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An Unusual Anatomic Variation of Dorsal Sensory Branches of the Ulnar Nerve: A Case Report

Ulnar Sinirin Dorsal Duysal Dallarının Alişılmadık bir Anatomik Varyasyonu: Bir Olgu Sunumu

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ABSTRACT

In some instances, it is mandatory to know the anatomy of the dorsal sensory branches of the ulnar nerve. The dorsal sensory branches consist of the area of most dense innervations with their anatomical variants. These variations are very important in the surgical and medical procedures dealing with the area. In this paper, we present a case of an unusual variation of the dorsal cutaneous ulnar nerve. The variation was observed in the operation of a right forearm of a 43 year old male following a traffic accident injury. Dorsal cutaneous Ulnar nerve was observed in an unusual course. It was piercing the flexor carpi ulnaris muscle's tendon and then going into the skin superficially. To our knowledge, this type of variation has never been published before. The knowledge of this type of variation may be useful during surgeries and electrophysiological examinations of the area.

Key words: anatomy, ulnar nerve, forearm, flexor carpi ulnaris muscle, peripheral nerves

ÖZET

Ulnar sinirin dorsal duysal dallarının anatomisini bilmek bazı durumlarda zorunludur. Dorsal duysal dallar, anatomik varyasyonları olan en yoğun innervasyon alanını içerir. Bu bölgeyle ilgili medical ve cerrahi işlemler için bu varyasyonlar çok önemlidir. Bu yazıda dorsal kutanöz ulnar sinirin bilinmeyen bir varyasyonunu sunuyoruz. Varyasyon trafik kazası sonrası ameliyat olan 43 yaşındaki bir erkeğin sağ kolunda görüldü. Dorsal kutanöz ulnar sinir normalden farklı ir seyirde izlendi. Sinir önce flexor carpi ulnaris kasını deliyor, daha sonra da cilde doğru yüzeyselleşiyordu. Bizim bildiğimize göre, bu tür bir varyasyon daha önce hiç yayınlanmamıştı. Böyle bir varyasyonun bilinmesi bölgenin cerrahisi ve elektrofizyolojik çalışmaları sırasında yararlı olabilir.

Anahtar kelimeler: anatomi, ulnar sinir, önkol, flexor carpi ulnaris kası, periferik sinirler

Dorsal cutaneous nerve of the hand or DCU is one of the terminal branches of the ulnar nerve^{1,2}. Ulnar nerve fibers derive from the eighth cervical and first thoracic roots in the majority of cases, however it may arise solely from the eighth cervical or from seventh and eighth cervical roots¹. Nerve fibres pass to the medial cord of brachial plexus and are individualized as ulnar nerve in the axilla. In the upper arm, the ulnar nerve is in relation to major vessels and gives branches only at the proximal forearm^{1,2}.

The DCU leaves the main ulnar nerve at about the midpoint of the medial and distal thirds of the forearm^{1,2}. Like the main ulnar nerve, DCU is between the ulnar bone and the flexor carpi ulnaris muscle, and covered by its muscular portion. At the level of its tendon, DCU is situated dorsally and medially. DCU leaves the ulnar nerve, piercing the antebrachial fascia, at the level of 4,8 to 10 cm above the ulnar styloid process or at a mean distance of 8,3 cm (SD=2,4) from the proximal border of the pisiform bone³, taking a posterior direction. DCU then courses around the ulnar styloid process medially and dorsally, and at the fifth metacarpal joint (located 2 or 3 cm distally to the ulnar styloid process), it gives off two¹ or three^{1,2,4} main branches.

In this paper, we present a case of an unusual variation of the dorsal cutaneous ulnar nerve.

Case

An unusual course of DCU was observed in a 43 year old male patient's right forearm operation. The right forearm was injured in a traffic accident. There was an open bone fracture on articulatio cubiti. The

