



Case Report | Olgu Sunumu

FORMATION VARIATION OF THE MEDIAN NERVE: A CADAVERIC CASE REPORT

N.MEDIANUS'UN OLUŞUM VARYASYONU: BİR KADAVRA OLGU SUNUMU

Mehtap Erdogan^{1*}, Keziban Karacan¹, Huseyin Baylan¹, Ebru Mihriban Guven¹

¹Sakarya University, Faculty of Medicine, Department of Anatomy, Sakarya, Türkiye.



ABSTRACT

The median nerve, the longest branch of the brachial plexus, is formation in axillary fossa by a fusion of two nerves including the radix lateralis nervi mediani and radix medialis nervi mediani. A variant of that formation was observed during routine dissection at anatomy department of our faculty. It was found that the left median nerve was formed by three branches (two lateral and one medial). One of the roots originated from the fasciculus medialis; the other two roots originated from the fasciculus lateralis. This variation should be known and has clinical importance especially in surgical interventions, surgical interventions of traumatic cases and radiologic evaluations in order not to mislead the clinician.

Keywords: Anatomical variation, dissection, median nerve, brachial plexus

Öz

Plexus brachialisin en uzun dalı olan n. medianus; fossa axillaris, radix lateralis nervi mediani ile radix medialis nervi mediani'nin birleşmesi ile oluşmaktadır.

Sakarya Üniversitesi Tıp Fakültesi Anatomi Anabilim Dalı'nda tıp öğrencileri için yapılan rutin diseksiyon sırasında, N.medianus'un varyant bir oluşumu gözlenmiştir. Sol aksiller bölgede, normalden farklı olarak N.medianus'un iki lateral ve bir medial dalın birleşimiyle oluştuğu tespit edilmiştir. Köklerin biri, fasciculus medialis; diğer iki kök ise fasciculus lateralis kaynaklanmaktaydı. Bu varyasyon, özellikle cerrahi girişimlerde, travmatik olguların cerrahi girişimlerinde ve radyolojik değerlendirmelerde klinisyeni yanıltmaması için bilinmelidir ve klinik öneme sahiptir.

Anahtar Kelimeler: Anatomik varyasyon, diseksiyon, n. medianus, plexus brachialis

*Corresponding author/İletişim kurulacak yazar: Mehtap Erdogan; Sakarya University, Faculty of Medicine, Department of Anatomy, Sakarya, Türkiye.

Phone/Telefon: +90 (553) 112 47 46, e-mail/e-posta: mehtaperdogan@sakarya.edu.tr

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Introduction

The plexus brachialis is a complex nerve network that provides motor and sensory fibers to the upper extremity through the fusion of the ramus ventralis arising from the C5-T1 segments. The median nerve is usually formed anterior or lateral to the axillary artery by the union of the radix lateralis (LR) from the faciculus lateralis and the radix medialis (MR) from the faciculus medialis (Figure 1). However, as a result of variations during embryonic development, the median nerve may form with three or more roots. Knowing this variation reduces the risk of complications in clinical and surgical practices.¹⁻³ Anatomical variations of the brachial plexus have crucial importance in the diagnosis of nerve blockages, peripheral nerve compression syndromes and surgical interventions.^{1,4} Although the median nerve is a union of two branches emerging from the lateral and medial faciculi of the brachial plexus.² However, many variations on this classical formation exist in literature. The presence of abnormal branches between musculocutaneous nerve and median nerve is among common variations.^{4,5}

