

Anatomical variation of the median nerve and accompanying subclavius posticus muscle: a cadaveric case report

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Abstract

The median nerve and subclavius muscle are two critical neuromuscular structures of the upper extremity. Although their anatomical variations are well described in the literature, a case report involving both anatomical variations in the same extremity is rare. Here, we report a case involving different anatomical variations in the median nerve formation and aberrant subclavius posticus muscle. During routine dissection, a rare anatomical variation was encountered in the left upper extremity of an adult male cadaver. In this case report, we observed two distinct findings in the left upper extremity of a 66-year-old male cadaver: a variant basilic vein passing between the lateral and medial roots of the median nerve and the presence of the subclavius posticus muscle. To our knowledge, a case involving an unusual basilic vein passing between the lateral and medial roots of the median nerve and an aberrant subclavian posticus muscle in the same extremity has not been reported to date. Knowledge of such variations may be useful for surgeons in avoiding iatrogenic injuries during anaesthetic and surgical procedures around the axilla and arm.

Keywords: anatomical variation; basilic vein; median nerve; subclavius posticus muscle

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Introduction

The median nerve (MN) is formed by the medial root from the medial cord and the lateral root from the lateral cord of the brachial plexus and converges anterior or lateral to the axillary artery.^[1-7] The literature has extensively documented variations in MN formation since the early 1900s. Since then, there have been several case reports on anatomical variations of the median nerve roots.^[1,3,4] But these studies are mainly based on variations of the median nerve formations and its relation to arteries in the arm and axilla. The current study highlights the presence of different anatomical variation at median nerve formation and describes a rare form of musculature anomaly.

The subclavius posticus muscle (SPM) is an aberrant muscle originating from the superomedial aspect of the first rib reaching to superior border of the scapula. This muscle has been reported to cause dynamic compression

of either the brachial plexus or the subclavian vessels depending on its activation. The SPM's proximity to neurovascular structures suggests its potential role in thoracic outlet syndrome.^[6,8]

It is important to know and report such anatomical variations of the median nerve with the basilic vein to avoid damage to the nerve during surgical treatment or anaesthetic procedures.^[1] To our knowledge, there is no cadaveric study showing the relationship between the median nerve and the basilic vein. In this paper, we describe the relationship between the median nerve roots and the basilic vein and the location of the subclavius posticus muscle on the same side on a cadaver.

Case Report

During routine dissection of the left upper extremity of a 66-year-old man in 2023 in the dissection laboratory of

Istinye University Department of Anatomy, we observed a variant basilic vein passing between the lateral and medial roots of the median nerve and an aberrant subclavius posticus muscle. Both sides of the cadaver were dissected according to Cunningham's Manual of Practical Anatomy. No variation was observed in the right upper extremity. The skin, superficial fascia and deep fascia were separated, the middle part of the clavicle was removed and various muscles were projected to visualize the formation and variation of the median nerve. Photographs of the dissection procedures were taken for proper documentation (Figure 1). The medial and lateral cord branches of the brachial plexus were carefully dissected; their course and formation were noted and photographed (Figure 2a). During its short passage in the axillary fossa, the median nerve travels posterior to the pectoralis major and minor muscles and anterior to the subscapularis muscle. After crossing the ulnar nerve anteriorly, it leaves the axillary fossa under

the inferior edge of the pectoralis major muscle and travels down the lower arm between the musculocutaneous nerve and the brachial artery. In the upper arm, the basilic vein is normally parallel to and medial to the course of the median nerve and its branches. Proximally, it drains into the axillary vein. The basilic vein does not ascend above the normal passage in the left arm. In the upper arm, the basilic vein travelled parallel to the musculocutaneous nerve, starting at the lateral border of the axilla and crossing the brachial artery anteriorly. The basilic vein travelled between the two roots of the median nerve to its junction with the axillary vein (Figures 2a and b). The course and branches of the median nerve in the forearm and hand were found to be normal. During dissection around vascular and nerve structures, the subclavius posticus muscle, which runs parallel to the cephalic vein, was also incidentally detected (Figure 2b).

