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Background

The major complaints of patients affected by ulnar neuropathy at the elbow (UNE) are sensory symptoms in the ulnar-innervated parts of the hand and digits. Pain may be present in the same territory, radiated at the elbow or widespread in the arm. The ulnar nerve supplies the proximal part of the border of the palm by the palmar cutaneous branch, the ulnar side of the hand dorsum and of the dorsal surface of IV and V digits by dorsal cutaneous branch and the distal ulnar border of the palm and palmar surfaces of the V and half of the IV digits by superficial terminal branch. Usually sensory symptoms of UNE do not match with this distribution and often the localization of UNE sensory symptoms is restricted to a part of the anatomical region of sensation of the ulnar nerve.

Aim of the study

To calculate the relations and agreement between the sensory symptoms complained by the patients, the clinical evaluation of sensation of the V digit and the findings of ulnar nerve sensory neurography.

Patients & methods

We used the database of our multicentre epidemiological prospective study on the risk factors of UNE. Case and controls were consecutively recruited from May 2014 to April 2016 among all patients referred to 4 outpatient EMG labs. UNE diagnosis was based on clinical findings and MCV delay of the ulnar nerve across the elbow. Controls were the other subjects admitted because upper limb complaints other than UNE and with normal ulnar nerve MCV across the elbow. The subjects with age <14 and >70 years, diabetes, connective diseases, carpal and Guyon's tunnel syndromes, polyneuropathy, C8-T1 radiculopathy, plexopathy, thoracic outlet syndrome, ALS and cancer in the previous five years were excluded from cases and controls. Sensory neurography included SCV and SNAP amplitude of the ulnar nerve in the IV and V digit-wrist segments (U4 and U5) and of the dorsal cutaneous ulnar nerve (DUC) in the styloid ulna-hand dorsum segment. The self-administered hand diagram was used for the evaluation of the distribution of symptoms reported by the patients [1]. The sensitivity was tested comparing the palmar aspect of the V digit vs. II or III digit by use of wadding or Semmes-Weinstein monofilament.

Results

We enrolled 157 cases (mean age 50.3±12.1 years, 58.6% males) and 348 controls (mean age 46.5±12.3 years, 54.9% females). All cases and 16.4% of controls were included in "possible" or "definite" ulnar aspect of hand according to hand diagram. The figure 1 shows the percentage of hand regions signed on the hand diagram by the cases and controls, loss of sensation detected in V digit and abnormal SNAP amplitude of U4, U5 and DUC recorded in the cases and controls. The agreement of abnormal/normal SNAP of U4, U5 and DUC with abnormal/normal hand diagram and the agreement of abnormal/normal sensation of the V digit with abnormal/normal U5 SNAP amplitude and with abnormal/normal V digit hand diagram are reported in the figures 2 and 3. The agreement is sufficiently high in almost all pairs.

