



MORPHOLOGICAL STUDY OF THE INSERTION OF BRACHIALIS MUSCLE AND ITS CLINICAL SIGNIFICANCE.

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ABSTRACT

Materials & Methods: The study on insertion of brachialis muscle was performed on 100 (200 specimens of superior extremities) embalmed donated cadavers (90 males & 10 females) in the department of Anatomy of K.J.Somaiya Medical College, Sion, Mumbai, India. The dissection of the arm and forearm was done meticulously to expose the brachialis muscle. The insertion of brachialis muscle was observed. The neuro vascular pattern of the upper limb were also observed. The photographs of the insertion of brachialis muscles were taken for proper documentation.

Observations: Out of 200 specimens of superior extremities the insertion of brachialis muscle in to the bicipital aponeurosis was observed in 4 specimens. In all the 4 specimens along with the biceps brachii muscle, the brachialis got inserted in to the bicipital aponeurosis. The bicipital aponeurosis was merged with the deep fascia of fore arm which got merged with the aponeurosis attached to the posterior subcutaneous border of the ulna. The median nerve and the brachial artery travelled deep to this additional insertion of brachialis muscle in to the bicipital aponeurosis. The associated altered anatomy of the nerves and vessels were not observed. All the variations were unilateral.

Conclusion: The knowledge of such type of variation is clinically important for Anatomists, Physiotherapists, Neurologists, Radiologists, Surgeons, Plastic Surgeons and Orthopedicians.

Key words: Brachialis Muscle, Bicipital Aponeurosis, Median Nerve, Brachial Artery, Nerve Compression, Anatomists, Neurologists, Radiologists, Surgeons, Plastic surgeons, Orthopedicians.

INTRODUCTION

The brachialis is a muscle in the upper arm that flexes the elbow joint. It lies deeper than the biceps brachii, and is a synergist that assists the biceps brachii in flexing at the elbow. It makes up part of the floor of the region known as the cubital fossa. The brachialis originates from the lower half of the front of the humerus, near the insertion of the deltoid muscle, which it embraces by two angular processes. Its origin extends below to within 2.5 cm of the margin of the articular surface of the humerus at the elbow joint. It also arises from the intermuscular septa of the arm, but more extensively from the medial than the lateral; it is separated from the lateral below by the brachioradialis and extensor carpi radialis longus muscles. Its fibers converge to a thick tendon, which is inserted into the tuberosity of the ulna and the rough depression on the anterior surface of the coronoid process of the ulna. The brachialis muscle is innervated by the musculocutaneous nerve, which runs on its superficial surface, between it and the biceps brachii. Part of it is also innervated by the radial nerve, proprioceptive branch which allows it to be split during certain approaches to the arm. The divide between the two innervations is at the insertion of the deltoid. Unlike the biceps, the brachialis does not insert on the radius, and therefore cannot participate in pronation and supination of the forearm. It flexes the elbow joint. The muscle is occasionally doubled; additional nips to the supinator, pronator teres, biceps brachii, bicipital aponeurosis, brachioradialis or radius are more rarely found [1].

MATERIALS AND METHODS

The study on insertion of brachialis muscle was performed on 100 (200 specimens of superior extremities) embalmed donated cadavers (90 males & 10 females) in the department of Anatomy of K.J.Somaiya Medical College, Sion, Mumbai, India. The dissection of the arm and forearm was done meticulously to expose the brachialis muscle. The insertion of brachialis muscle was observed. The neuro vascular pattern of the upper limb were also observed. The photographs of the insertion of brachialis muscles were taken for proper documentation.

Observations

Out of 200 specimens of superior extremities the insertion of brachialis muscle in to the bicipital aponeurosis was observed in 4 specimens. In all the 4 specimens along with the biceps brachii muscle, the brachialis got inserted in to the bicipital aponeurosis. The bicipital aponeurosis was merged with the deep fascia of fore arm which got merged with the aponeurosis attached to the posterior subcutaneous border of the ulna. The median nerve and the brachial artery travelled deep to this additional insertion of brachialis muscle in to the bicipital aponeurosis. The associated altered anatomy of the nerves and vessels were not observed. All the variations were unilateral.

