Electrodiagnostic description of a rare variant of Berrettini anastomosis: A case report

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ABSTRACT

INTRODUCTION: Berrettini Anastomosis is a common purely sensory anastomosis between ulnar and median nerves in palm. Here, via a communicating branch, ulnar nerve can provide sensory supply to digits 3 and 2. There have been electrodiagnostic (EDX) descriptions of the former. However, till date, to the best of our knowledge, there have been no EDX descriptions of the latter. Here, in our case report we would like to describe first instance of the same.

PRESENTATION OF CASE: During an assault with a knife a 25-year-old male sustained laceration injury of right median nerve and flexor tendons which were repaired surgically. During rehabilitation, a nerve conduction study (NCS) was performed which incidentally revealed that ulnar nerve was responsible for sensory innervation of digit 2.

DISCUSSION: Until recently, it was generally believed that EDX of BA was not possible. However, recent studies on EDX features in BA, have recorded small sensory nerve action potentials (SNAP) from digit 3 on distal ulnar nerve stimulation. But there are no published reports where SNAP from digit 2 on ulnar nerve stimulation were studied, even though anatomical evidence of the same exists. In our patient, we incidentally recorded the same.

CONCLUSION: Although our patient had a complete laceration of median nerve, he did not have major sensory disturbances. NCS findings suggested sensory supply of digits 5, 4, 3 and 2 were by ulnar nerve. Without adequate knowledge of communicating branch crossovers in palm, there is a possibility that clinical findings can be misdiagnosed and NCS features can be misinterpreted. For surgeons, awareness of these communicating branches can prevent iatrogenic injuries during surgical interventions.

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1. Introduction

Normally, sensory supply of palmar aspect of digit 5 (D5) and medial half of digit 4 (D4) is by ulnar nerve (UN). While the lateral half of digit 4 and the remaining digits are supplied by median nerve (MN) (Illustration 1). Berrettini anastomosis (BA) also known as superficial palmar communication is a very common purely sensory palmar anastomosis between UN and MN. BA is reported to have a high prevalence of 60.9%, due to which, it is generally considered to be a normal anatomical structure rather than a variation. In the vast majority (86.2% of all BA) the communicating branch (CB) arises from 4th common digital nerve (CDN), branch of UN in palm and joins the 3rd CDN, a branch of MN (Illustration 2) [1–3]. BA is named after Pietro Berrettini da Cortona, an Italian painter who provided the earliest illustration of this communication in 1741 [4]. Despite knowledge of its existence since centuries there had not been much progress in terms of evaluating EDX properties of BA using NCS. In fact, it was generally accepted that BA could not be diagnosed by EDX techniques [5–7]. It was in 2018 that Seidel et al. provided for the first EDX evidence of BA: an UN sensory crossover supplying digits [D3] [8]. However, till date there has not been any EDX description of sensory UN crossover to digit 2 (D2). Here, in this case report, we describe about a UN sensory communication to D2 and elaborate on its EDX features, which to the best of our knowledge is the first instance of such a report.

2. Case report

While on vacation break, a 25-year-old right-handed male medical student had an altercation during which he was assaulted by a knife which resulted in a deep laceration injury to right palm
and wrist region. The laceration extended from the base of the 5th metacarpal obliquely zig-zagging across hypothenar eminence and into wrist and distal forearm region. He had no significant past medical, surgical, family, drug or psychosocial history. The injury resulted in a complete laceration of deep branch of MN along with lacerated flexor tendons. There were no associated bony or major vascular injuries. At a regional hospital, under brachial plexus block, lacerated flexor tendons were sutured and an epineural repair for MN injury was performed. During rehabilitation, about a month post surgery, he noticed stiffness of right wrist and fingers with associated numbness over the thenar aspect of palm. At which time he presented to our institute. On examination, his hand and digits were in a state of extension with adaptive shortening of long flexors. Flexion movements of the digits were restricted (Fig. 1). To investigate further he was advised NCS. Motor NCS of right MN did not produce any recordable compound muscle action potentials (CMAP) when stimulated either at proximal or distal sites. However, CMAP recordings from right UN and radial nerve were normal.

