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Research Paper

A Study of the Ulnar Nerve Variations and its Clinical Implications

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ABSTRACT

Aims: Because anatomical variations frequently increase the danger of misdiagnosis, a thorough evaluation of nerve variations is essential to the efficiency of clinical or surgical practise. One of the main nerves involved in neuropathy is the ulnar nerve (UN). The ulnar nerve's anatomical variations have been noted in the current investigation, and their potential clinical implications have been taken into account.

Method and materials: The ulnar nerve was examined in 100 upper limbs for potential alterations. A study has been done on careful observation for any abnormal formation and/or communication in regard to the UN.

Result: 10% of the 100 limbs showed changes related to the ulnar nerve. Among them, aberrant communication with a nearby nerve was found in four of the instances, and variations in UN development were observed in the remaining six limbs.

Conclusion: The UN's anomalous formation and unusual communication with other nerves may jeopardise the upper limb's typical sensory-motor function. Clinicians must understand the structural differences of the UN in order to assess the severity of ulnar nerve neuropathy and plan appropriate surgical procedures.

KEYWORDS: Variations, Ulnar nerve, Neuropathy, Surgical intervention

INTRODUCTION

The anterior principal rami of spinal nerves C5, C6, C7, C8, and T1 combine to produce the brachial plexus[1]. The ulnar nerve (UN), sometimes known as the musicians nerve, is the main branch of the medial cord of the brachial plexus that emerges in the axilla. It is made up of ventral rami fibres from the C8 and T1 spinal neurons. It is a mixed nerve that innervates the forearm and hand muscles and transmits feeling to the ulnar aspect of the palm, the ulnar half of the back of the hand, the medial half of the fourth digit, and the entire fifth digit (dorsal ulnar cutaneous distribution). The second most frequent entrapment neuropathy in the upper arm is ulnar nerve entrapment (after entrapment of the median nerve). However, it frequently receives additional C7 fibre input from the median nerve via its lateral root[1].

UN is medial to the axillary artery at the axilla, and in the upper humeral level, it is still adjacent to and medial to the brachial artery. The only noticeable branches found in the arm are a few vasomotor twigs that are close to blood vessels.

Brachial plexus variations have frequently been described in the literature[2]. Unusual UN forms and communications at the axilla or at the upper humeral level with neighbouring nerves should be taken note, as they may create a challenge during surgical attempts to cause a nerve blockade[3]. The origin or trajectory of the distal branches is a common location for UN changes. However, it has been recognized that there are many differences in the communications between nearby nerves in the hand or the forearm in the literature that describes these variances. The current anatomical investigation attempts to pinpoint ulnar nerve variants and to examine the potential clinical significance of such differences.

MATERIALS AND METHODS

The present study was conducted in the Department of Anatomy, K.J. Somaiya Medical College, Mumbai, India. 100 formalin embalmed upper limbs of human cadavers aged between 50 and 65 years were dissected. Of the 100 upper limbs 48 were right and 52 were left. The axillary region was carefully dissected and brachial plexus and its branches were separated. The medial cord was separated and ulnar nerve was traced. The dissection was further continued towards the anterior compartment of the arm in order to probe any communications of ulnar nerve with adjoining peripheral nerves at mid humeral level. Meticulous dissection of variants and/or abnormal communication if any was reported. In the case of persistence of variant communication between adjoining peripheral nerves, the length of the communicating nerves was measured and documented. Relevant photographs of variant specimens were taken and recorded.

RESULTS

A total of 10 ulnar nerve variations were seen in 100 upper limbs which accounted for 10% of variant cases. All ten variations of ulnar nerve were observed in right upper limbs. Aberrant formation of the ulnar nerve with a contribution from the lateral cord of brachial plexus (Figure 1) was seen. The contributing branch passed from lateral to medial side deep to the median nerve and joined the ulnar nerve on the lateral side. After its aberrant formation the remaining course of the nerve in the arm was normal.

