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STUDY OF NEUROMUSCULAR ENTRAPMENT IN THE ARM DUE TO VARIANT CORACOBRACHIALIS AND BRACHIALIS MUSCLES

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ABSTRACT

Aim to study the neuromuscular entrapment in the arm due to variant coracobrachialis and brachialis muscles. 100 upper limbs of 50 donated embalmed cadavers (45 males & 5 females) of age group ranging from 70 to 80 years were dissected in the department of Anatomy at K.J. Somaiya Medical College, Sion, Mumbai, INDIA. The neuromuscular entrapment in the arm due to variant coracobrachialis and brachialis muscles was observed in 2 specimens. The photographs of the variations were taken for proper documentation and ready reference. The neuromuscular entrapment in the arm due to variant coracobrachialis and brachialis muscles was observed in 2 specimens. We observed an entrapment of brachial artery and median nerve by coracobrachialis and brachialis muscles. The median nerve and the brachial artery passed through the coracobrachialis muscle in the right arm and also an accessory slip of the brachialis muscle originated from anteromedial surface of the shaft of humerus and got inserted into the medial epicondyle of the humerus. The accessory slip of the brachialis muscle passed over the brachial artery and the median nerve. The neuromuscular entrapment in the arm due to variant coracobrachialis and brachialis muscles may have some mechanical advantages and disadvantages during the movement of elbow joint. The knowledge of such variations were important for medical fraternity such as surgeons, orthopaedicians, neurologists, radiologists and physiotherapist for dealing with injuries or operations around the elbow joint.

Keywords: Coracobrachialis Muscle, Brachialis Muscle, Accessory Belly, Median Nerve, Brachial Artery, Variation, Neurovascular Compression, Upper Limb Injuries, Elbow Joint.

INTRODUCTION

The coracobrachialis muscle shows several interesting morphological and anatomical characteristics. It is the counterpart in the arm of the adductors (longus, brevis, magnus) of the thigh. It arises from the apex of the coracoid process, where it is fused with the medial side of the short head of biceps. The tendon is continued into a muscular belly of varying development which is inserted into the medial border of the humerus. The lower extent of the insertion is marked by the nutrient foramen of the humerus, for the nutrient branch of the brachial artery runs along the lower border of the muscle. The upward extent of the insertion cannot be seen on most bones, the muscle usually leaves no impression. The musculo cutaneous nerve passes through the muscle and supplies it. Compared to the morphological interest of this muscle its action is negligible. It is a weak adductor of the shoulder joint, the main adductors of which are pectoralis major and latissimus dorsi [1,2].

In some animals the coracobrachialis muscle has three heads [3]; in man two have fused, trapping the nerve between them, and the third part has become suppressed. The occasional supratrochlear spur (on the anteromedial aspect of the lower humerus) may be continuous with a ligament (of Struthers) which passes to the medial epicondyle and represents the remains of the third head [4]. The median nerve or brachial artery or both may run beneath it and be subjected to compression.

The brachialis is the muscle of the front of the arm region. It is situated behind the biceps brachii muscle. The brachialis arises from the lower half of the front of the shaft of the humeres including both the anteromedial and anterolateral surface of the shaft of the humerus.

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It also take origin from lower part of the present on the posterior surface of the shaft of the humerus and the medial intermuscular septum attached to the medial border of the shaft of the humerus. It is separated distally from the lateral intermuscular septum by brachioradialis and extensor carpi radialis longus muscle. The brachialis covers the anterior part of the elbow joint. The fibres of brachialis muscle converge to form a thick and broad tendon which is inserted into the ulnar tuberosity and to a rough surface on the anterior part of the coronoid process of ulna. The brachialis muscle is hybrid muscle, it has dual nerve supply. The muscles cutaneous nerve (C5, 6) supplies the medial part of the muscle. Whereas the radial nerve (7) supplies its lateral part.