Sensory NCS of right MN did not produce any recordable SNAP over D2 (Fig. 2A). Distal stimulation of UN while recording over D5 (Fig. 2B), D4 and D3 resulted in a normal SNAP. Furthermore, the most significant finding was that upon distal stimulation of UN while recording over D2 also resulted in a normal SNAP (Fig. 2C), the amplitude of which was 64% the SNAP amplitude recorded from D5. This suggested that UN was responsible for sensory supply of D2 (Illustration 3). NCS values obtained have been presented in Table 1.

3. Discussion

In literature, there are quite a few studies pertaining to anatomical description of CB in BA along with various classification systems [9–13]. However, only one cadaveric study reports of UN CB anastomosing with nerves providing sensory innervation to D2 [13]. In May 2020, Seidel et al. provided a systematic EDX description of BA [14]. In this study, they were able to record small SNAP from

Fig. 1. A healed scar from the laceration injury and surgical intervention that followed can be seen running from the base of little finger across hypothenar eminence in a zig-zag fashion extending to the wrist and distal forearm region.

Fig. 2. A,B,C are sensory NCS waveforms recorded from our patient and X,Y,Z are sensory NCS waveforms obtained from a normal healthy volunteer. Figure A: Sensory NCS from distal median nerve stimulation while recording over index finger demonstrating absent SNAP. Figure B: Sensory NCS from distal ulnar nerve stimulation depicting normal SNAP while recording over little finger. Figure D: Sensory NCS from distal ulnar nerve stimulation revealing normal SNAP while recording over index finger. Figure X: Sensory NCS from distal median nerve stimulation while recording over index finger demonstrating normal SNAP. Figure Y: Normal SNAP while recording over little finger when distal ulnar nerve is stimulated. Figure Z: Absent SNAP over index finger on distal ulnar nerve stimulation in a healthy volunteer.
D3 and D4, while UN was being stimulated distally. They reported that the frequency of EDX measurable BA from D3 was 34%. SNAP amplitudes of UN crossover to D3 were on an average 27% of the amplitude of ulnar D4 SNAP [14].

As seen from the previous two studies pertaining to EDX descriptions of BA [8,14], their NCS findings are related to sensory UN CB innervating D3. The authors however, did not report on UN sensory crossover to D2 [8,14]. Upon an exhaustive literature search, neither were we able to find any EDX report of UN CB resulting in sensory supply of D2, despite anatomical evidence for the same. This report is the first EDX description of the same. For comparison, sensory NCS findings that were carried out on a healthy volunteer have also been presented. Fig. 2X, represents NCS waveforms recorded on distal MN stimulation while recording over D2. Distal UN stimulation while recording over D5 and D2 are depicted in Fig. 2Y and X respectively. NCS values of the same are tabulated in Table 2.
over 15 years of experience and was assisted by a final year academic resident in Physiology. The procedure was carried out under the supervision of a neurosurgeon with over 15 years of experience.

Although the study clearly recorded UN SNAP from D2, we are unsure if recordings with similar amplitudes would be obtained in the absence of MN laceration injury. There is a possibility that nerve fibers from UN might have been augmented to compensate for MN injury. At the time of most recent online follow up, the patient had significant improvement in range of movements of his digits. He continued to receive physiotherapy. He was advised progressive passive stretching of fingers and first web space, along with the continued use of sputnik splint. This case study has been reported in line with the SCARE 2018 criteria [15].

4. Conclusion

The findings in our case report have profound clinical implications. Clinically, the patient did not have major sensory disturbances despite a complete laceration of MN. There is a possibility that clinical signs and symptoms could have been misinterpreted leading to misdiagnosis. Adequate knowledge of the waveform patterns on NCS resulting from UN CB crossovers can prevent erroneous conclusions of EDX findings. Additionally, awareness of these CB can prevent iatrogenic injuries during surgical interventions in palm.

Declaration of Competing Interest

The authors report no declarations of interest.

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Ethical approval

This case report is exempt from ethical approval of our institution.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

All the authors participated in formulation of study concept and design, data collection and analysis, and preparation of the manuscript.

Registration of research studies

1. Name of the registry: Not applicable
2. Unique identifying number or registration ID: Not applicable
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