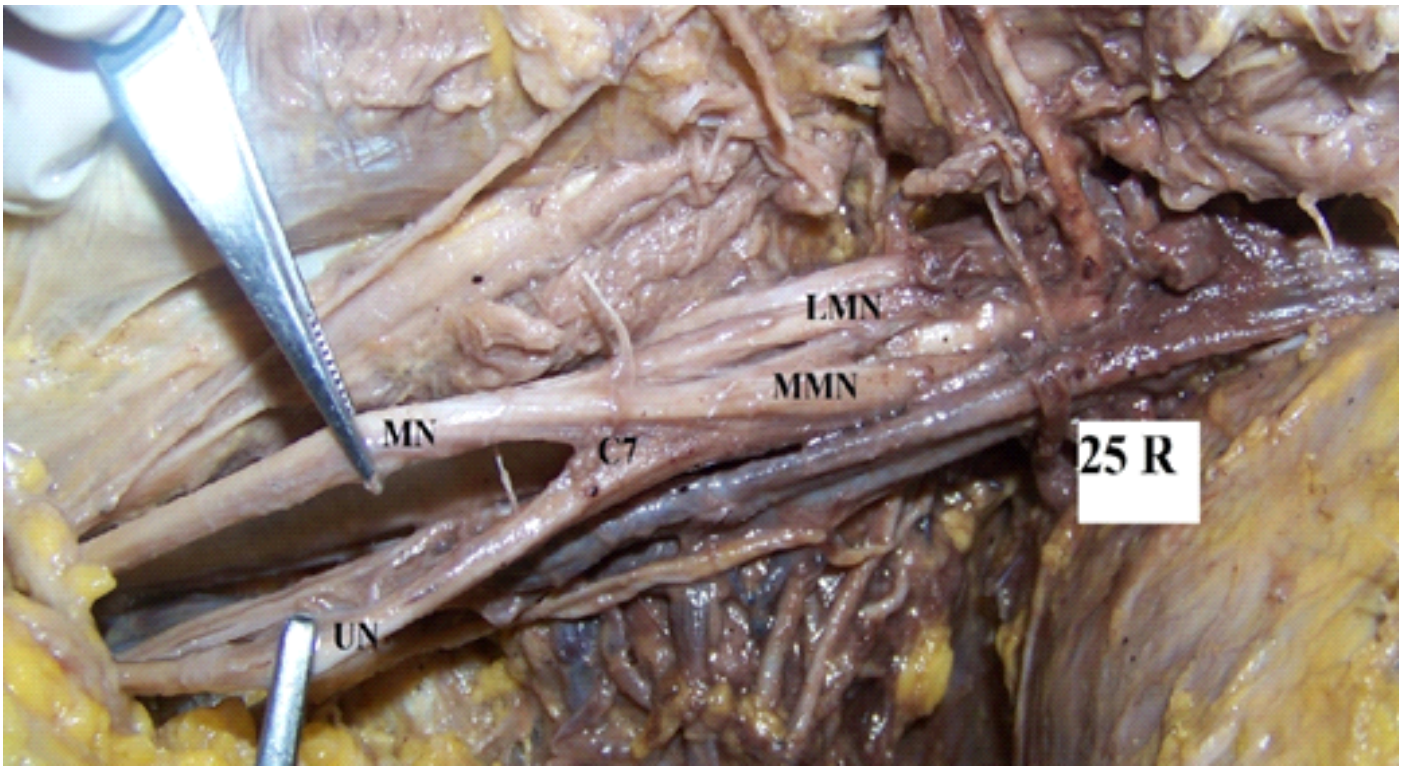

Figure 1: Contribution from lateral cord to ulnar nerve

In the remaining cases, ulnar nerve had abnormal communications with the adjacent nerves (Figure 2).