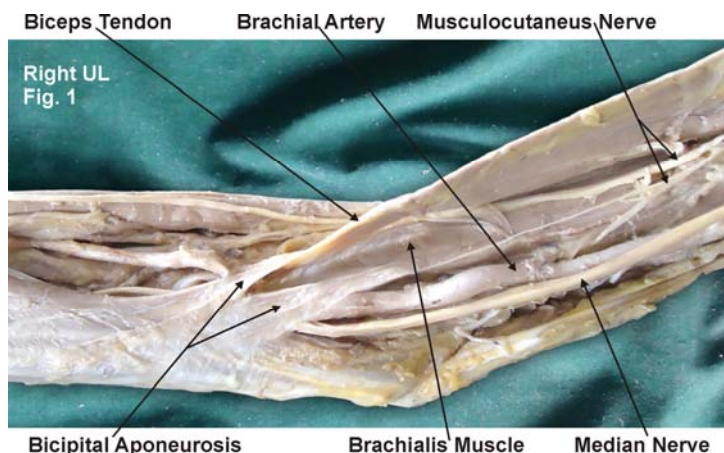


Fig. 1 showing the photographic presentation of the additional insertion of brachialis muscle in to the bicipital aponeurosis.

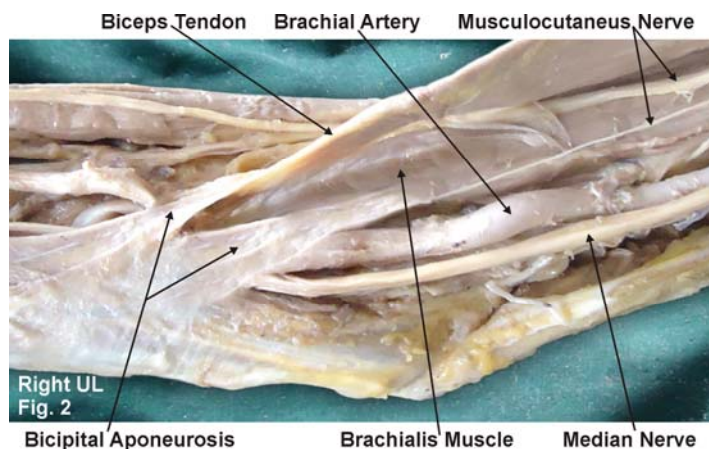


Fig. 2 showing the photographic presentation of the median nerve and the brachial artery travelled deep to the additional insertion of brachialis muscle in to the bicipital aponeurosis.

DISCUSSION

The additional insertion of brachialis muscle in to the bicipital aponeurosis is very rare and not found in literature. In the present case along with the biceps brachii muscle, the brachialis got inserted in to the bicipital aponeurosis. The bicipital aponeurosis was merged with the deep fascia of fore arm which got merged with the aponeurosis attached to the posterior subcutaneous border of the ulna. The several cases on the presence of accessory brachialis muscle in the arm have been reported in literature. 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 [2]. Loukas et al. reported an accessory brachialis muscle originating from mid shaft of humerus and medial intermuscular septum. During its course medially, toward the elbow, the accessory brachialis muscle crossed 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 [3]. Paraskevas et al. have described a variant muscle on the left side arising from the medial border of 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 musculocutaneous nerve [4].

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 olecranon process of ulna [5]. Rajanigandha et al. reported the occurrence of an accessory brachialis muscle that formed a fibro-muscular tunnel after blending with the medial intermuscular septum [6]. The role of additional insertions in compression syndrome is a well known phenomenon. In the present study, in all 4 specimens, the median nerve and the brachial artery travelled deep to the additional insertion of brachialis muscle in to the bicipital aponeurosis and it had the potential to compress the median nerve and the brachial artery with consequent functional impairment. The compression of the median nerve and brachial artery by various types of structures leading to clinical neurovasculopathy has been reported in literature [7,8].

Developmental basis of present variation:

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 [9]. Langman stated, however, that some muscle primordia disappear through cell death despite the fact that cells within them have differentiated to the point of containing myofilaments (10). Failure of muscle primordia to disappear during embryologic development may account for the additional insertion of brachialis muscle in to the bicipital aponeurosis reported in this study.

CONCLUSION

The existence of such variation of the brachialis muscle should be kept in mind by the surgeons operating on patients with median nerve palsy and brachial artery compression, by the orthopaedicians dealing with supracondylar fracture of the humerus, by the radiologists while doing radiodiagnostic procedures e.g. C T scan, MRI of the arm and angiographic studies and also by the physiotherapists.

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