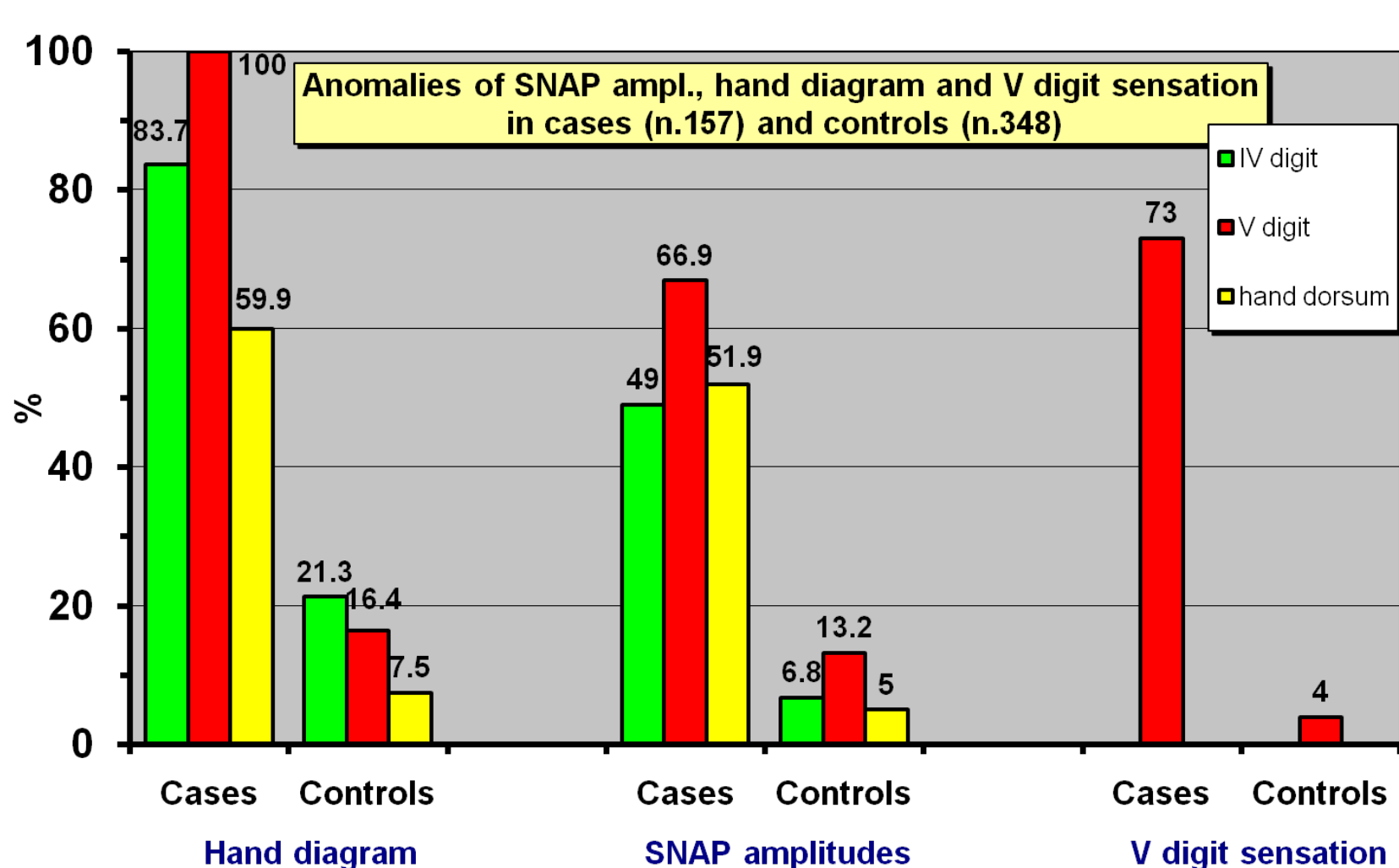


FIG 1

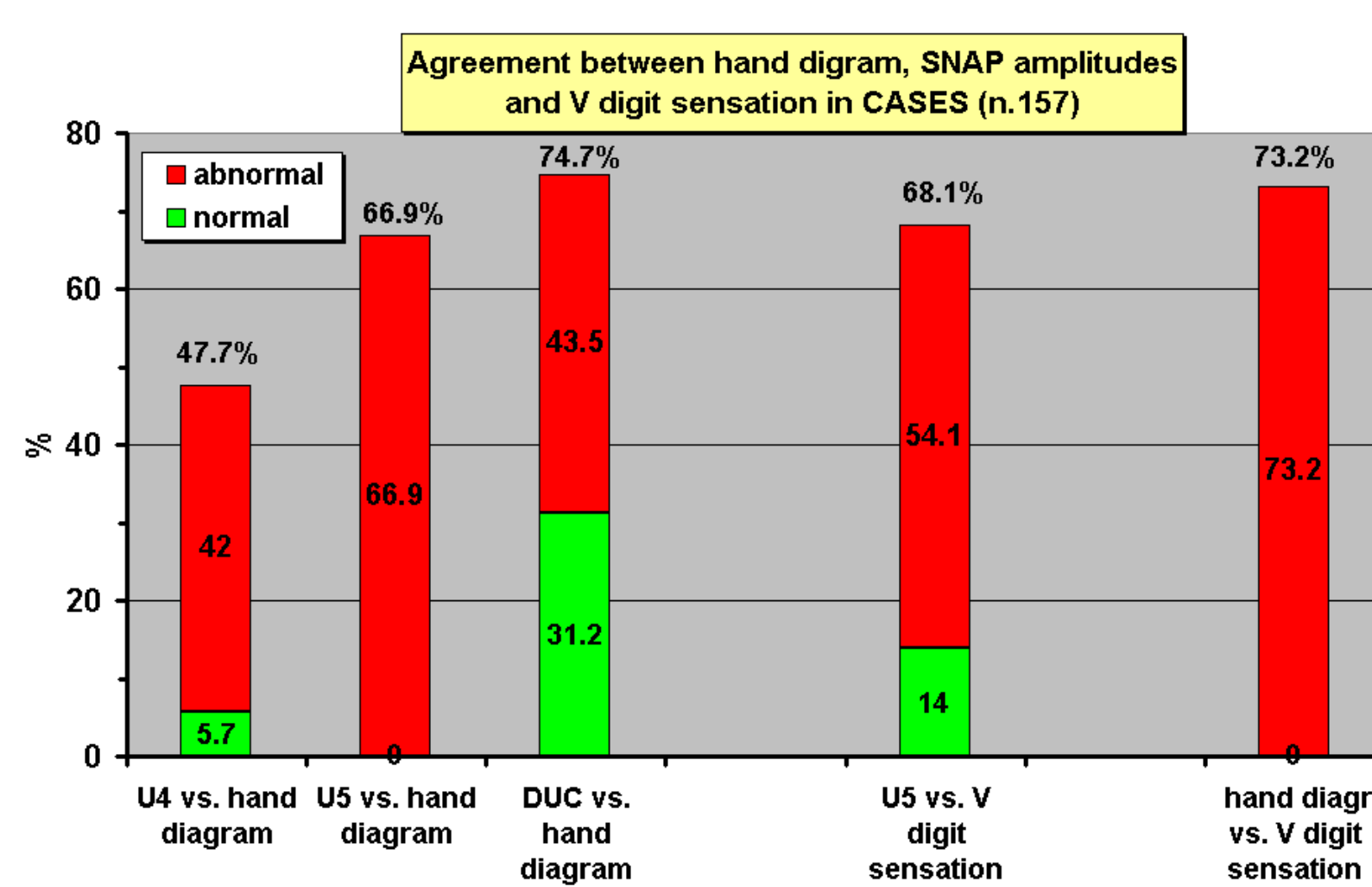


FIG 2

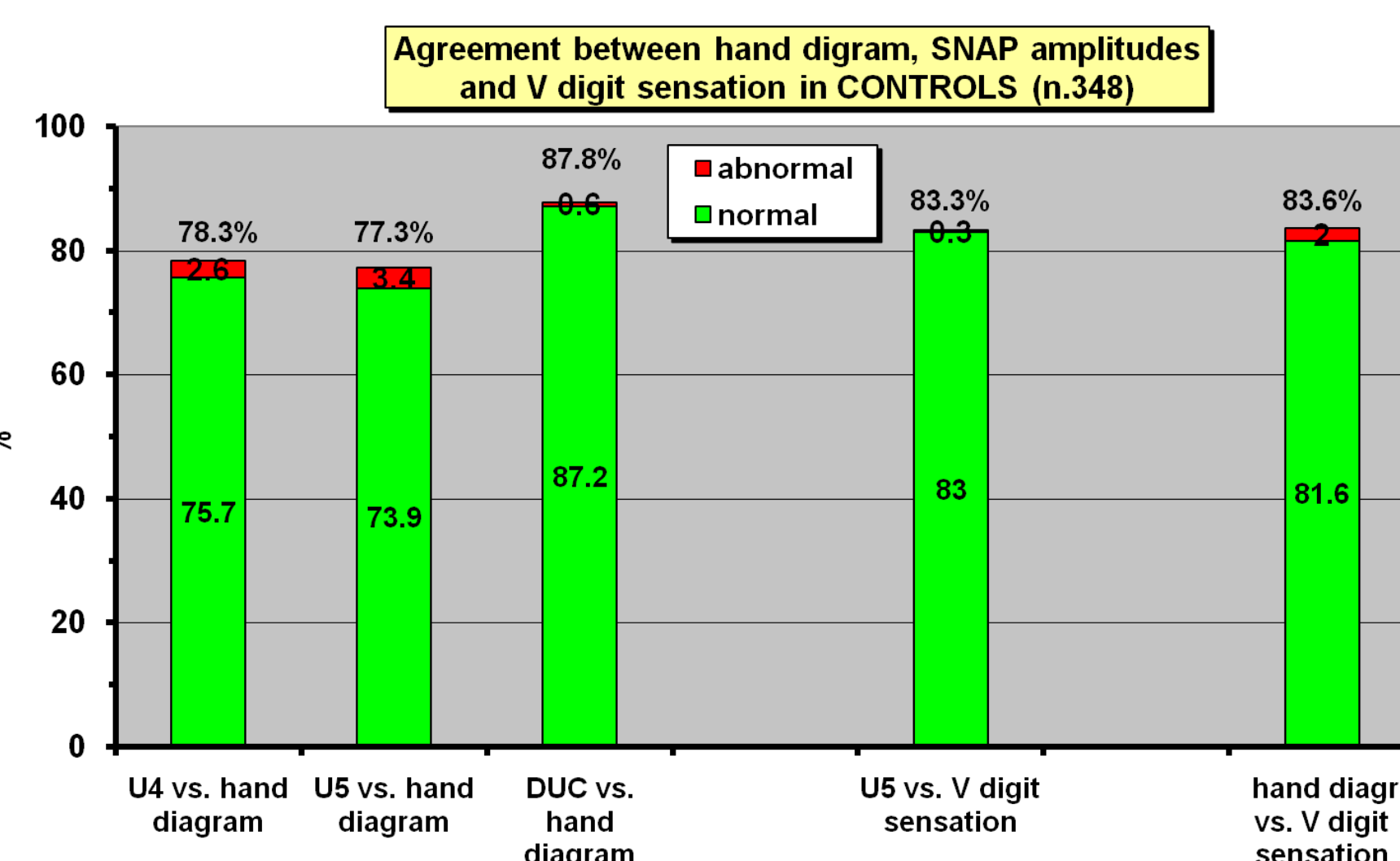


FIG 3

Discussion

There is significant variability in the distribution of symptoms reported by the patients versus the anatomical distribution of the sensory fibers. The internal topography of a nerve has substantial clinical relevance in terms of the clinical manifestations following nerve lesions. The nerve lesions are often partial sparing some nerve fascicles. Therefore a partial proximal nerve lesion of the ulnar nerve may selectively damage just some nerve fibers/fascicles sparing others resulting in such restricted motor or sensory deficits that the lesion appears to be more distal than it actually is [2]. In addition the topographical position of the motor fascicles supplying two forearm muscles (flexor carpi ulnaris and flexor digitorum profundus