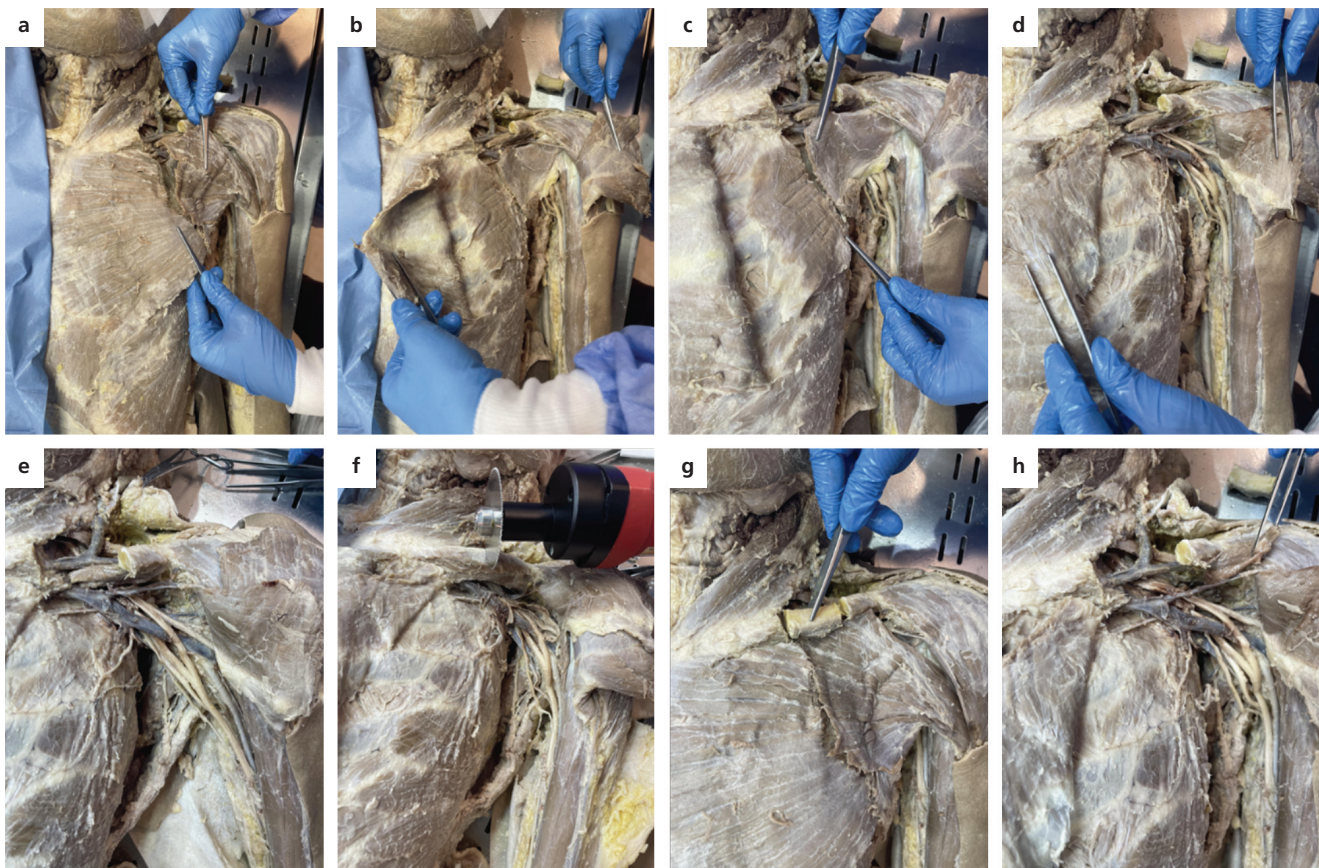


Figure 1. Step-by-step dissection of the axilla and brachial plexus after removing skin and superficial fascia. (a) identifying the pectoralis major muscle and cutting it from the midline; (b) retracting the pectoralis major muscle; (c) identifying the pectoralis minor muscle and cutting it from the midline; (d) retracting the pectoralis minor muscle; (e) reviewing the parts of the brachial plexus with cords and terminal branches, as well as locating vessels; (f-g) removing the middle third of the clavicle with oscillating saw; (h) retracting the subclavian muscle laterally.

