

Common trunk of the medial brachial and antebrachial cutaneous nerves arising directly from the inferior trunk of the brachial plexus: a case report with clinical implications

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Abstract

Purpose: The medial brachial cutaneous nerve (MBCN) and medial antebrachial cutaneous nerve (MACN) typically arise independently from the medial cord of the brachial plexus. We describe a compound variation combining a shared origin directly from the inferior trunk with a distinct distal branching pattern, resulting in potential clinical relevance at two different anatomical sites.

Methods: The variation was identified during routine dissection of the right upper limb of an 85-year-old formalin-fixed male cadaver. Morphometric measurements were independently repeated by two investigators using a digital caliper and subsequently averaged.

Results: A common MBCN-MACN trunk arose directly from the inferior trunk in the supraclavicular region. It measured 9.6 cm in length and 5.1 mm in external width at its origin, compared with 4.9 mm for the ipsilateral ulnar nerve. The trunk descended alongside the inferior trunk and medial cord before dividing at the inferior border of the pectoralis minor into the MACN and a short MBCN stem. The MBCN divided into two cutaneous branches, whereas the MACN formed anterior and posterior branches that pierced the deep brachial fascia and subsequently divided into four branches. One secondary posterior branch coursed directly on the surface of the basilic vein and crossed it anteriorly.

Conclusion: This variation may be clinically relevant in two distinct regions. Proximally, its unexpected origin and substantial caliber may affect supraclavicular procedures and electrodiagnostic localization. Distally, its four-branch configuration and intimate relationship with the basilic vein may increase susceptibility to injury during venous access and surgery around the medial elbow.

INTRODUCTION

Despite its well-established description, the brachial plexus demonstrates considerable variability in the origin, course, and organization of its branches [3]. Among its smallest, purely sensory rami are the medial brachial cutaneous nerve (MBCN) and medial antebrachial cutaneous nerve (MACN). Typically, both nerves arise independently from the medial cord, a continuation of the anterior division of the inferior trunk, and carry C8–T1 fibers [10].

From its origin, the MBCN descends toward the skin of the medial arm, whereas the MACN courses through the arm closely accompanying the basilic vein. The MACN typically divides into an anterior and posterior branch, which pierce the deep brachial fascia and continue toward the medial forearm and wrist. [4, 10]. The superficial course of these nerves and their close relation to venous and surgical landmarks expose them to iatrogenic injury, with cases of neuropathic pain and paresthesia described in routinely performed procedures such as venipuncture, cubital tunnel release surgery, and brachioplasty [2, 4, 8].

Numerous variations of the medial cutaneous nerves have been reported in the literature. These notably include communications with other brachial plexus nerves, atypical origins, and shared common trunks

[3]. However, to our knowledge, a compound variation in which both nerves share a common trunk that arises directly from the inferior trunk of the brachial plexus has not been reported to date, nor has the caliber of such a trunk previously been quantified. We describe this variation together with a four-branch distal configuration of the MACN, including a branch coursing directly over the surface of the basilic vein. This combination may be clinically relevant at two distinct anatomical sites: the supraclavicular and elbow regions.

CASE REPORT

During dissection of the right upper limb, posterior cervical triangle and supraclavicular region of an 85-year-old formalin-fixed male cadaver, we observed an unusual configuration of the MACN and MBCN. Morphometric measurements were obtained independently on two separate occasions by different members of the research team using a digital caliper with an accuracy of ± 0.02 mm. Minimal pressure was applied to avoid tissue compression, and the mean of the measurements was reported. No visible pathological changes were observed in the examined regions. The left upper limb demonstrated a typical branching pattern.

In the supraclavicular region, a single, well-defined nerve trunk was observed (Fig. 1). This nerve trunk arose directly from the inferior trunk of the brachial plexus, measured 9.6 cm in length, and had an external width of 5.1 mm at its origin. For internal comparison, the external width of the ipsilateral ulnar nerve at its origin from the medial cord was 4.9 mm when measured using the same method. For both nerves, their points of origin were also their widest points.

