Anomalous Innervation of the Median Nerve in the Arm in the Absence of the Musculocutaneous Nerve

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Abstract: The brachial plexus innervates the upper extremities. While variations in the formation of the brachial plexus and its terminal branches are quite common, it is uncommon for the median nerve to innervate the muscles of the arm. During the dissection of an elderly male cadaver at the Department of Anatomy of the All India Institute of Medical Sciences, New Delhi, India, in 2016, the coracobrachialis muscle was found to be supplied by a direct branch from the lateral root of the median nerve and the musculocutaneous nerve was absent. The branches of the median nerve supplied the biceps brachii and brachialis muscles and the last branch continued as the lateral cutaneous nerve of the forearm. These variations may present atypically in cases of arm flexor paralysis or sensory loss on the lateral forearm. Knowledge of these variations is important in surgeries and during the administration of regional anaesthesia near the shoulder joint and upper arm.

Keywords: Anatomic Variation; Dissection; Median Nerve; Musculocutaneous Nerve; Case Report; India.

Case Report

An upper limb dissection of an elderly male cadaver was performed during a routine educational dissection at the Department of Anatomy of the All India Institute of Medical Sciences, New Delhi, India, in 2016. During the dissection, the brachial plexus was observed to have a unilateral anomalous branching pattern. All of the usual branches of the medial and posterior cords were present; however, branches from the lateral cord were unusual in the left axilla. The left lateral cord gave rise to a lateral pectoral nerve and, distal to this branch, it continued as the lateral root of the median nerve around the third part of the axillary artery. The musculocutaneous nerve was absent. A branch originated from the lateral root of the median nerve and supplied the coracobrachialis muscle.

The median nerve was formed by the union of the medial and lateral roots from the respective medial and lateral cords of the brachial plexus, anterior to the axillary artery. The branches from the median nerve supplied the flexor muscles of the left arm, except the coracobrachialis muscle, and the last branch continued as the lateral cutaneous nerve of the forearm. The first branch from the left median nerve supplied the two heads of the biceps brachii muscle and another branch supplied the brachialis muscle approximately 3.5 cm below the first branch. After that, a third branch arose and passed deep to the biceps brachii muscle from...
the medial to lateral side, piercing the deep fascia and continuing as the lateral cutaneous nerve of the forearm, superficial to the brachioradialis muscle [Figure 1]. The variation was present unilaterally without any communication between the nerves. No other variations were found in relation to the other vessels and muscles.

**Discussion**

Branching pattern variations of the brachial plexus can be explained embryologically. During the fifth gestational week, the fetus develops forelimb muscles due to regional expression of the homeobox D genes in the mesenchyme of the paraxial mesoderm. The coracobrachialis muscle was innervated by the branch from the lateral root of the median nerve. The medial cutaneous nerve of the left forearm arose from the lateral root of the median nerve, while the lateral cutaneous nerve of the left forearm arose from the median nerve. The variation was present unilaterally without any communication between the nerves. The flexors of the arm and the lateral aspect of the forearm are generally innervated by the musculocutaneous nerve, a branch of the lateral cord, which was absent in the present case.

A previous case report noted a single branch arising from the lateral root of the median nerve, supplying the two head of the biceps brachii. The coracobrachialis muscle was innervated by a nerve originating from the lateral cord of the brachial plexus while the rest of the flexor muscles were innervated by branches from the median nerve. The lateral cutaneous branch of the forearm also arose from the median nerve, along with a communication between the median and lateral cutaneous nerves of the forearm. Gümsiburun et al. observed a case wherein the coracobrachialis muscle was innervated by two direct branches from the lateral cord and that the variation was present bilaterally. Le Minor categorised communications between the median and musculocutaneous nerves; in type V cases, the musculocutaneous nerve is absent and all of the flexor muscles of the arm are innervated by the median nerve.

Nakatani et al. reported three anomalies in which all of the flexor muscles were innervated by branches from the lateral cord and the lateral cutaneous nerve of the forearm arose from the lateral and medial roots of the brachial plexus. Pacholczak et al. described a case in which the lateral cord pierced and innervated which was innervated directly by a branch from the lateral root of the median nerve, while the lateral cutaneous nerve of the left forearm arose from the median nerve. The variation was present unilaterally without any communication between the nerves. The flexors of the arm and the lateral aspect of the forearm are generally innervated by the musculocutaneous nerve, a branch of the lateral cord, which was absent in the present case.

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Nakatani et al. reported three anomalies in which all of the flexor muscles were innervated by branches from the lateral cord and the lateral cutaneous nerve of the forearm arose from the lateral and medial roots of the brachial plexus. Pacholczak et al. described a case in which the lateral cord pierced and innervated

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**Table 1:** Literature review of anomalous anatomical variations of the median nerve

<table>
<thead>
<tr>
<th>Author and year of case report</th>
<th>Source of innervation</th>
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<tbody>
<tr>
<td>Beheiry et al. (2004)</td>
<td>Lateral root of the median nerve</td>
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<tr>
<td>Gümüşburun et al. (2000)</td>
<td>Median nerve</td>
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<tr>
<td>Le Minor (1990)</td>
<td>Median nerve</td>
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<tr>
<td>Nakatani et al. (1997)</td>
<td>Median nerve</td>
</tr>
<tr>
<td>Pacholczak et al. (2011)</td>
<td>Lateral root of the median nerve</td>
</tr>
<tr>
<td>Shinde et al. (2015)</td>
<td>Lateral root of the median nerve</td>
</tr>
<tr>
<td>Present case (2016)</td>
<td>Median nerve</td>
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</tbody>
</table>
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Conclusion

This case report describes the dissection of a cadaver in which the left median nerve was found to supply the lateral aspect of the forearm as well as the flexor muscles of the arm, except for the coracobrachialis muscle. This rare variation may result in unexpected clinical presentations in cases of traumatic injuries or paralysis. Knowledge of such variations is therefore of clinical and surgical importance.

References