

Higher origin of the dorsal branch of ulnar nerve and connection between it and the deep branch throughout the hypothenar muscles: a case report

S. Paul¹, S. Das² and S. Chaudhary³

Maulana Azad Medical College, New Delhi-110002, India

SUMMARY

The present case report describes a rare finding of dorsal branch of the ulnar nerve which originated from the junction of upper fourth and lower three fourth of the forearm, passed between the two heads of flexor carpi ulnaris and then descended along the medial border of the extensor surface forearm in the superficial fascia. On the dorsal aspect of the wrist, it divided into two branches, a medial and a lateral branch. The medial branch joins throughout the hypothenar eminence with the deep branch of the ulnar nerve and the lateral branch became cutaneous on the medial half of dorsum of hand and medial two and half digits i.e radial and ulnar side of little and ring finger and the ulnar side of middle finger.

Key words: Ulnar nerve – Anatomical variations – Dorsal ulnar branch – Hypothenar region – Hand

INTRODUCTION

According to conventional textbooks of anatomy, the ulnar nerve after its course in the forearm passes under the superficial part of the flexor retinaculum (in Guyon's canal) with the ulnar artery and divides into superficial and deep branches in the palmar aspect of the hand (Standring, 2005). The dorsal branch of the ulnar nerve arises at a distance of 5 cm proximal to the wrist (Standring, 2005). The dorsal division is responsible for the sensory innervation to the medial one and half digits.

The variations in the branching pattern of the dorsal branch of the ulnar nerve may be important for diagnosis of any sensory deficit. The higher branching of the dorsal branch makes it liable to any superficial injuries, lacerations in the region of the forearm. Surgeons operating on the dorsal aspect of the forearm and the palm should be aware of such anomalies to check any inadvertent injuries. Abnormal branching pattern of the nerve may also be important for any electrophysiological studies.

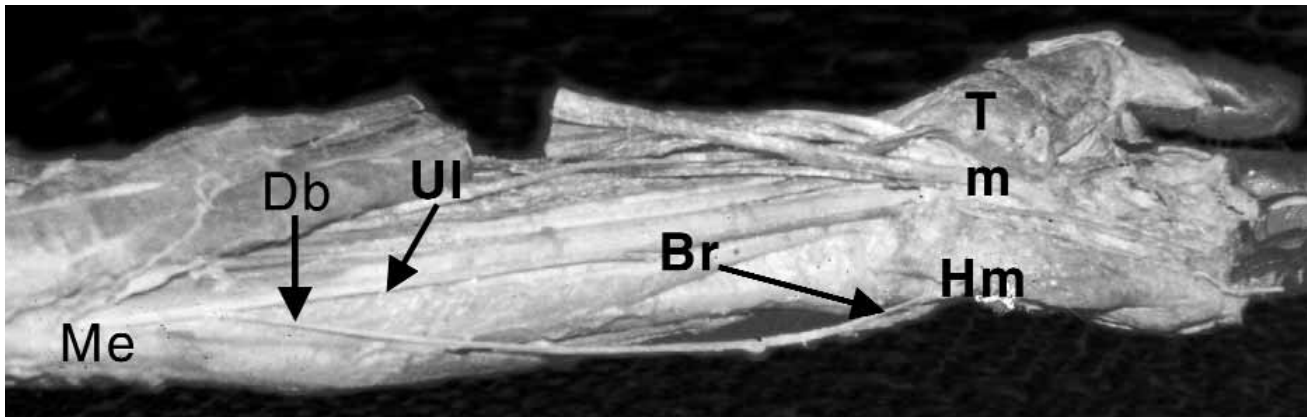


Fig. 1. Photograph of dissected specimen (ventral view). **Db:** Dorsal branch of ulnar nerve; **UI:** Main ulnar nerve; **Br:** Branch to hypothenar muscles; **Hm:** Hypothenar muscles; **Tm:** Thenar muscles; **Me:** Medial epicondyle.

CASE REPORT

During routine cadaveric dissection in the department of anatomy, we detected an abnormal branching pattern of the ulnar nerve on the left side of a 55 year male cadaver who died of pneumonia. The forearm and the palm were dissected in detail and the structures were displayed. The origin, course and the branches of the ulnar nerve were studied in detail and the specimen was photographed (Figs.1 and 2).

