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Anatomy

A VARIATION IN THE INSERTION OF BRACHIALIS MUSCLES AND ITS CLINICAL RELEVANCE – A CADAVERIC STUDY

Nadine.N	Postgraduate student, Department of Anatomy, Sree Mookambika Institute of Medical Sciences, Kulasekharam, Tamil Nadu, India
Kalaiselvi.C*	Postgraduate student, Department of Anatomy, Sree Mookambika Institute of Medical Sciences, Kulasekharam, Tamil Nadu, India*Corresponding Author
Girija Kumari.k	Head of Department, Department of Anatomy, Sree Mookambika Institute of Medical Sciences, Kulasekharam, Tamil Nadu,

ABSTRACT Brachialis muscle is one of the chief muscles in the anterior compartment of arm. It lies beneath biceps brachii and takes origin from the lower half of shaft of humerus,and lower part of spiral groove it gets inserted into anterior surface of coronoid process and tuberosity of ulna. 30 upper limbs were dissected out over a period of 3 years in the department of anatomy, Sree Mookambika Institute of Medical Sciences, Kulasekharam. A variation in the insertion of brachialis muscle was noted in one of the specimens. Brachialis muscle splits into three slips before its insertion. First slip goes medially and gets inserted into coronoid process of ulna, second slip goes laterally and unites with the main bulk of brachialis muscle and gets inserted into coronoid process and tuberosity of ulna as usual. During this splitting of the muscle towards its insertion it encloses two main nerves of the arm – musculocutaneous nerve and radial nerve. Normally the musculocutaneous nerve will be leaving the arm between biceps brachii and brachialis, whereas in this case the musculocutaneous nerve is seen emerging between the two slips of brachialis muscle. The other upper limbs were also dissected to find out any variation in its origin and insertion but was found to be normal. The entrapment of the nerve between the slips of brachialis will cause entrapment syndrome and it must be kept in mind while dealing with neuropathies of upper limbs.

KEYWORDS : Brachialis, Musculocutaneous nerve, Radial nerve

INTRODUCTION:

The brachialis muscle is one of the chief muscles in the anterior compartment of the arm. It lies beneath the biceps brachii and takes its origin from the lower half of the shaft of the humerus, the lower part of the spiral groove, and gets inserted into the anterior surface of the coronoid process and tuberosity of the ulna. It is the flexor muscle of the arm, supplied by the musculocutaneous nerve (C5, C6, C7). [1]

LITERATURE SURVEY:

According to the literature reviewed, there are only a few studies that reported such variation in the insertion of the brachialis muscle.

METHODOLOGY:

30 upper limbs were dissected over a period of 3 years from 2020-2023 in the department of anatomy, Sree Mookambika Institute of Medical Sciences, Kulasekharam. Dissection of the upper limb was carried out according to the instruction given in Cunningham's Manual of Practical Anatomy Volume -1 and we found a variation in the insertion of the brachialis muscle in one of the specimens of the right upper limb.

RESULTS:

In one of the right upper limbs, the origin of the brachialis muscle was found to be normal whereas it showed variations in insertion and relation to nerves. The brachialis muscle is split into three slips before its insertion. The first slip goes medially and gets inserted into the coronoid process of the ulna, and the second slip goes laterally and unites with the main bulk of the brachialis muscle and gets inserted into the coronoid process and tuberosity of the ulna as usual. During this splitting of the muscle towards its insertion, it encloses two main nerves of the arm – the musculocutaneous nerve and radial nerve in between the slips. Normally the musculocutaneous nerve will be leaving the arm between biceps brachii and brachialis, whereas in this case the musculocutaneous nerve is seen emerging between the two slips of brachialis muscle itself. (fig.1) The other upper limbs were also dissected to find out any variations in their origin and insertion but were found to be normal.

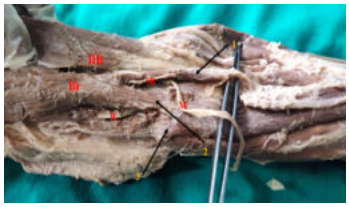

Fig.1 Picture depicting the variation in the brachialis muscle and its relation to musculocutaneous nerve

BB- Biceps brachii, Br- Brachialis, R- Radial nerve, SR- Superficial branch of radial nerve, M- Musculocutaneous nerve, 1,2 &3 - slips of brachialis muscle

DISCUSSION:

Accessory muscles can result in noticeable swelling and cause pressure effects on the nearby neurovascular systems. By squeezing the brachial artery and median nerve, accessory muscles in the arm region may be a cause of neurovasculopathy. [1,2]

These accessory muscles pass anterior to the arteries and nerves, which might lead to the entrapment of such structures. In rare circumstances, the etiology of forearm paralysis caused by compression of the median, ulnar, or medial cutaneous nerves may be the presence the accessory muscles of the arm region. They may also result in brachial vascular compression symptoms.[3]

The topographical placement of the nerves in the muscular compartments becomes difficult to determine during surgical planning if there is an anatomical variation, which complicates the surgical approach. [4].

In the supracondylar area, an accessory brachialis muscle may compress the nearby neurovascular systems. [5,6,7]

When operating on the elbow joint, understanding the brachialis muscle's atypical insertion is crucial. [8]
A thorough evaluation of the cubital tunnel for an accessory muscle, which may be a contributing factor to the musculoskeletal issue with the upper limb, may be helpful. [9]

By analyzing the embryological development of the muscles, it is possible to comprehend muscular variability. [10] Muscle primordia with mesodermal origins are there where the muscles in the upper limb develop. Following the development of skeletal components, the single muscle mass begins to divide into various muscles. All of these distinct forms of muscles resulting from the failure of the muscle primordia to dissipate in specific locations. [11]

Despite being uncommon, differences in the brachialis' morphology have been documented in the literature; it may be split into two or more segments that converge with the brachioradialis, biceps brachii, or

pronator teres. The ulnar component of the elbow joint's flexion may be restricted by the distal attachment of the AcBr into the radius's shaft below the bicipital tuberosity. This will also make it harder for the forearm to pronate and supinate because of the variant AcBr muscle aponeurosis. [12,13].

Understanding morphological aspects of AcBr is crucial in comprehending diseases like median nerve entrapment. The information is crucial for catheterizing the brachial artery and performing surgeries around the elbow joint. This will help avoid misunderstandings during angiographic studies and radiodiagnostic treatments near the cubital fossa. According to studies, the tendon of the AcBr muscle can be harvested for tendon transfer procedures, the annular ligament reconstruction of the superior radioulnar joint, and the repair of the tibial collateral ligament of the knee joint. [5]

When reporting the MRI in this region, the arm's accessory muscles shouldn't be mistaken for malignancies. [14]

When there is a brachial artery or brachial vein compression associated with entrapment neuropathy, the accessory muscles at the arm may be the cause. Due to the presence of AcBr, procedures in the cubital fossa, particularly those involving the elbow joint, may become challenging. When doing carotid and vertebral angiography, the percutaneous brachial technique is frequently preferred. Understanding AcBr can let you carry out this procedure without problems. In these circumstances, the ultrasound-guided brachial artery puncture is recommended, and it should be taken into consideration. [15]

CONCLUSION:

The brachialis muscle's varied insertion will jeopardize the nearby neurovascular systems. Orthopedists, anesthesiologists, and radiologists must have a thorough understanding of the Accessory Brachialis muscle prior to surgery. This can help prevent misunderstandings and their related problems. For the proper diagnosis and treatment of musculoskeletal problems of the arm, the details are crucial.

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