Discussion

Anatomical variations of peripheral nerves pose a potentially important anatomical, clinical and surgical problem. One of these, the median nerve, is formed by the union of two roots, the lateral root and the medial root, which come from the lateral and medial cord of the brachial plexus, respectively, but the location of this union can vary. However, it has been found that both cords can merge most commonly in the axillary fossa.^[2,3] Normally the basilic vein crosses the median nerve and unites with the brachial vein to form the axillary vein.^[5] In the present study we found unusual formation of median nerve involving the basilic vein course that passed in between the two roots of median nerve and no previous study reported this kind of variation of median nerve formation. The course of the basilic vein, in close proximity to the median nerve, puts this structure at risk of injury and may result in pain from repeated cannulation during dialysis. Such moving upward of the basilic vein may impede the blood flow in the vessel during certain movements of the shoulder joint.^[1,5]

Furthermore, an interesting finding observed in this case was the presence of the subclavius posticus muscle. During our routine anatomical dissection, the relationship of the median nerve to the subclavius posticus muscle was incidentally observed. The subclavius posticus muscle is a rare abnormal muscle that may be a potential cause of thoracic outlet syndrome because the subclavian vessels and brachial plexus are located inferior to the muscle.^[6]

On the basis of embryological development, the variational pattern of the median nerve can be explained. The morphology of the MN originates from embryogenesis. The etiology of median nerve formation, with its potential variants, can be traced back to embryonic development and continues throughout the rest of a person's life.^[1,7] The somites forming the limbs migrate and bring their respective nerve. The existence of this anomaly may be hitch on to random factor influencing the mechanism of formation of the limb muscles and the peripheral nerves during embryonic life. It is known that the brachial plexus seems to be a single radicular cone in the

