve release surgery by experienced surgeons, endoscopically compared with open surgery, showed that iatrogenic injury to this connection was the most frequent during the first modality.6

Anatomical studies consider it to be a standard anatomical variant, due to its high frequency.1 However, it is not frequently investigated in electrophysiological studies on a routine basis. Therefore, this work aims to determine the frequency of this communicating branch’s presence through sensory conduction studies.

Abstract

Objectives

This study aims to estimate the frequency of Berrettini’s ulnar-median nerves communication in a neurophysiology laboratory.

Materials and Methods

A total of 358 hands belonging to patients, both sexes, median age of 58 years, was studied. Antidromic sensory nerve conduction studies of the ulnar nerves, registered in digits III and IV were performed in search of the ulnar-median communication. A Berrettini’s percentage was calculated in each communication: [(amplitude SAP digit III/amplitude SAP digit IV) × 100].

Results

Ulnar-median nerves communication (Berrettini’s branch) was found in 37 hands (10.95%), with a female gender predominance. Bilaterality percentage was low (1.78%). Most communications encountered had a Berrettini’s percentage between 11 and 50%. Some of them exceeded 100%.

Conclusions

Electromyographers should routinely search for this nerve communication, especially in those patients undergoing carpal tunnel syndrome or Dupuytren’s contracture surgeries.
Materials and Methods

A prospective study of the electrophysiological evaluations of the hands corresponding to patients of both sexes who attended the Clinical Neurophysiology Service of the German Hospital, Buenos Aires, Argentine Republic, during 2020. Exclusion criteria corresponded to patients with diagnoses of advanced peripheral neuropathies (acquired or hereditary), neuropathies of the ulnar nerve (at the level of the Guyon canal or the level of the ulnar canal at the elbow), those hands belonging to patients with a history of surgery for carpal tunnel syndrome, Dupuytren’s contracture, or neurovascular island flaps. Patients with other neuromuscular conditions were included. Sensory conduction studies were performed antidromically, using ring electrodes on the third and fourth fingers, 4 cm apart (Fig. 1). The active ring electrode was placed 1 cm from the base of the finger, to avoid the presence of artifacts. The temperature of the skin of the palm was kept at 32°C. The median and ulnar nerves were stimulated, at the wrist level, at a distance of 14 cm proximal to the active ring electrode (Fig. 1). The averaged data of the sensory action potentials (SAP) were obtained: peak latencies and amplitudes from the baseline to the SAP obtained peak were analyzed (Fig. 2).

The amplitudes of the third finger’s responses when stimulating the ulnar nerve were compared with the amplitudes of the responses obtained in the fourth finger when stimulating the ulnar nerve, a Berrettini’s percentage was calculated [(amplitude digit III/amplitude digit IV) x 100]. The normal peak latency of the SAP recorded at the fourth finger was established at ≤3.5 ms. SAP belonging to Berrettini’s communication had similar peak latencies to those obtained in the fourth finger, in addition to a good configuration. Electrophysiological studies were performed with Dantec Keypoint equipment, version 2.40.0.263.

Statistical Analysis

A descriptive statistical analysis of the following variables was performed: gender, left or right handedness, and the Berrettini percentage.

Results

Three hundred and thirty-eight hands belonging to 169 patients with a median age of 58 years (age range: 18–85 years) were studied.

The present work followed the World Health Organization (WHO) Ethical Code (Helsinki’s Declaration), and the Habeas Data Law. All the participants signed an informed consent, and the local Ethics Committee approved the research work.
bilateral. Eighteen unilateral Berrettini’s communications were found in left hands (53%).

When considering the Berrettini ratio, four groups were found (→ Table 1): the highest percentage corresponded to 11 to 50%.

### Discussion

In the present work, the frequency of Berrettini’s communication’s electrophysiological finding was 10.95% which would imply a prevalence of 20%. The prevalence was higher in women. In a low percentage, the presence of this connection was bilateral.

This frequency is lower than that reported by the work performed at Wayne State University, Michigan, which was evaluated from 33.9% of the patients. The explanation for this difference in frequencies could not be found with the data obtained and analyzed. In both studies, the low frequency of bilaterality is low, and the predominance in the female gender was found. However, the frequency of Berrettini’s anastomosis encountered in the present study is slightly higher than the one reported in a study performed in Lima, Perù, which was 9.4% of the cases.

Most Berrettini’s communications encountered in this study had a Berrettini’s percentage between 11 and 50%. However, some connections had a Berrettini’s percentage higher than 100%. This finding was remarkable: these communications may probably have a greater number of axons than the fourth finger’s cutaneous branch of the ulnar nerve. In a case series by Seidel et al, ulnar sensory nerve action potential (SNAP) amplitudes measured in the third finger were smaller than those measured in the fourth finger. In the study published in 2019, ulnar SNAP amplitudes measured in the fourth finger were 27% the size of those measured in the fourth finger.

Pietro Berrettini da Cortona (1596–1669) was an architect and painter who illustrated the super anatomical atlas which was published in 1741.

### References