OBSERVATIONS

On the left side, the ulnar nerve entered the forearm between the heads of the flexor carpi

ulnaris and thereafter gave the dorsal branch. The origin of the dorsal branch was approximately at the junction of the upper one fourth and the lower three fourth of the forearm. The dorsal branch descended along the medial side of the flexor carpi ulnaris and turned on the dorsal aspect of the wrist lying between the flexor carpi ulnaris and ulna. It further divided into two, a medial branch ('MBr' in Fig. 2) which again branched to sink into the muscles of hypothenar eminence whereas the lateral sensory branch ('LBr' in Fig. 2) supplied medial half of dorsum of hand and medial two and half digits. The lateral two and half digits on the dorsal aspect were innervated by the radial nerve.

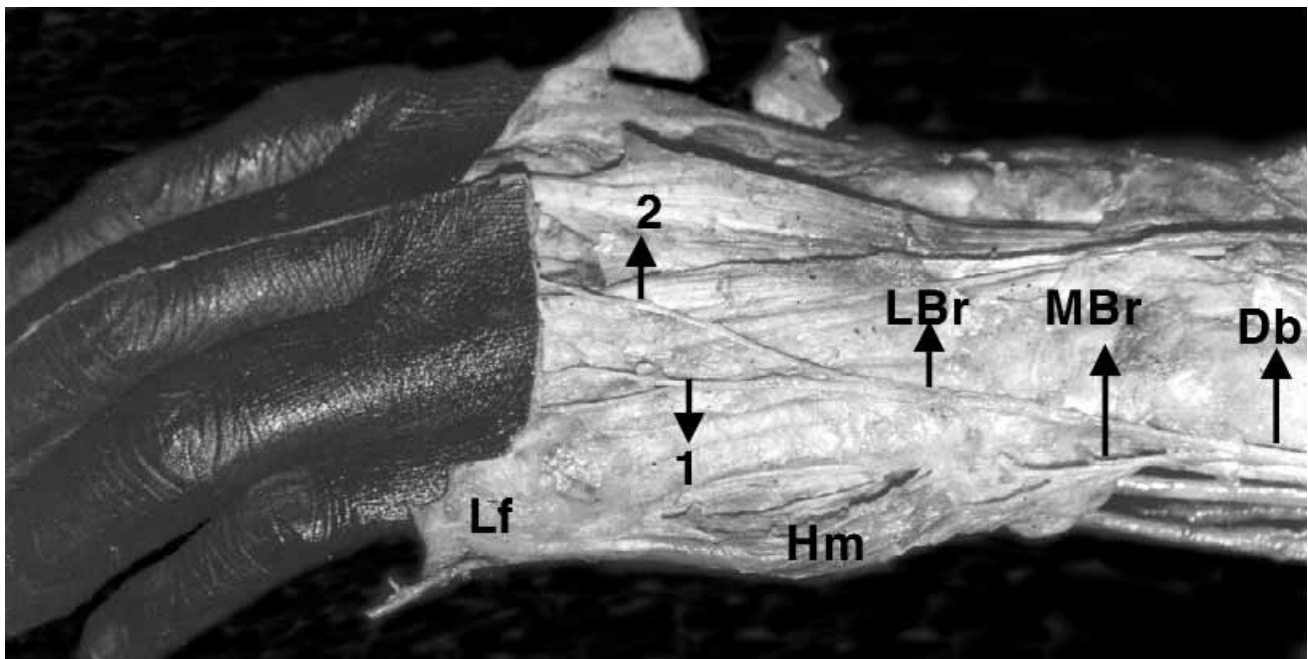


Fig. 2. Photograph of dissected specimen (dorsal view). **MBr:** Medial branch; **LBr:** Lateral branch; **Hm:** Hypothenar muscles; **Db:** Dorsal branch of ulnar nerve; **1:** Branch to ring and little finger; **2:** Branch to middle and ring finger; **Lf:** Little finger.