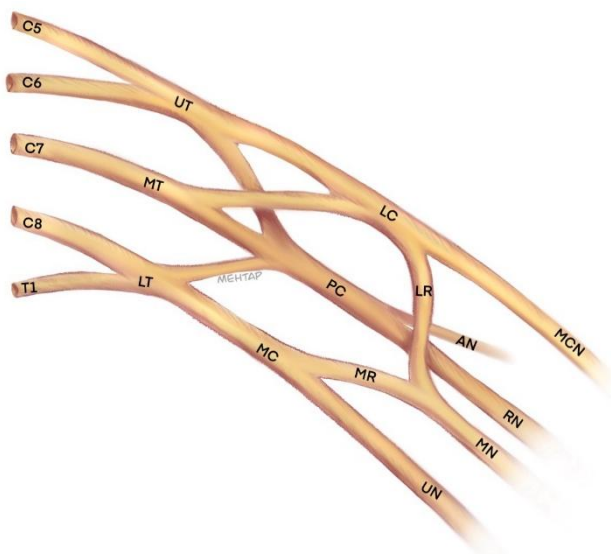


Figure 1. Diagram of brachial plexus (Image credits: Mehtap Erdogan)

(UT: Upper Trunk; MT: Middle Trunk; LT: Lower Trunk; MC: Medial Cord; PC: Posterior Cord; LC: Lateral Cord; MCN: musculocutaneous nerve; MN: median nerve; UN: ulnar nerve; LC: Lateral cord of brachial plexus; LR: Lateral root of the median nerve; MR: medial root of median nerve)

The embryological origin of these anatomical variations is based on the segmental organization and the environmental factors.⁶ This variability during the embryonic period may affect the formation and distribution of the median nerve.⁷ Variations may increase risks in surgical procedures and repair of nerve injuries and affect the efficacy of peripheral nerve blocks.^{1,3}

This case aims to contribute to clinical practice and the prevention of surgical complications by better understanding the variants of the median nerve.

Case Report

A variant formation of the median nerve (MN) was observed in the left axilla and arm region of an adult male cadaver during dissection in Sakarya University Faculty of Medicine Anatomy Laboratory.

In the cadaver we examined, the median nerve was formed by the merger of three roots: the first lateral root of the median nerve (LR1), the second lateral root of the median nerve (LR2) and the medial root of the median nerve (MR). LR1 and LR2 originated from the lateral cord and MR from the medial cord. After LR1, LR2 and MR met anterior to the axillary artery, MN then continued along the arm in its normal course, passing anterior to the brachial artery (Figure 2). On the other hand the other side MN (of the right upper extremity) had no variation different from the population. No previous surgical intervention or anomaly was found in the cadaver.



Figure 2. Dissection of the anterior compartment of left axilla showing variant formation of median nerve

(MCN: musculocutaneous nerve; MN: median nerve; UN: ulnar nerve; LC: Lateral cord of brachial plexus; LR1: First lateral root of the median nerve; LR2: Second lateral root of median nerve; MR: medial root of median nerve; AA: Axillary artery; AV: Axillary vein)

Remarkably, the high level of origin of the deep brachial artery observed in some literature cases was not detected in this cadaver.

Discussion

Although the anatomists, clinicians may come across many variations in the formation of the MN, MN is mostly reported to consist of 2 roots (1 lateral and 1 medial). Like we detected, there are also variations in which it may consist of 2 lateral and 1 medial root.

MN variations result from segmental changes in the embryonic development of the plexus brachialis. The three-rooted median nerve formation observed in our study is similar to previously described variations in the literature. However, in this case, no accompanying vascular anomaly was observed and the vascular structures were found to conform to classical anatomy. Like our finding, Sontakke et al.⁸ Sontakke et al. also reported the formation of a median nerve with three roots, including two lateral and one medial roots⁸. Besides no variation of the deep brachial artery and the vascular structures were found in our case.

Pandey¹ and Uzun⁵ described many variations related to brachial plexus formation and stated that most variations are due to the connections between the musculocutaneous nerve and MN.^{1,5} Uzun et al. emphasised the presence of conduction branches between the musculocutaneous nerve and MN, and stated that this may increase the risk of surgical complications.⁵ The presence of such transmission branches was not observed in this case, but this may vary in different populations.³

In a case reported by Morimoto et al. 2015, proximal entrapment of the median nerve and course variations of the axillary artery were observed together and it was emphasised that such variations may lead to nerve compression⁹ Nonthasaen et al. have analysed the variational relationships between the axillary artery and median nerve in detail and emphasised the importance of considering these relationships in surgical interventions.¹⁰

In conclusion, the median nerve variations should be considered in clinical applications, especially in surgical procedures, nerve blockades and peripheral nerve injuries. Embryological development and segmental changes affect the median nerve formation leading to clinically significant consequences.^{6,7} These variations may pose a risk for nerve compression syndromes, surgical complications and nerve injuries and should be considered in clinical diagnosis and treatment processes.^{1,3}

In the light of all these findings, consideration of brachial plexus variations in clinical practice reduces the risk of complications, especially in cases such as nerve blocks, peripheral nerve surgery and upper extremity trauma.

