

Variant structures potent to compress the median nerve in the arm

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ABSTRACT

The most commonly known nerve compression syndrome is carpal tunnel syndrome, in which the median nerve is compressed at the wrist. Along with the pathological processes, some of the anatomically variant structures can also compress the nerves and often leads to confusion in the diagnosis and treatment if one is unaware of such possible anatomical variants. Here, we present a case of possible median nerve compression by an additional belly of coracobrachialis and a fascial sheet from the brachialis, and we also discuss the other possible structures that can compress the median nerve.

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Nerve compression syndromes involving peripheral nerve dysfunction that may be due to structural changes in the nerve or adjacent tissues such as anatomical variations are common. A well-known example is compression of the median nerve at the wrist (carpal tunnel syndrome), other nerves, such as the ulnar nerve at the wrist or the elbow, radial nerve in the radial groove, and the spinal nerve roots at the vertebral foramen are vulnerable. Nerve compression syndromes usually occur at sites where the nerve passes through a tight tunnel formed by stiff tissue boundaries. The resultant confined space limits movement of tissue and can lead to sustained tissue pressure gradients. Space-occupying structures or lesions (for example, lumbrical muscles, tumors, and cysts) can cause nerve compression injury.¹ Entrapment

or compressive neuropathies are important and wide spread debilitating clinical problems. They are caused frequently as the nerve passes through a fibrous tunnel, or an opening in fibrous or muscular tissue.² The objective of the present study was to find out any variations in the formation, course and branching pattern of median nerve. Variant anatomy recognized during routine cadaveric dissection has important learning potential, provides insight into the variant structure's surgical, medical, and radiologic implications. Moreover, it imparts the concept of patient uniqueness and subsequent individualization of medical and surgical therapies.

Case Report. During our routine dissection of the upper limb for the undergraduate medical students, we encountered a rare variation wherein we found an additional belly from the coracobrachialis in addition to the normal insertion into the middle of the medial border of the humerus, which is forming a thin tendon passing over the median nerve and brachial artery and inserted into the medial intermuscular septum of the arm. In the same arm, we also found an aponeurotic sheet from the brachialis passing over the median nerve and brachial artery and attached to the deep fascia over the common flexors of the elbow, and thus forming a long tunnel for the passage of the median nerve and brachial artery (Figure 1).

Discussion. Compression neuropathies of the median nerve are common. The median nerve and brachial artery lie under cover of the medial border of biceps brachii anterior to the coracobrachialis in the proximal part in the arm.³ Compressions of the nerve and artery by various types of structures leading to clinical neurovasculopathy have been reported. Bilecenoglu et al⁴ described 7 potential sites for compression of the median nerve. These include the median nerve piercing the brachialis muscle in the arm, lacertus fibrosus, ligament of Struthers, between the 2 heads of pronator teres, beneath the Sublimis Bridge, accessory head of flexor pollicis longus (Gantzer's muscle), and vascular bands crossing the median nerve.⁴ It has been reported that the hypertrophic brachialis or anomalous muscle on the anterior surface of the arm, coracobrachialis longus, supernumerary muscles of brachialis, and brachiofascialis muscle can also be an etiologic factor for entrapment of the median nerve.⁵ An accessory musculo aponeurotic band from the brachialis to the medial intermuscular septum forming a tunnel in the arm for the median nerve and brachial artery was reported.⁶ These accessory muscles can cause neurovasculopathy by compressing

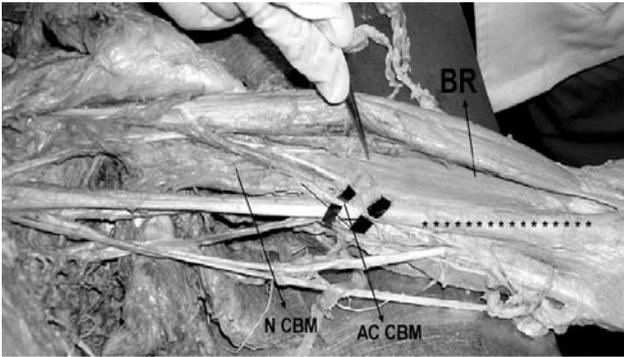


Figure 1 - Picture showing variant structures crossing the median nerve and brachial artery in the arm. N CBM – normal coracobrachialis; AC CBM – accessory slip of coracobrachialis; BR - brachialis; ***** - aponeurotic sheet from brachialis.

the median nerve and brachial artery. The most frequent brachialis variation is subdivision of the muscle into 2 parts. When the muscle is divided, distal insertions are variable. The parts may be attached to the fascia of the forearm; the part is then named brachiofascialis.⁷ An accessory brachialis originated medially from the mid-shaft of the humerus and the medial intermuscular septum inserting into the common tendon of the antebrachial flexor compartment muscles. During its course medially towards the elbow, the accessory brachialis crossed both the brachial artery and the median nerve. The distal tendon split to surround the median nerve.⁸ In most species, the coracobrachialis consists of 3 heads coracobrachialis brevis, medius, and longus. In humans, medius and longus fuse to form coracobrachialis. The coracobrachialis in humans is formed of one muscular part that probably represents the persistence of the coracobrachialis medius of lower animals, or the fusion of the 2 heads observed in apes and prosimians, trapping the musculocutaneous nerve between them.⁹ An abnormal coracobrachialis muscle originated separately from the coracoid process and the capsule of the shoulder joint by a long and slender tendon, and its tendon passed superficially to the normal coracobrachialis and medially to the short head of biceps brachii, inserting into the antebrachial fascia or deep fascia of the arm and the medial epicondyle was reported.¹⁰ Wood et al^{11,12} reported 2 cases of a coracobrachialis longus muscle. In one case, an accessory head of the coracobrachialis extended from the coracoid process to the medial supracondylar ridge, in another case, this inserted into the medial epicondyle. They also found a coracoscapularis muscle that inserted into the capsule of the shoulder joint where the coracobrachialis was absent. Other entrapment neuropathies have been recognized in the upper extremity, involving the superficial sensory radial nerve, the anterior interosseous nerve, the median nerve in the elbow region (for example, pronator syndrome), the ulnar nerve at the base of the palm (Guyon's canal), the palmar cutaneous branch of the median nerve, and various components of the brachial plexus (neurogenic thoracic outlet syndrome). Anatomical variations, such

as a hypertrophied subscapularis muscle may lead to entrapment of the suprascapular nerve.^{13,14}

In conclusion, in the present case, we found an additional belly of coracobrachialis (representing coracobrachialis longus of Wood), forming a tendon crossing the median nerve and brachial artery to insert into the medial intermuscular septum, and also an aponeurotic sheet from brachialis (brachiofascialis of Wood) extending over the brachial artery and median nerve forming a musculoaponeurotic tunnel attaching to the fascia over the common flexor muscles. Both these variants crossing the brachial artery and median nerve can potentially cause clinical complications such as compression on contraction, leading to neurovasculopathy. During high compression of the median nerve, these possible anatomical variations should also be considered as potential causes, and these anatomic variations of the coracobrachialis could cause confusion during surgery or evaluation of CT and MRI scans of the upper limb.

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