From its origin, the nerve trunk descended alongside the inferior trunk and then the medial cord, maintaining a medial position relative to both structures. The trunk bifurcated at the level of the inferior border of the pectoralis minor muscle into two nerves identified as the MACN and MBCN based on their course and cutaneous distribution. The MBCN had an external width of 1.9 mm and continued for a short distance as a single stem before dividing into two branches distributed to the skin of the medial arm. The MACN measured an external width of 3.0 mm at its origin and remained undivided until the distal third of the arm, where it gave rise to an anterior (A) and posterior (P) branch, which pierced the deep brachial fascia separately.

The anterior branch subsequently bifurcated into two secondary branches, one to the skin of the medial forearm (A1) and the other continuing toward the skin of the distal forearm and wrist (A2). The posterior branch also gave rise to two secondary branches. The smaller, lateral of the two (P2) coursed directly over the medial surface of the basilic vein, crossed the vein anteriorly, and subsequently descended alongside the larger (P1) toward the skin of the posteromedial forearm. In total, four separate MACN branches were identified in the cubital region at the level of the interepicondylar line.

DISCUSSION

The variation described in this report combines four distinct elements, each contributing to its overall significance. In a recent meta-analysis on the branching variations of the brachial plexus, Benes et al. describe five documented origins for the MACN and four for the MBCN. These include, among others, a common trunk of the medial cutaneous nerves arising from the medial cord – at an estimated prevalence of 3.0%, and independent origin from the inferior trunk at 0.2% for the MBCN and 2.1% for the MACN. The only reported cases of a common MACN-MBCN nerve trunk originating from a structure other than the medial cord are origins from the T1 root, with an estimated pooled prevalence of 0.1% [3]. We believe this to be the first documented case of a shared common trunk arising directly from the inferior trunk.

To further discuss the potential impact of this variation on procedures involving the supraclavicular region, the external width of the common trunk was measured. To our knowledge, the caliber of such common trunks has not been previously described. However, when compared to data available for the MACN proximal to its bifurcation, the measured width was nearly double the reported values, although this comparison must be interpreted cautiously due to differences in measurement technique [1]. The larger width may reflect the combined neural and connective-tissue components associated with both medial cutaneous nerves; however, their internal organization could not be determined macroscopically. Notably, the external width of the common trunk was comparable to that of the ipsilateral ulnar nerve measured using the same method. This comparison illustrates the substantial size of the common trunk but should not be interpreted as indicating equivalent axonal content or functional capacity.

Ultrasound-guided intertruncal nerve block is often used to provide anesthesia for surgical procedures involving the elbow, forearm, wrist, and hand, particularly when reliable blockade of the ulnar nerve and other terminal branches is required [5]. Because this technique involves needle placement and anesthetic deposition in direct proximity to the inferior trunk, an unexpected supraclavicular origin of the common trunk may be clinically relevant. Previous reports of MACN injury following brachial plexus block indicate that direct needle–nerve contact can produce neuropathy characterized by persistent pain, paresthesia, and sensory loss [6]. Injury to the common trunk could lead to these symptoms manifesting in territories supplied by both nerves, spanning much of the medial upper limb.

The proximal origin may also have implications for electrodiagnostic localization. MACN Sensory nerve action potential (SNAP) studies are frequently used in the evaluation of medial cord plexopathies and can help distinguish plexus lesions from isolated ulnar nerve neuropathy. In the typical configuration, a medial cord lesion is expected to reduce the amplitude of the MACN nerve action potential [9]. However, in this case, a lesion distal to the origin of the common trunk could spare the MACN and preserve its sensory response. Conversely, an injury confined to the common trunk would affect both the MACN and MBCN while sparing the remaining branches of the medial cord. Recognizing the impact of anatomical variations on diagnostic procedures may be relevant when the obtained findings do not correspond to the expected pattern of plexus involvement.