of the fourth and fifth digits) and of the sensory fibers coming from the dorsum of the hand may explain because these fibers are less predisposed to compression in the elbow region [2] (Figure 4). Even if the nerve damage is at the elbow, often only the terminal digital sensory branch may be involved; this would falsely localize the lesion to the wrist [2]. Therefore the selective fascicular damage of UNE is likely the main cause of these restricted clinical deficits. In our series only 39.6% of UNE cases signed the dorsum of hand and 51% showed the drop of DUC SNAP amplitude; these low percentages are also due to anatomical variation in sensory innervation of the dorsum of hand from the radial nerve or to the presence of communicating branches between the superficial nerves of hand [3] (Figures 5-6). In our series we observed about 5% of cases and controls had SNAP recording from the ulnar part of hand dorsum following stimulation of the radial nerve at the wrist and in half of these cases the anomaly is unilateral. Therefore if DUC SNAP is absent, anatomical variation should be always checked.



FIG 6. All-radial supply to the dorsum of the hand. SBRN superficial branch of the radial nerve; black pinhead indicates the radial styloid process. Sulaiman S, et al. The sensory distribution in the dorsum of the hand: anatomical study with clinical implications, Surg Radiol Anat. 2015; 37:779-85



FIG 4. Intraneural topography of the ulnar nerve at the level of the medial epicondyle. M = motor fibers of the hand, S = skin fibers of the hand; D = dorsal nerve fibers of the skin; F = flexor carpi ulnaris and the deep flexor of the fingers. Oswald TA. Anatomic: Consideration in evaluation of the proximal ulnar nerve. Physical Medicine and Rehabilitation Clinics of North America 1998;9:777-94.