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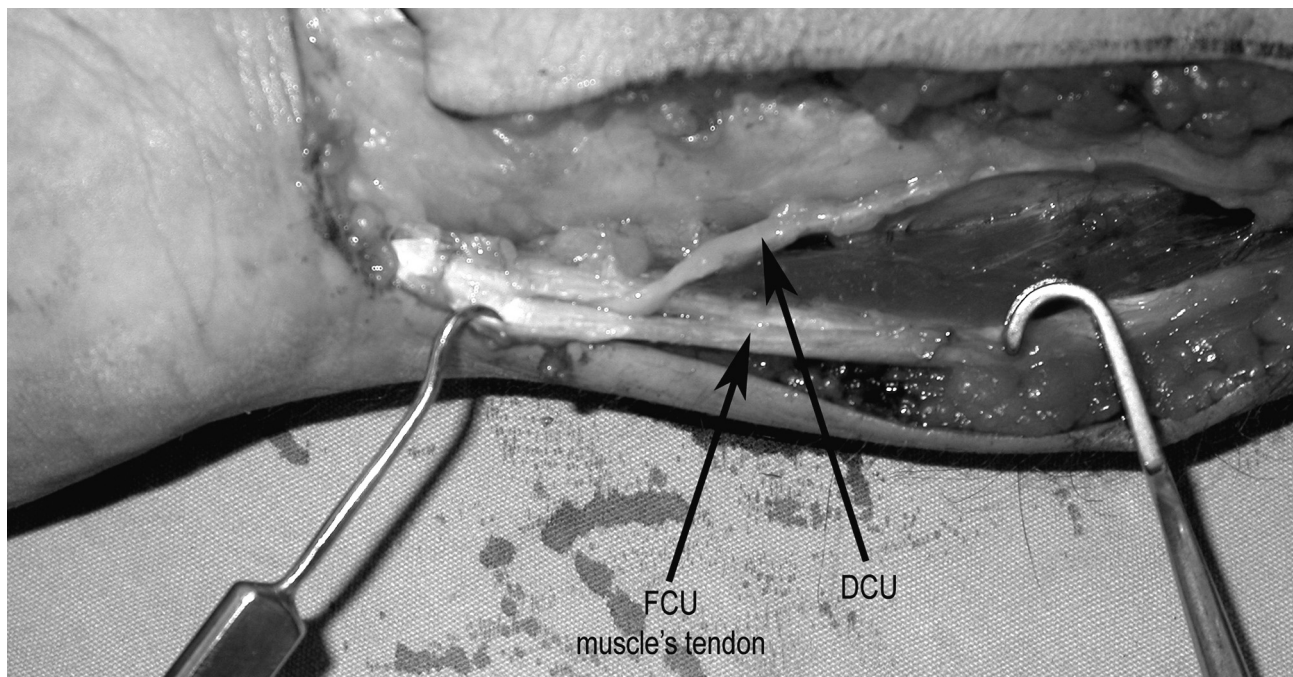


Figure 1. The dorsal cutaneous branch of Ulnar nerve was leaving the main ulnar nerve at the midpoint between the medial and distal thirds of the forearm. It was positioned between the ulnar bone and the flexor carpi ulnaris muscle.

median and the ulnar nerves, brachial artery and the tendons of the muscles were cut. The loose connective tissue surrounding the injured area had also deformities.

A plastic and reconstructive surgeon operated the patient. During the course of the surgery while transferring the flexor carpi ulnaris muscle, the operator noticed that the DCU was piercing the tendon of the flexor carpi ulnaris muscle. The DCU was leaving the main ulnar nerve at the midpoint between the medial and distal thirds of the forearm. It was positioned between the ulnar bone and the flexor carpi ulnaris muscle. After piercing the tendon, the DCU was following its normal anatomic course (Figure 1 and 2). In the MR imaging examination of left forearm, we could not demonstrate a similar variation.

Discussion

Intraneural topography of the fibres detailed to various branches of the ulnar nerve was first studied by Sunderland¹. He could trace DCU fibres beginning from several centimetres above the humeral epicondylar line to two centimetres below the ulnar styloid process. He observed a relatively precise localization of DCU fibres in the ulnar trunk, emphasizing their long independent intraneural course just to turn into

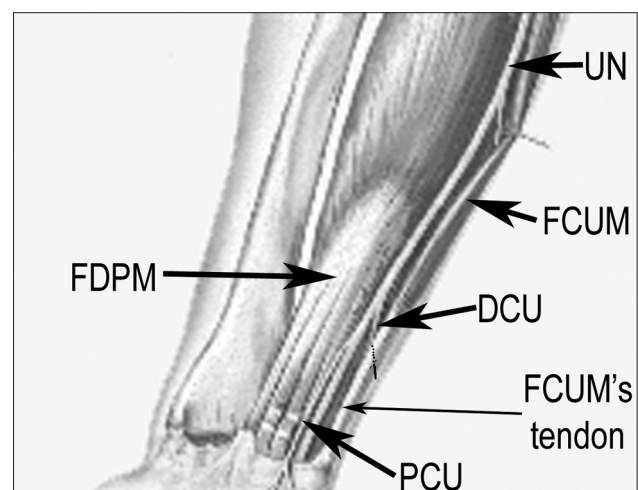


Figure 2. Schematic representation of the variation.