The brachialis muscle is a flexor of the elbow joint. The brachialis muscle along with the supinator muscle forms the floor of the cubital fossa. The content of cubital fossa from medial to lateral side is median nerve, brachial artery, tendon of biceps brachii muscle and radial nerve. All these contents of cubital fossa are present anterior to the brachialis muscle. The brachialis muscle may be derived into two or more parts. It may be fused with the brachioradialis, the pronator teres or the biceps brachii muscle. Sometimes the brachialis muscle may give slip to radius or bicipital aponeurosis.

The blood supply of the brachialis muscle is derived from the superior and inferior branches. The superior branch is from the brachial artery and the inferior branch is either from the superior ulnar collateral artery or from the brachial artery. The accessory arteries supplying the brachialis muscle are small and variable in number. They may arise from the brachial artery, superior and inferior ulnar collateral arteries or the profunda brachii artery. The brachialis muscle can be tested clinically by palpating its fibres during flexion of elbow joint against resistance.

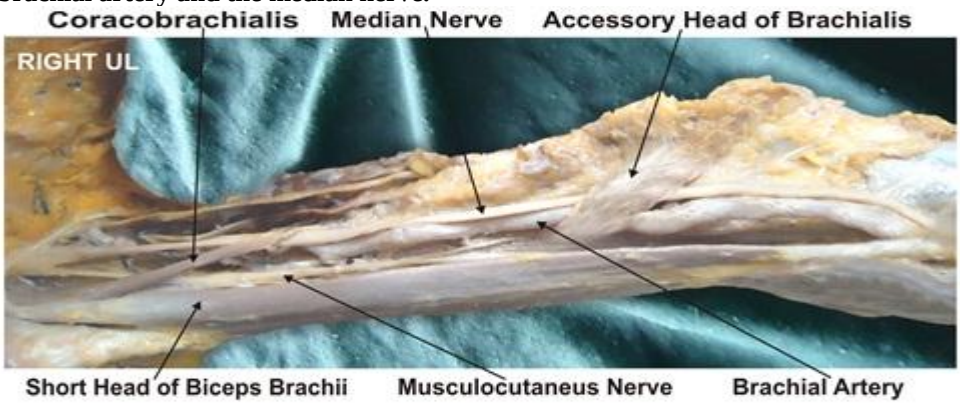
MATERIALS AND METHODS

100 upper limbs of 50 donated embalmed cadavers (45 males & 5 females) of age group ranging from 70 to 80 years were dissected in the department of Anatomy at K. J. Somaiya Medical College, Sion, Mumbai, INDIA. The neuromuscular entrapment in the arm due to variant coracobrachialis and brachialis muscles was observed in 2 specimens. The photographs of the variations were taken for proper documentation and ready reference.

Observations

The neuromuscular entrapment in the arm due to variant coracobrachialis and brachialis muscles was observed in 2 specimens. we observed an entrapment of brachial artery and median nerve by coracobrachialis and brachialis muscles. The median nerve and the brachial artery passed through the coracobrachialis muscle in the right arm and also an accessory slip of the brachialis muscle originated from anteromedial surface of the shaft of humerus and got inserted into the medial epicondyle of the humerus. The accessory slip of the brachialis muscle passed over the brachial artery and the median nerve.

Figure 1. Showing the superficial fibres of the coracobrachialis muscle and an accessory slip of the brachialis muscle passed over the brachial artery and the median nerve.



DISCUSSION

The accessory head of coracobrachialis muscle may be attached to the lesser tubercle, medial epicondyle or the medial intermusculur septum [2]. The clinical implication of the accessory head of the coracobrachialis is that it has the potential to cause the median nerve entrapment and the brachial artery compression. Various studies have described the compression of the median nerve and the brachial artery with anomalous muscles [5-9]. In the present study the accessory head of the coracobrachialis muscle arises from superficial fibres of the coracobrachialis muscle having 3 cm muscle belly and 15 cm tendinous band. It extended downwards and medially in front of the median nerve and brachial artery and finally got inserted on the anteromedial aspect of the medial epicondyle of the humerus.