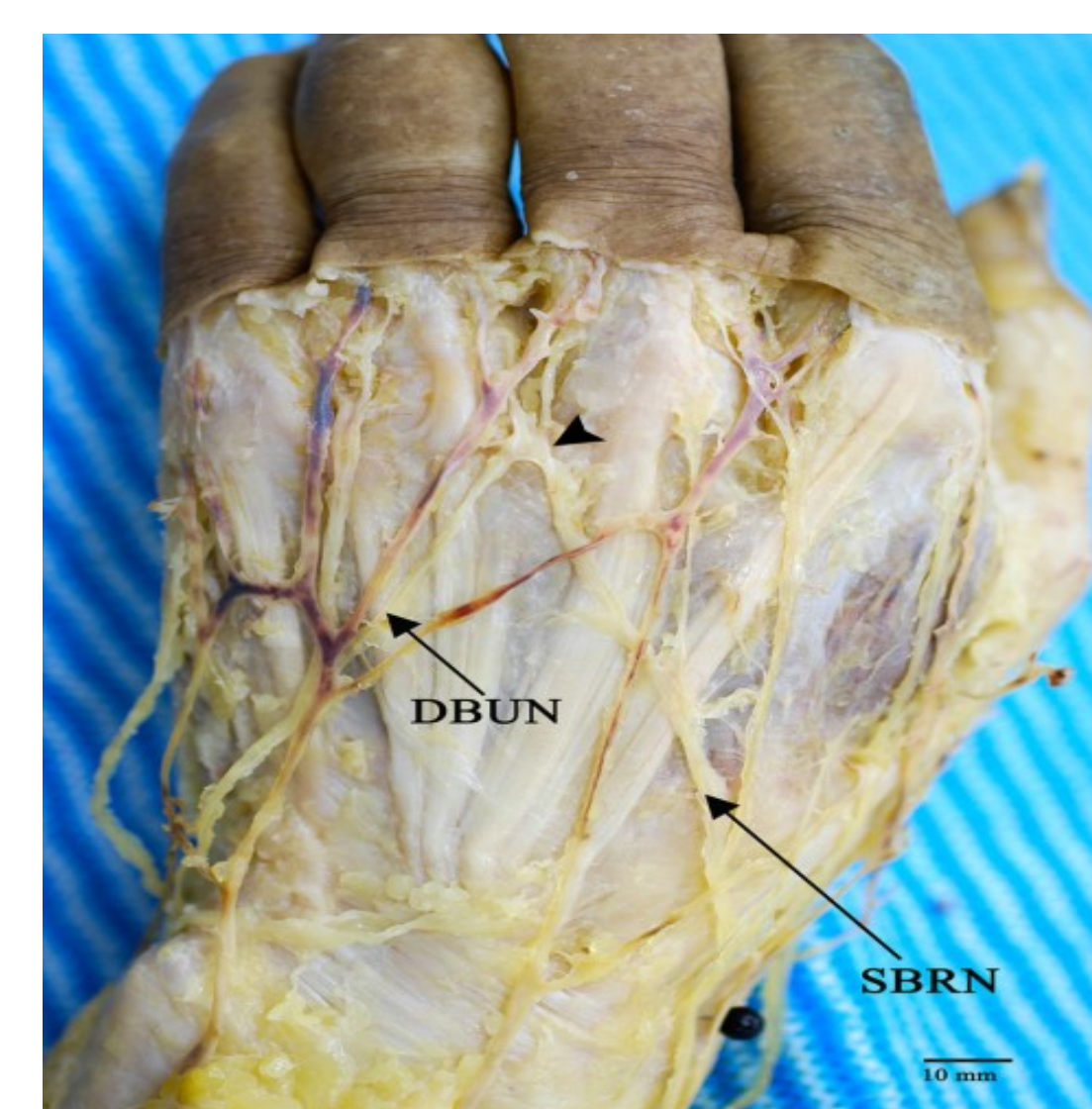


FIG 5. The branches of communication between the superficial branch of the radial nerve (SBRN) and the dorsal branch of the ulnar nerve (DBUN, dorsal branch of ulnar nerve) modify the sensory innervation of both the medial side of the ring finger to the side of your middle finger. The black circle indicates the styloid process of the radius. Sulaiman S, Soames R, Lambet C, The sensory distribution in the dorsum of the hand: anatomical study with clinical implications, Surg Radiol Anat. 2015; 37:779-85.

Conclusions

Hand diagram is an useful tool in screening of UNE. All patients signed the V digit in the figure, but also 16.4% of controls signed the V digit and 2% showed also hypoesthesia; these control subjects may have intermittent symptoms of ulnar neuropathy or cervical radiculopathy (where electrodiagnostic examination (EDX) was not sufficiently sensitive to make the diagnosis) or could be true false positive. However even if there is a sufficient agreement and relation between hand diagram, abnormal sensation and SNAP, the hand diagram cannot replace clinical and instrumental examination (especially EDX) to localize the site of nerve injury because the damage of the nerves is commonly partial. Sensory neurography, even if it is "no-localizing" EDX of UNE, is abnormal in more than half of patients (especially U5 SNAP), matches with clinical findings and may help to document axonal degeneration.

References

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