The distal branching pattern represents a separate site of potential vulnerability. In a study of 96 upper limbs, Damwan et al. found that two branches emerging from the deep brachial fascia were the most common configuration, observed in 52.1% of analyzed specimens, whereas four branches at the interepicondylar line were observed in only 3.1% of cases. For each specimen, the distance from the basilic vein to the closest branch of the MACN was measured. In the four-branch pattern, the measured distance was 0.3–2.3 cm lateral to the basilic vein; however, when all patterns were considered, individual branches could lie directly superficial to the vein [4]. The branching pattern, combined with a large number of superficial branches observed in this case, could impact the likelihood of iatrogenic nerve injury at the cubital fossa and elbow, where cases of injury to the MACN have been described during venipuncture and cubital tunnel release surgery. [8]. More proximally, reported injuries following brachioplasty further illustrate the vulnerability of the medial cutaneous nerves during surgical procedures [2].

Developmentally this variation may reflect altered timing of fascicular segregation within the C8–T1 component of the brachial plexus. Normally, fibers destined for the MACN and MBCN pass through the anterior division of the inferior trunk before emerging as separate branches from the medial cord. In the present specimen, fascicles destined for both nerves may have separated from the inferior trunk at an atypically proximal level rather than becoming incorporated into the medial cord pathway, while remaining macroscopically united until their distal division. The combination of proximal separation from the remaining inferior trunk fibers and delayed division into the MACN and MBCN could account for the supraclavicular origin and extended length of the common trunk. During upper limb development, axon growth is influenced by local molecular signaling and spatial factors, including developing vascular and musculoskeletal structures [7]. Other documented cases of single nerves arising directly from the more proximal elements of the plexus, as well as the often unilateral nature of these variations, may reflect the importance of local developmental cues on the formation of brachial plexus variations.

This report is limited by its observation in a single formalin-fixed specimen, the use of one-dimensional external width measurements, and the absence of histological and intraneural analysis. Nevertheless, the significance of this variation arises from its unexpected supraclavicular origin, substantial macroscopic size, shared proximal pathway, and distinct distal branching pattern. We encourage anatomists and surgeons to remain alert to compound variations and to document their findings, as awareness of such configurations may improve the understanding of brachial plexus variability and the planning of procedures involving the upper limb.

Declarations

Funding: No funding was received.

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Ethical approval: Cadaveric material was handled in accordance with national regulations governing the use of human cadavers for educational and scientific purposes. The donor provided written, informed

consent for the use of their body for educational and scientific purposes. No separate ethical approval was required.

Author contributions:

Kopa: Protocol/project development, Data collection or management; Stachura-Kuřach: Protocol/project development, Data collection or management, Data analysis, Manuscript writing/editing; Dutka: Manuscript writing/editing; Chmielowska: Data analysis; Lepich: Protocol/project development; Bajor: Protocol/project development

All authors read and approved the final manuscript

Data availability:

All morphometric data supporting the findings of this study are reported in this article. The original measurement records are available from the corresponding author upon reasonable request, subject to institutional regulations governing the use of donated human material.