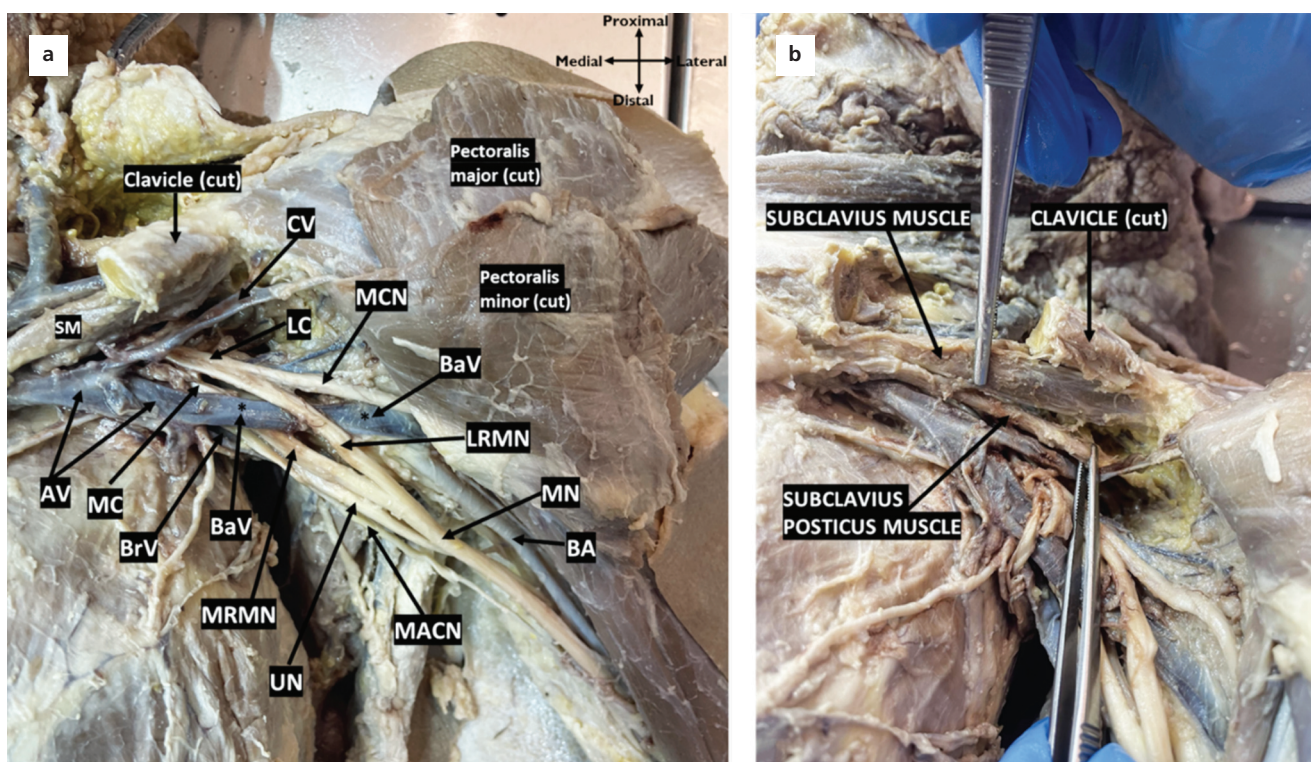


Figure 2. (a) Dissection of the left axilla showing the basilic vein (*) passing between lateral and medial roots of the median nerve. AV: axillary vein; BA: brachial artery; BaV: basilic vein; BrV: brachial vein; CV: cephalic vein; LC: lateral cord; LRMN: lateral root of median nerve; MACN: medial antebrachial cutaneous nerve; MC: medial cord; MCN: musculocutaneous nerve; MN: median nerve; MRMN: medial root of median nerve; SM: subclavius muscle; UN: ulnar nerve. (b) dissection of the infraclavicular region exhibiting the subclavius muscle along with the subclavius posticus muscle.

upper limb bud. This cone divides longitudinally into ventral (ulnar and median nerve) and dorsal (gives rise to the axillary and radial nerve) divisions.^[9,10] A report shows that the abnormal relation of the brachial plexus and its branches can be ascribed to unusual developmental pattern of cords and its divisions in relation to the axillary artery during embryonic life.^[1] Embryologically, this variation can be explained by understanding the role of the formation, location, and course of the cords and the median nerve with their communicating branches. It may be also due to the factors influencing the mechanism of action of mesenchymal cells giving rise to peripheral nerves and limb muscles.

There are many case reports in the literature involving different variations of the median nerve and basilic vein, but we could not find a report similar to this case regarding the combined variations of the median nerve and basilic vein. The variations related to the formation of median nerve have been studied and presented by many authors at various times, but these studies are mainly based on median nerve formations by the union of three roots,^[1,3,4,10] the arterial relations to the MN formation^[4] or a communicating branch from the musculocutaneous to the median nerve.^[4,9] In a previous cadaver-based study (42 anatomical bodies), it was concluded that the median nerve presented variation in its formation in 22.6% (three or more roots). These variations were more common in males than females and were bilateral in 19% of all anatomical bodies.^[3] During the dissection of a 65-year-old male cadaver, Diramali et al.^[2] showed that the medial brachial vein, which should be normally joined with the basilic vein just at the distal of the emergence of the median nerve, joined with the basilic vein after passing through two roots of the median nerve bilaterally. In a study on a 45-year-old male Indian cadaver, Vollala et al.^[10] reported that on the left side, the brachial vein passed between the medial and lateral roots of the median nerve and drained into the axillary vein. Our case is a very notable case due to its clinical presentation. On the other hand, in our donor body, a proximity stood out with a study previously reported in a cadaveric case study by Ameet et al.^[1] as distinct from our study, brachial vein passed in between the two lateral roots of median nerve.