The main ulnar nerve had its normal course and after its passage through the Guyon's canal, divided into superficial and deep terminal branches as usual. The superficial supplied the skin and the palmaris brevis muscle while the deep gave branches to the hypothenar muscles and other intrinsic muscles of the palm.

DISCUSSION

Past research studies have described the medial proper digital nerve to the little finger arising from the dorsal branch of the ulnar nerve and the dorsal branch of the ulnar nerve to have a higher origin in the forearm (Bozkurt et al., 2002; Bergman et al., 2000). The variation in the origin of the dorsal branch of the ulnar nerve has been classically reported from the wrist till the elbow level, with 1) origin at the level of the elbow in the "retrocubital fossa" between the medial epicondyle and the olecranon (Gruber, 1868), or 2) just near to it (Smith, 1905). The variation of this nerve has also been highlighted in an earlier research study (Hovelacque, 1927). The anatomical variations of the dorsal branch of the ulnar nerve and its clinical significance have been reported in a past study (Linell, 1921). The present study also revealed a higher origin of the dorsal branch of the ulnar nerve in the forearm. Surprisingly, conventional textbooks (Standring, 2005) do not highlight much regarding the higher origin of the dorsal branch and therefore research studies may be much more informative. The occurrence of the higher origin of the dorsal branch in the forearm increases the chances of the nerve being damaged in any traumatic injuries involving the forearm or the elbow region, as it is very superficial.

The innervation of the hypothenar muscles of the palm is usually by the deep terminal branch of the ulnar nerve in the palm (Standring, 2005). Some exceptions to this fact have been reported, where the dorsal branch of the ulnar nerve has been found to innervate the hypothenar muscles (Blair et al., 1988). In the present study, we detected a branch from the dorsal branch to the hypothenar muscles. In the absence of any histological study, we only presume that there might have been a motor supply to the hypothenar muscles.

The dorsal branch is usually related to the dorsal aspect of the wrist and dorsum of hand

and digits (sensory) but in the present case the hypothenar muscles also received its supply from the dorsal aspect. In such a case, the extra supply from the dorsal branch to the hypothenar muscles may take care of the situation caused due to neural loss to the deep terminal branch of the ulnar nerve. The position of the dorsal branch being more superficial makes it more prone to injuries.

The dorsal branch and the ulnar nerve have been described as two separate entities that travel within a common epineural conduit (Jabaley et al., 1980; Sunderland, 1978). Admittedly, in the present case, we did not perform any histological study to investigate the neural branch ending in the muscular fibres.

A variation in the branching pattern of the dorsal division giving rise to 2 or 3 branches has been found in the proportion of 2:1 respectively (Alexandre and Martinon, 1974). Thus one cannot neglect the clinical importance of the anomaly.

A division of the dorsal cutaneous branch, joining the volar branch of the sensory branch of the ulnar nerve has been described by Kaplan (Kaplan, 1963). The communication between the dorsal branch and the ulnar proper palmar digital branch to the little finger has been termed as Kaplan's anastomosis. This Kaplan's anastomosis has been described to join the superior or the deep ramus of the ulnar nerve (Morestin, 1896; Wulle, 1988; Hoogbergen and Kauer, 1992). Interestingly, a past research study had also reported different types of connections between the superficial and dorsal branches of the ulnar nerve; with the medial proper digital branch of the little finger or with the fourth common digital palmar branch and also in some rare cases the connection was found with the deep ones traversing between the short flexor muscles and opponens muscles to terminate in the nerve of one or another hypothenar muscles (Morestin, 1896).

It is essential to know the normal and the abnormal branching pattern of dorsal branch as correct positioning of the electrodes are necessary during any electrophysiological studies (Garibaldi and Nucci, 2002). Researchers have found that left-handed persons flex their wrist during writing and this increases the chances of damage to the dorsal branch (Spinner, 1978). Painful neuromas have been found in the dorsal branch of the ulnar nerve (Henderson et al., 1991). Handcuff neuropathy has

also been detected in individuals (Henderson et al., 1991). The superficial position of the dorsal branch makes its clinically more important. The innervation pattern of the dorsal branch also plays an important role in designing superficial flaps that are harvested from the dorsal aspect.

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