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Figures

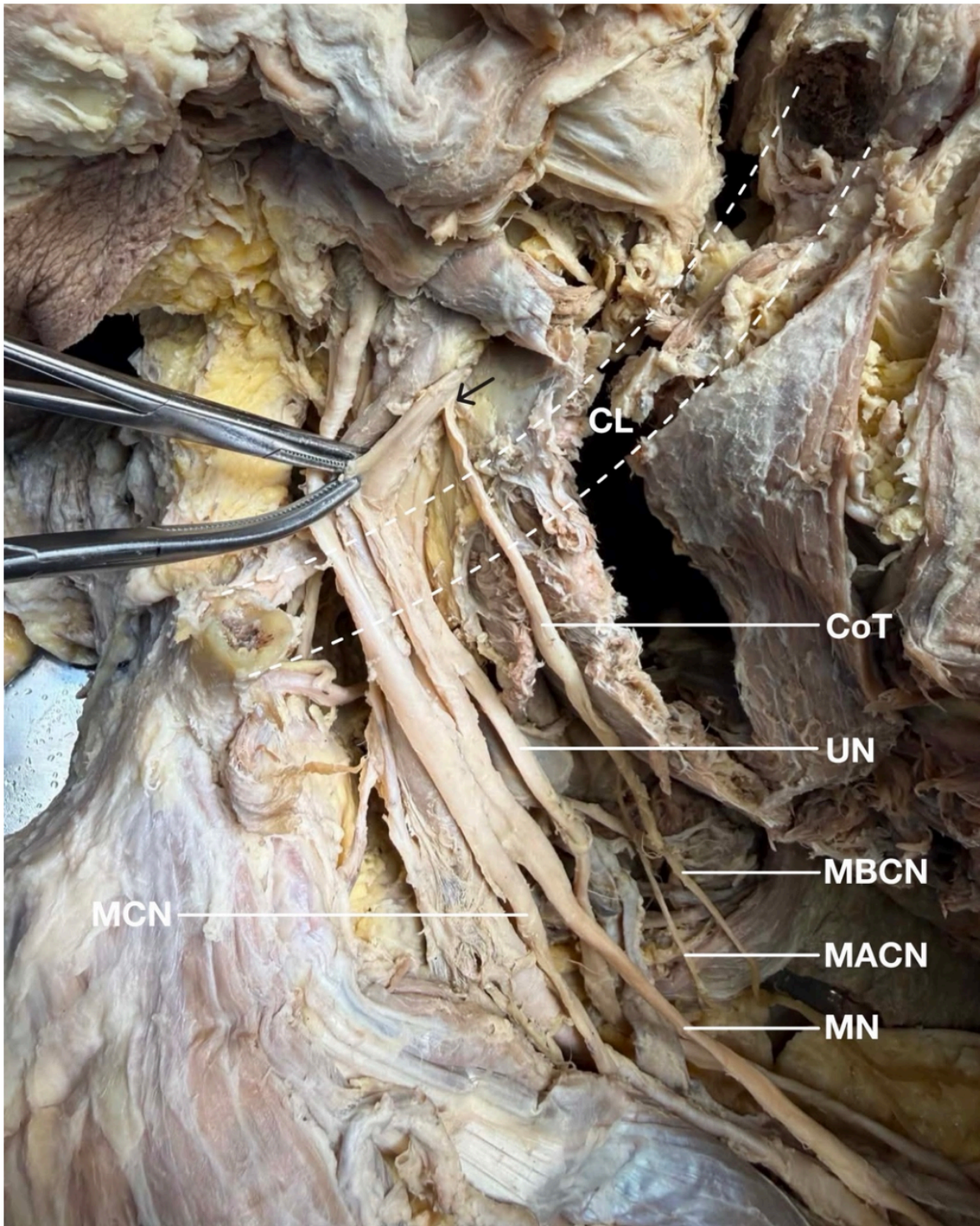


Figure 1

Right supraclavicular and axillary region showing the common trunk (CoT) of the medial brachial cutaneous nerve (MBCN) and medial antebrachial cutaneous nerve (MACN). The arrow indicates its origin from the inferior trunk of the brachial plexus. The clavicle was removed during dissection; its approximate location was marked with dashed lines (CL). MCN musculocutaneous nerve, MN median nerve, UN ulnar nerve