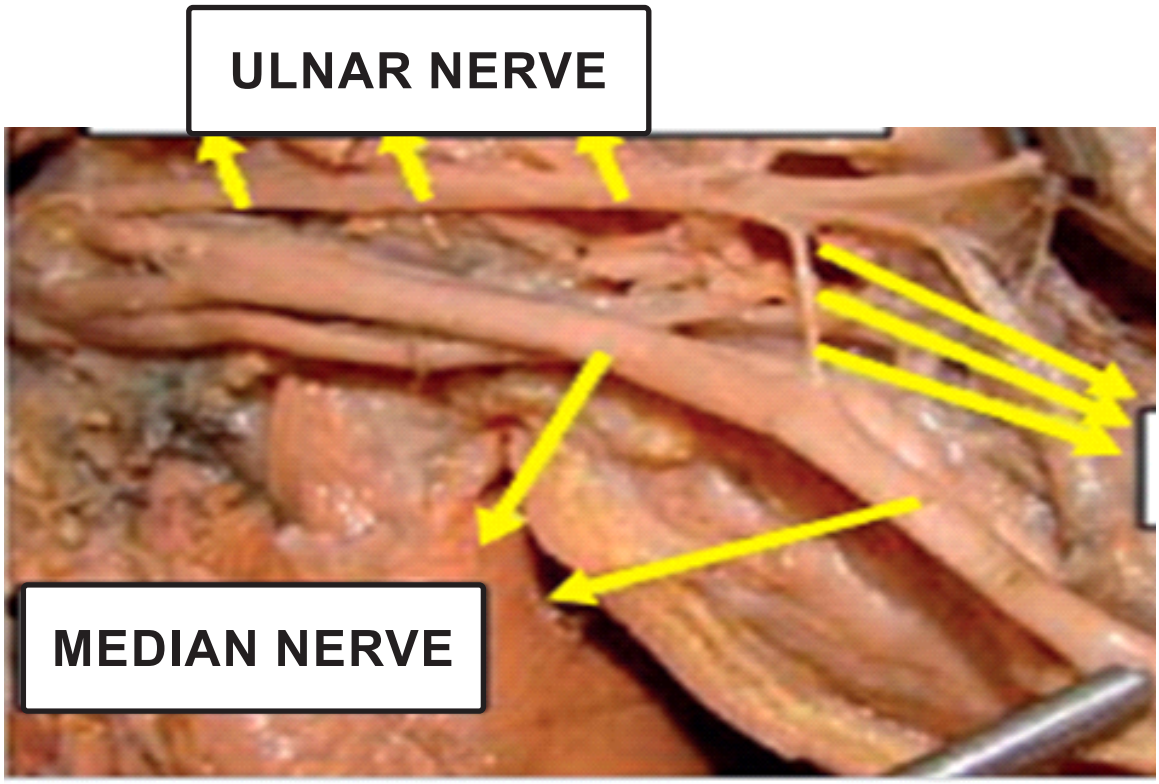

Figure 2: Communication between ulnar and median nerve

DISCUSSION

The migration of muscles from somites into the early upper limb mesenchymal primordium may change, altering the primitive segmental organisation of nerves, which may result in variations of the brachial plexus. Only with complete awareness of all potential anatomical variants, including aberrant branch origins and variable branch-to-branch communication, can a good brachial plexus blockade be achieved [4].

Given that there are few accounts of UN variant development, it is uncommon. A unusual genesis of UN from the median nerve was documented by Sachdeva and Singla[5]. The median nerve in their case split into the median nerve proper and the UN not long after it formed. The variety in the creation of UN that Gupta et al. discovered is identical to the variation that we detect here, with the exception that there was a contribution from the medial root of the median nerve [6].

In this study, we discovered that the lateral cord's contribution to UN's aberrant formation. Iatrogenic injuries and entrapment neuropathies are more likely to occur when there are variations in the origin, course, and distribution of nerves[7]. Therefore, it is important to take its aberrant formation into account when developing diagnostic strategies and administering treatment for ulnar neuropathy.

In the medial and lateral cords, unusual communications between the brachial plexus branches are frequently observed. Although it is frequently observed on the dorsal surface of the hand, as is evident from reports in the literature, aberrant communication between the radial and ulnar nerves is extremely uncommon at high humeral levels [8,9,10].

According to Kroll et al., brachial plexus injuries account for 23% of incidence cases and are the second most common cause of nerve injuries, with ulnar neuropathies accounting for 33% of cases[11]. Among the other important risk factors that could be linked to this cause are anatomical anomalies. In evaluating unexplainable sensory loss brought on by trauma or surgical intervention in a specific area, determining the presence of communicating branches may be crucial [12].

The results of the studies described clearly show that variations in the ulnar nerve are common. The second most typical neuropathy to be entrapped is the ulnar nerve. These variances become significant during shoulder and elbow surgical operations when the existence of an unanticipated variation may result in iatrogenic damage. The several ways that neurological disorders are diagnosed can often be challenging13. Understanding the ulnar nerve's distribution, variations, and potential communication with the median nerve is important for treating injuries to the upper limb. All of these

variations will be found using electrodiagnostic tests. A useful technique for identifying aberrant arm, forearm, and hand abnormalities is electromyography. There is a need to better understand the likelihood of anatomical variation and the frequency with which they occur in patients with ulnar nerve symptoms for whom the clinician finds it challenging to pinpoint the exact cause, as this can give clues for a specific diagnosis of the potential cause of ulnar nerve trapping[14].

Therefore, understanding the varied pattern of peripheral nerves is crucial for all medical professionals, including surgeons, radiologists, and anesthesiologists before delivering anaesthetic medications and thus in diagnostic procedures. Weakness caused by communication root or nerve damage may be difficult to diagnose [15].

CONCLUSION

Because surgeries in these areas are frequently performed as well as because diagnostic approaches to management of ulnar neuropathy frequently target these regions, awareness of anatomical variations of UN both in its formation and in abnormal communication is essential. Clinicians must be aware of the anatomical variations of the UN in order to take into account the type of complications associated with ulnar nerve neuropathy. In order to prevent unintended iatrogenic damage to the ulnar nerve during radiological procedures, operating on fractured patients, or diagnostic therapy for interventional radiologists, orthopaedics, and neurologists, it is frequently helpful to understand these variations along the usual pattern.

CONFLICT OF INTEREST: None

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