a terminal ramus. Jabaley et al.² had the same experience in their own dissections. They concluded that “DCU and ulnar nerve are two separate nerves travelling within a common epineural conduit while still retaining their autonomy”. The DCU leaves the main ulnar nerve at about the midpoint between the medial and distal thirds of the forearm, according to classical textbooks^{1,2}. Rarely, the DCU may leave the ulnar trunk just below the medial humeral epicondyle¹.

Like the main ulnar nerve, DCU is between the ulnar bone and the flexor carpi ulnaris muscle, covered by its muscular portion. At the level of its tendon origin, DCU is situated dorsally and medially.

DCU leaves the ulnar nerve by piercing the anteb-
rachial fascia at the level of 4,8 to 10 cm above the
ulnar styloid process^{1, 2} or at an average distance of
8,3 cm (SD=2,4) away from the proximal border of
the pisiform bone, in the posterior direction. These
measured distances are important references for plac-
ing stimulating electrodes. DCU, then courses aro-
und the ulnar styloid process medially and dorsally,
and at the fifth metacarpal joint 2 cm or 3 cm distally
to the ulnar styloid process, it gives off two¹ or three<sup>1,
2, 4</sup> main branches.

Alexandre and Martinon dissected thirty hands and
found both types of branching in a proportion of
2:1, respectively for two and three branches. The
hands with two main branches as lateral and medial
have a secondary division in the lateral ramus¹. These
data help to define the location of the recording
electrodes. The active electrode may be positioned
either along the fifth metacarpal bone or between the
fourth and the fifth metacarpals and the reference
electrode is placed 3 cm distally.

The dorsum of the hand may be innervated entirely
by the superficial radial nerve as in the case of DCU
agenesis. A DCU was also absent in one of the dis-
sected upper extremities³. Alternatively the poste-
rior or the lateral cutaneous nerves of the forearm
may extend further distally than usual, modifying
the standard pattern of innervation. Variability in
dorsal hand innervation may be caused also by com-
municating branches of ulnar-radial or ulnar-ulnar.
A DCU giving a radial branch in the dorsum of the
hand is less frequent (10%) than the radial nerve gi-
ving branch to DCU (77%)¹. Anastomosis between
the superficial radial nerve and DCU was found in
4-15% of the hands⁵. Complete absence of anasto-
mosis is also possible, as shown in 13% of the anatomi-
cal specimens¹.

The anatomical variants mentioned above may be
responsible for low amplitude or absence of respon-
se observed in the conduction velocity test, thus pre-
disposing to incorrect physiological test results and
diagnosis⁶. A paired conduction velocity examination
between the DCU and the superficial radial nerve
should help in avoiding misinterpretation.

Kaplan¹ described a peculiar pattern of branching of
the DCU proximal to its division in the dorsum of
the hand and distal to its joining with the volar sen-
sory branch of the ulnar nerve. As the pisiform bone
and the tendon insertion site of the flexor carpi ulna-
ris are very close to this anastomosis, a neural injury
may occur in case of pisiform bone fractures and du-
ring the surgical procedures of the area. Sunderland¹
had noted a similar anatomical anastomosis.

In 2% of the hands studied anatomically by Bonnel
and Vila⁷ there was a communication between the
DCU and the ulnar proper palmar digital nerve of
the fifth finger. This anomalous branch of the DCU
has been designated as Kaplan's anastomosis and it
may join with the superficial or the deep rami of the
ulnar nerve. In 4% of the hands, Kaplan's anastomo-
sis left the DCU medially at about 2,5 centimetres
proximal to the ulnar styloid process and provided
innervation to the radiocarpal joint, the abductor di-
giti minimi muscle, and the fifth carpometacarpal jo-
int⁸. Examination of the conduction velocity of the
DCU may provide good complementary informa-
tion in the electroneuromyographic analysis of the
ulnar nerve palsies. In addition, patients may express
symptoms and signs in the DCU territory, associa-
ted with more widespread peripheral neuropathy as
in mononeuropathy multiplex or polyneuropathies⁹.

In conclusion, to our knowledge our case was uni-
que. This type of variation has never been published
before. The knowledge of this type of variation may
be useful during surgeries and electrophysiological
examinations of the area.

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