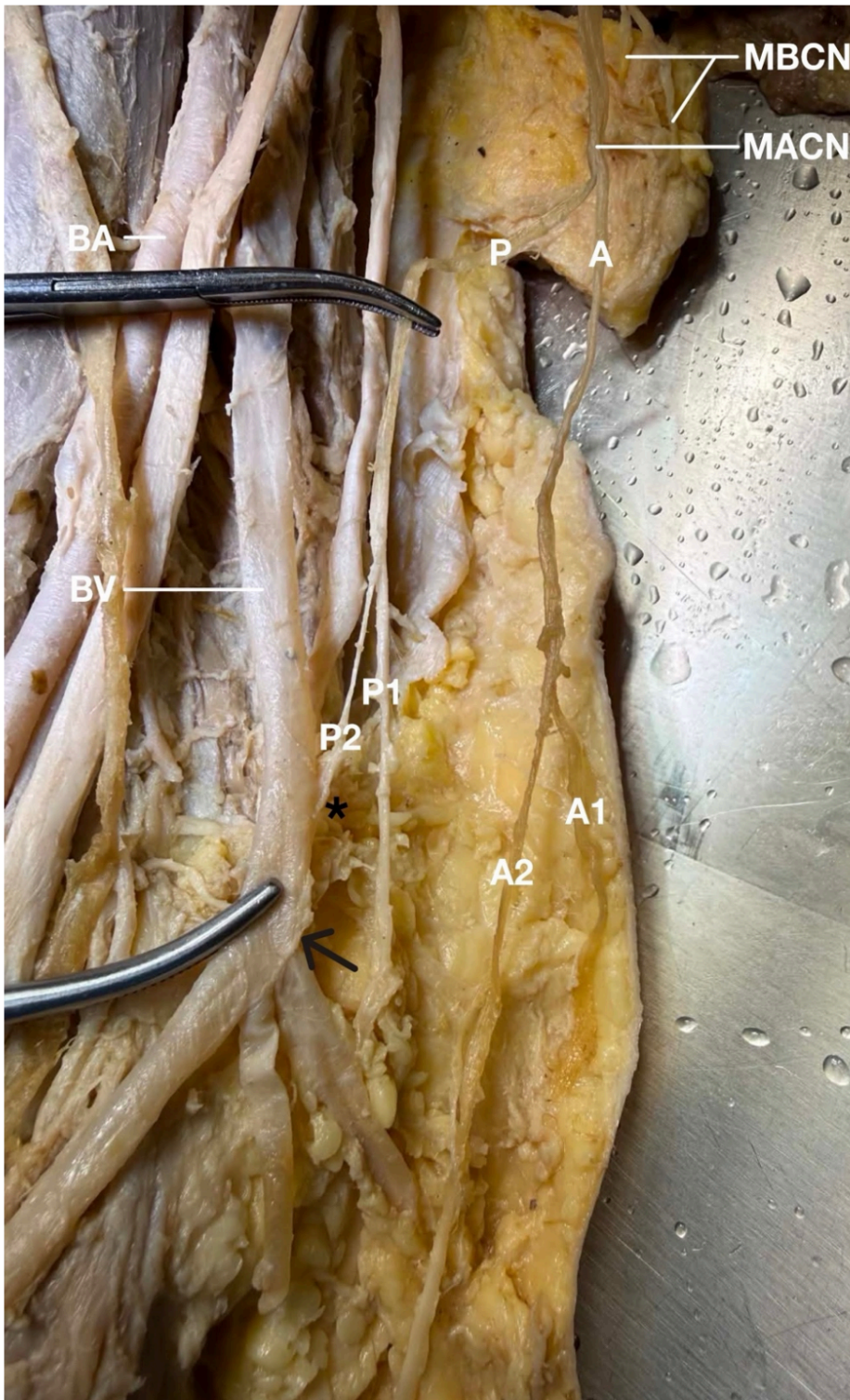


Figure 2

Right distal arm and cubital fossa showing the division of the MACN into an anterior (A) and posterior (P) branch, each further dividing into two branches (A1–A2 and P1–P2). The asterisk indicates the point at which P2 reaches the basilic vein. The arrow indicates the course of P2 along the surface of the vein, as it crosses it anteriorly. BA brachial artery, BV basilic vein, MACN medial antebrachial cutaneous nerve, MBCN medial brachial cutaneous nerve.