The clinical significance of such variations is especially important in axillary surgeries, post-traumatic reconstruction and nerve block applications. The position of the roots and their relationship with the axillary artery and its branches may predispose to vascular or neurological compression syndromes.

Compliance with Ethical Standards

The Institutional Review Board of Kocaeli University granted ethical permission for this investigation (Approval Code: KOÜ GOKAEK-2019, Project Identifier: 2019/269). All procedures were conducted in compliance with the principles outlined in the Declaration of Helsinki.

Conclusion

Variant formations of the median nerve should be considered in upper extremity surgery, radiological diagnosis and evaluation of peripheral nerve injuries. Three-rooted median nerve variations are rarely detected in routine dissections and may lead to results that may affect clinical practice.

Compliance with Ethical Standards

This case report is based on an anatomical variation observed in a formalin-fixed cadaver during routine dissection practice. According to institutional and national guidelines, this type of study does not require ethical committee approval. Nevertheless, all procedures were conducted in accordance with ethical and professional standards.

Conflict of Interest

The authors declare no conflicts of interest.

Author Contributions

ME: Study design, dissection, photography, and literature review; ME and HB: Writing the first draft of the article and manuscript revision; KK and HB: Review of the manuscript with focus on formatting and layout corrections; EMG and KK: Critical reading and providing feedback on the manuscript.

Financial Disclosure

None.

References

1. Pandey SK, Shukla VK. Anatomical variations of the cords of brachial plexus and the median nerve. *Clin Anat.* 2007;20(2):150-156. doi:10.1002/ca.20365
2. Budhiraja V, Rastogi R, Asthana AK. Anatomical variations of median nerve formation: embryological and clinical correlation. *J Morphol Sci.* 2011;28(4):283-286.
3. Ghosh B, Dilkash MNA, Prasad S, Sinha SK. Anatomical variation of median nerve: cadaveric study in brachial plexus. *Anat Cell Biol.* 2022;55(2):130-134. doi:10.5115/acb.22.022
4. Choi D, Rodríguez-Niedenführ M, Vázquez T, Parkin I, Sañudo JR. Patterns of connections between the musculocutaneous and median nerves in the axilla and arm. *Clin Anat.* 2002;15(1):11-17. doi:10.1002/ca.1085
5. Uzun A, Seelig LL Jr. A variation in the formation of the median nerve: communicating branch between the musculocutaneous and median nerves in man. *Folia Morphol (Warsz).* 2001;60(2):99-101.
6. Larsen WJ. *Human Embryology.* 3rd Edition. New York, USA: Churchill Livingstone; 2001.

7. Sanes JR, Reh TA, Harris WA. Development of the Nervous System. 3rd Edition. Amsterdam, Netherlands: Elsevier; 2012.
8. Sontakke BR, Tarnekar AM, Waghmare JE, Ingole IV. An unusual case of asymmetrical formation and distribution of median nerve. *Int J Anat Var.* 2011;4:57-60.
9. Morimoto D, Isu T, Kim K, Sugawara A, Isobe M, Morita A. Proximal entrapment neuropathy of the median nerve above the elbow-case report. *J Nippon Med Sch.* 2015;82(6):287-289. doi:10.1272/jnms.82.287
10. Nonthasaen P, Chaimongkhon T, Chobpenthai T, Mahakkanukrauh P. Anatomical variations and surgical implications of axillary artery branches: an anatomical study of the coracoid process region. *Anat Cell Biol.* 2025;58(1):35-43. doi:10.5115/acb.24.215