The variation in the formation of the median nerve is of great clinical importance in terms of both the nerve itself and its relationship with neighboring structures. In the events of trauma and accidents of upper limb or neoplasm these variations may be encountered while repairing the nerves. Surgeons who perform radical neck dis-

section and other surgical operations in the upper arm and axillary region need to be aware of these anatomical variations.^[2,10] Because any injury caused to this nerve in the axilla or upper arm may bring about unforeseen paralysis of the flexor muscle structures of the elbow and hypoesthesia over the area of cutaneous innervation of the median nerve.^[1,3] This information may also help in explaining the interpretation of a nerve compression with unusual clinical symptoms. On the other hand, knowing the variations of the basilic vein can reduce the incidence of complications during an intervention aimed at this area.^[10] Basilic vein is an acceptable site for venipuncture. Since the course of the vein, in close proximity to the median nerve, knowledge about this variation might be considered by the vascular surgeons when using an arteriovenous graft or fistula for hemodialysis access in patients with kidney failure.^[5] For all these reasons, variations in the formation of median nerve and its relation to the basilic vein maybe of critical importance for anesthesiologists and surgeons, while they perform surgical procedures. This is an unusual anatomic variation that is inadequately documented, hereby its frequency is likely underestimated by anatomists and radiologists.

Conclusion

In this case report, we present a case of coexistence of the median nerve and the subclavius posticus muscle in the same individual. This case study demonstrates that both variations are rarely found in a single cadaveric body, a finding that, to our knowledge, has not been reported in the literature. Awareness and detailed knowledge of such an anatomical variation may be crucial to prevent iatrogenic injuries during anesthetic and surgical procedures around the axilla and arm. It also helps to avoid intraoperative confusion in complex traumatic injury patterns.

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Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Author Contributions

SA: dissection, project development, manuscript writing; ID: dissection, project development, manuscript writing and editing.

Ethics Approval

This retrospective case study involving human participants complies with the ethical standards of the institutional and national research committee and the 1964 Declaration of Helsinki and its subsequent amendments or similar ethical standards. All authors have permission for participation and publication. The study was approved by Istinye University Human Research Ethics Committee with registration number 04/2023.K-23/92. As there were no concerns about identifying information, the authors obtained informed consent at Istinye University Bahçeşehir Liv Hospital where the images were obtained. All data used in this study are available for verification upon request.

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References

1. Ameet KJ, Mamatha T, Rajalakshmi R, Vasudha VS. Compression of brachial vein between two lateral roots of median nerve- a case report. *Journal of Surgical Academia* 2015;5:44-6.
2. Diramali M, Kosif R, Meyvacı SS, Daghan FE. Bilateral variations of median nerve formation and endpoint variation of brachiales veins. *International Journal of Anatomical Variations* 2019;12:46-9.
3. Encarnacion M, Nurmukhametov R, Barrientos RE, Melchenko D, Goncharov E, Bernard E, Huerta JM, Uhl JF, Efe IE, Montemurro N, Ramirez I. Anatomical variations of the median nerve: a cadaveric study. *Neurol Int* 2022;14:664-72.
4. Mat Taib CN, Hassan SN, Esa N, Mohd Moklas MA, San AA. Anatomical variations of median nerve formation, distribution and possible communication with other nerves in preserved human cadavers. *Folia Morphol (Warsz)* 2017;76:38-43.
5. Sadeghi A, Setayesh Mehr M, Esfandiari E, Mohammadi S, Baharmian H. Variation of the cephalic and basilic veins: a case report. *J Cardiovasc Thorac Res* 2017;9:232-4.
6. Shetty P, Pai MM, Prabhu LV, Vadgaonkar R, Nayak SR, Shivanandan R. The subclavius posticus muscle: its phylogenetic retention and clinical relevance. *Int J Morphol* 2006;24:599-600.
7. Soubeyrand M, Melhem R, Protais M, Artuso M, Crézé M. Anatomy of the median nerve and its clinical applications. *Hand Surg Rehabil* 2020;39:2-18.
8. Ulusoy OL, Alis D, Oz A, Barlas SB, Sokmen BK, Sever S, Mutlu A, Colakoglu B. The prevalence and characteristics of the subclavius posticus muscle in the adult population on MRI. *Surg Radiol Anat* 2018;40:1141-5.
9. Uyaroglu FG, Kayahoglu G, Erturk M. Anastomotic branch from the median nerve to the musculocutaneous nerve: a case report. *Anatomy* 2008;2:63-6.
10. Vollala R, Potu K, Gorantla R, Reddy S. Variant median nerve and lateral antebrachial cutaneous nerve associated with anomalous brachial vein: case report. *Neuroanatomy* 2008;7:28-32.

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