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Case Report

Misexpression of Median Nerve Variation in Relation to 3rd Part of Axillary Artery – A Case Report

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Abstract

During a routine dissection of an adult male cadaver at the College of Medical Sciences in Bharatpur, Nepal, it was noted that the right median nerve was formed by three roots. This observation was made after a careful dissection of both upper limbs, including the axilla, arm, forearm, and palm. Of the three roots contributing to this anomalous median nerve, one originated from the lateral cord and two from the medial cord of the brachial plexus. Despite this atypical configuration, the distribution of the median nerve in the arm, forearm, and palm appeared normal, and the arterial pattern, including the axillary and brachial arteries, was also typical.

Keywords: Cadaver, median nerve, brachial plexus.

INTRODUCTION

The median nerve typically forms from the convergence of two roots: the lateral root from the lateral cord (C5, C6, C7) of the brachial plexus and the medial root from the medial cord (C8, T1). These roots encircle the third part of the axillary artery, joining together either anteriorly or laterally to it. The median nerve initially enters the arm lateral to the brachial artery. Near the insertion of the coracobrachialis, it typically crosses in front of (though occasionally behind) the artery, then descends medial to it toward the cubital fossa, where it lies behind the bicipital aponeurosis and in front of the brachialis, separated from the elbow joint by the latter. It usually enters the forearm between the heads of the pronator teres, moving to the lateral side of the ulnar artery, with the deep head of the pronator teres separating it from the artery [1].

CASE REPORT

During a routine dissection of an adult male cadaver at the Department of Anatomy, College of Medical Sciences in Bharatpur, Nepal, an anomalous formation of the median nerve was observed. A thorough and meticulous dissection of both upper limbs including the axilla, arm, cubital fossa, forearm, and palm was conducted to investigate the formation, relationships, and distribution of the anomalous right median nerve, as well as to assess the left median nerve.

The lateral root from the lateral cord (C5, C6, C7) of the brachial plexus and the medial root from the medial cord (C8, T1). These roots encircle the third part of the axillary artery, joining together either anteriorly or laterally to it. But in the present case the lateral root passes blow the third part of the axillary artery and also it was determined that the right median nerve comprised three roots: one originating from the lateral cord and two from the medial cord of the brachial plexus. These two roots were found to pass obliquely below the second and third parts of the axillary artery, joining individually with the lateral root of the median nerve to form the median nerve trunk, situated medial to the third part of the axillary artery (Figure 1). Despite this anomalous formation, the distribution of the median nerve in the arm, forearm, and palm was normal, and the arterial pattern in the arm was also typical. The left median nerve exhibited a normal anatomical configuration as well.

Figure 1: Shows formation of Triple Root Formation of the Median Nerve

1. Axillary artery, 2. Lateral cord of brachial plexues, 3. Medial Cord of Brachial plexues, 4. The lateral root of median nerve, 5. Median nerve, 6. Additional root from the lateral cord, 7. Axillary vein, 8. Lateral root of median nerve, 9. Radial nerve, 10. Basilic vein, 11. Short head of biceps brachii, 12. Pectoralis major, 13. Axillary areolar pad, 14. Lateral thoracic vein, 15. Medial root of median nerve, 16. Lateral pectoral nerve, 17. Anterior circumflex humeral artery, 18. Musculocutaneous nerve

DISCUSSION

The anatomical variations of the median nerve can be broadly categorized into two groups: variations at the level of the roots and variations associated with the accompanying artery [2]. In the present study, variations in the formation of the median nerve characterized by three roots have been documented. The factors contributing to this pattern of variation can be understood through the interpretation of developmental biology and embryology. By the fourth week of gestation, limb buds begin to develop on the ventrolateral aspect of the body wall, and primitive muscles start forming in the seventh week due to the condensation of mesenchymal tissue near the base of the developing extremities. As the limb buds elongate in proportion to the growth of skeletal elements, the muscular tissue differentiates into anterior and posterior compartments [3]. The nerve supply to the extremities is provided by the somites as they migrate toward the limbs. Consequently, each dermatome and myotome have primordial segmental innervation. During this migration, some nerve fibers come into proximity and fuse to form a network of nerves [1]. The lower five cervical and upper two thoracic segments correspond to the developing upper limb buds. The anterior primary rami of the spinal nerves from these segments begin to innervate the mesenchyme of the upper limb buds. Initially, each anterior ramus divides into anterior and posterior branches, which later unite to form peripheral spinal nerves that innervate the anterior and posterior muscle groups of the upper limb. Once the primitive branching and course are established, the nerve fibers and muscle cells derived from the mesenchymal tissues undergo physiological differentiation [3]. Weiss's principle of contact-guidance and Ramón y Cajal's theory of neurotropism or chemotropism elucidate the movement of primitive nerve fibers. In chemotropism, axonal growth cones detect concentration gradients of molecules in their environment and grow toward the source. The contact guidance mechanism facilitates adherence between the target structure and the growth cone [4, 5]. Neural cell adhesion molecules (N-CAM), L1, and cadherins present on cellular surfaces recognize and bind to components of the extracellular matrix. These interactions play a crucial role in determining axonal pathfinding [6]. Variations in the origin, course, and branching patterns of motor nerve fibers are the result from differing levels of expression of various transcription factors. The variation in the median nerve root observed in our study is likely a consequence of the misexpression of certain transcription factors. Satyanarayana *et al*., reported that the median nerve is formed by three roots, with two originating from the lateral cord and joining individually with the medial root, creating the median nerve trunk, which aligns with our findings. The same authors also documented the formation of the median nerve from four roots, where three come from the lateral cord and connect individually with the medial root [7]. Anju Bala *et al*., discovered that

the medial root of the median nerve received a supplementary branch from the medial aspect of the terminal portion of the lateral cord of the brachial plexus [8]. Vinay Sharma *et al*., noted that the median nerve was formed by one lateral root and two medial roots [9]. Mat Taib *et al*., dissected forty-four upper limbs from Malaysian cadavers and discovered that the median nerve formed from either four or three roots. In all cases where three roots were present, two originated from the lateral cord and one from the medial cord [10]. Anomalies in related blood vessels, particularly the axillary and brachial arteries, are often associated with unusual patterns of the median nerve [11, 2]. There is no change in the course of axillary artery or the normal anatomical relationship with the median nerve in the present study. However, in the present study, there were no alterations in the course of the axillary artery or its typical anatomical relationship with the median nerve.

The variations in the anatomy of the median nerve in the arm hold considerable clinical significance. Rao emphasized that clinicians and surgeons should be mindful of these variations when performing surgical procedures in this area [13].

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