The presence of accessory belly of the brachialis muscle has been reported by many authors. Dharap observed an unusual muscle that passed obliquely from the middle of the humerus anterior to the median nerve and brachial artery, forming a tunnel for them, before inserting with the common origin of the forearm flexor muscles [5]. Loukas et al. reported an accessory brachialis muscle originating from middle of the shaft of the humerus and the medial intermuscular septum. The accessory brachialis muscle crossed over both the brachial artery and the median nerve. The distal tendon split to surround the median nerve before inserting into the brachialis tendon and the common tendon of the antebrachial flexor compartment muscles [10]. Paraskevas et al. have described a variant muscle on the left side arising from the medial border of the brachialis muscle and after bridging the median nerve, the brachial artery and vein; it was fused with the medial intermuscular septum. The muscle was innervated by the musculocutaneous nerve [11]. George and Nayak have described few fleshy fibers of brachialis arising from the distal third of the muscle and merging with superficial flexors of the forearm and to the medial aspect of the olecranon process of ulna [12]. Rajanigandha et al. reported the occurrence of an accessory brachialis muscle that formed a fibro-muscular tunnel after blending with the medial intermuscular septum [13]. An anomalous muscle, without any contribution from the biceps or the brachialis, originated between the coracobrachialis and the brachialis from the humerus, has been reported previously. This muscle passed obliquely across the front of the brachial artery and the median nerve. The muscle also was found to blend with common origin of flexor muscles. There are three well described entrapment syndromes involving the median nerve or its branches, namely carpal tunnel syndrome, pronator teres syndrome and anterior interosseous syndrome. A few case reports were found in the literature, explaining the possible median nerve entrapment due to a third head of biceps brachi [14,15]. Even though anatomy literature hardly mentions the median nerve compression due to bicipital aponeurosis, a fewresearch reports say that it could be a cause of high median nerve compression, along with brachial artery (**16**). The simultaneous occurrence of the above mentioned variants in the same specimen has not been reported to the best of our knowledge. Although causes no symptoms most of the time, such structures have the potential to compress the median nerve with consequent functional impairment. The accessory muscle slips may also compress the underlying arteries viz., median nerve and brachial artery in the present study.

Developmental Basi

The accessory head of the coracobrachialis and brachialis muscle reported in this case may be explained on the basis of the embryogenesis of the muscles of the arm. Embryologically, the intrinsic muscles of the upper limb differentiate in situ, opposite the lower six cervical and upper two thoracic segments, from the limb bud mesenchyme of the lateral plate mesoderm. The formation of muscular elements in the limbs takes place shortly after the skeletal elements begin to take shape. At a certain stage of development, the muscle primordia within the different layers of the arm fuse to form a single muscle mass [17]. Langmanstated, however, that some muscle primodia disappear through cell death despite the fact that cells within them have differentiated to the point of containing myofilaments [18]. Failure of muscle primordia to disappear during embryologic development may account for the presence of the accessory muscular bands. The morphological variations of the coracobrachialis and brachialis muscle may be due to failure of muscle primordia to disappear during the embryological development.

Clinical Significance

Compression of the median nerve and brachial artery by various types of structures leading to clinical neurovasculopathy has been reported [19, 20]. On contraction, these muscles can compress the median and ulnar nerves, leading to further irritation of the nerves. Also, on contraction these muscles can compress both the brachial artery and brachial veins. The possibility of those muscles anomalies should, therefore, be considered when in any patient, a high median or ulnar or medial antebrachial cutaneous nerve paralysis exists with symptoms of lower brachial artery or brachial vein compression. Also, these muscles should not be mistaken for tumors on MR imaging of the arm [21]. The fibres of accessory slip of the brachialis muscle can be used in reconstruction surgery of the annular ligament and the medial collateral ligament of elbow joint.

CONCLUSION

The knowledge of presence of the variant coracobrachialis and brachialis muscles compressing the median nerve and brachial artery may be clinically important for clinicians, surgeons, orthopaedicians and radiologists performing angiographic studies. Such variations are important for diagnostic evaluation and surgical management of vascular diseases and injuries.

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Competing Interests

The author declares that he has no competing interest.

Authors' contributions

SPS draft the manuscript, performed the literature review & obtained the photograph for the study.

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