

## A VARIATION WITH AN EXTRA MUSCULO TENDINEOUS SLIP OF INSERTION FROM BICEPS BRACHII MUSCLE

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### ABSTRACT

Biceps brachii muscle is one of the muscles with most frequent anatomical variations. The incidences of variation in anatomy of biceps brachii muscle were observed mainly in number of heads of origin/proximal attachment, though the variation in tendon of insertion /distal attachment is comparatively rare. Normally the biceps brachii muscle insert with one common tendon. In this present case the origin of biceps brachii muscle was normal, but its insertion was by two separate tendons: one by common tendon and other by an accessory tendon. An extra musculo tendinous slip was found which arises from short head of biceps brachii muscle inserting on medial epicondyle of humerus. This type of variation is less commonly found. This particular variation is important for a clinical perspective as this an extra musculo tendinous slip may cause entrapment syndrome of median nerve and hypo perfusion of the upper limbs due to compression of the brachial artery.

**Keywords:** Brachii artery, Biceps brachial muscle, Hypo perfusion, Musculo tendinous slip

### INTRODUCTION

Biceps brachii is a muscle with usually two heads (a long head and a short head) which lies in the anterior compartment of arm between shoulder and elbow.<sup>1</sup>The short head originates from the apex of the coracoid process and a long head originates from the supra glenoid tubercle of the scapula. Both heads join in the medial part of the arm and insert with its main tendon on posterior part of the radial tuberosity.<sup>2</sup>This muscle supplied by musculocutaneous nerve (C5, C6, C7) which is a

branch of lateral cord of brachial plexus and anterior circumflex humeral artery which is a branch of brachial artery.<sup>3</sup> Muscle crosses three joints (“three joint muscles”) viz: shoulder, elbow and superior radio-ulnar joint.<sup>4</sup>It can therefore act on all of them. Biceps is a strong supinator when the fore arm is flexed. All the screwing movements are done with it. It is a flexor of the elbow. In short, biceps flexes the fore-arm at elbow joint, supinates fore-arm at radio-ulnar joints, and flexes arm at shoulder joint. Thus

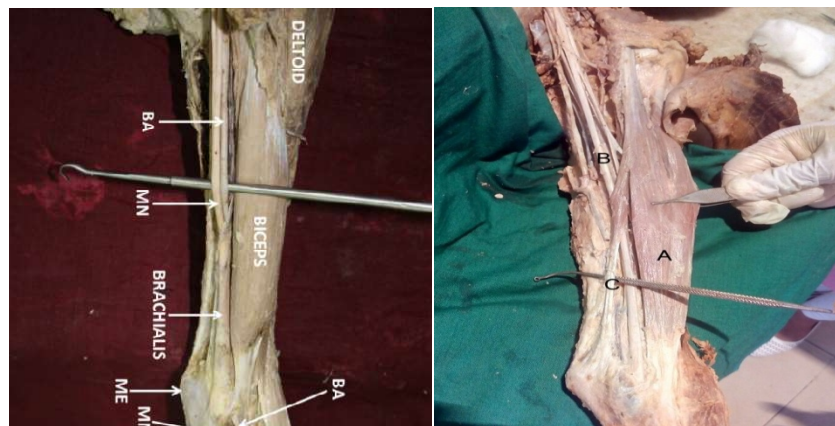
this is the normal anatomy of biceps brachii muscle but this is very variable. There is a wide range of variations of extra heads of biceps brachii according to race. Previous studies in human being show that the third head of biceps brachii is seen in about 8% of Chinese, 10% of Europeans, 12% of Black Africans, 18% of Japanese<sup>5</sup> and 2% in Indian population.<sup>6</sup> The incidence of variation in anatomy of biceps brachii muscle was observed 15%, with incidence being 11.6% and 3.3% among male and female cadavers studied, respectively. Variation was unilateral in 10% and bilateral in 3.3%.the incidence of third head was 13.3%, incidence of extra slip/bellies of insertion were found to be 1.6%.<sup>7</sup>The knowledge of such variation in the architecture of surrounding region is important because they can produce clinical symptoms by compressing surrounding neurovascular bundles and also important for correct identification during imaging and to prevent iatrogenic injuries during surgery.<sup>8,9</sup> This can also affect the kinematics of the joints the muscle act on. The present study reports on a rare, unusual and clinically important variation associated with biceps brachii muscle.

**Methods** – The cadaver were embalmed and preserve in ten percent formalin. The left upper limb of a male cadaver was dissected by taking a

longitudinal incision on the anterior aspect of the arm, from the acromion process to a point 3 cm. below the elbow joint. Horizontal incision made at the proximal and distal ends of the longitudinal incision bilaterally. Skin and subcutaneous fascia were removed to expose the biceps brachii muscle from origin to insertion. The blood vessels and nerves of this were also dissected meticulously. Appropriate photographs were taken.

### Case Report –

During the dissection of left upper limb in the department of *Sharir Rachana* at National Institute of Ayurveda, Jaipur, Rajasthan, an anatomical variation in the insertional pattern of biceps brachii muscle was found in a male cadaver, aged approximately 45 years. Skin, superficial fascia along with cutaneous vessels and nerves were normal. After removing the deep fascia, the biceps brachii muscle was seen in the anterior compartment of the left arm it was noticed that an extra musculo tendinous slip which was originate from the short head of biceps brachii muscle inserting on medial epicondyle of humerus. This slip lies medial to the common belly of biceps and above the median nerve and brachial artery



(Fig.1:) (Fig.2:)

**Fig.1:** (BA- brachial artery, MN- Median nerve) Biceps brachii muscle showing normal origin and insertion of long and short head.

**Fig.2:** (A- Biceps brachii muscle, B- Median nerve, C- Extra musculo tendinous slip)

Showing insertional variation of biceps brachii muscle with an extra musculo tendinous slip originate from short head of biceps brachii, inserting on the medial epicondyle of humerus.

This variation can compress the brachial artery and the median nerve, the potential cause of the pronator syndrome. The pronator syndrome is much less common than the carpal tunnel syndrome. It usually presents in the fifth decade and is four times more common in women.<sup>10</sup> The patient most commonly complains of aching pain in the proximal forearm and the distal arm. Pain may radiate proximally and is often aggravated by use of the upper limb, especially with resisted forceful pronation or repeated pronation/supination movements. The differential diagnosis of the pronator syndrome is extremely important because this entity is relatively uncommon compared with carpal tunnel syndrome. In fact, as noted by Lister,<sup>11</sup> symptoms of carpal tunnel syndrome are very similar to those of pronator syndrome.<sup>11</sup> **Similarities between two syndromes:** Pain in wrist and forearm regions, weakness of thenar muscles numbness/ paresthesias of radial three and a half digits.<sup>11</sup> **Differences in two syndromes:** No nocturnal pain in pronator syndrome, negative Tinel's sign at wrist in pronator syndrome, nerve conduction study shows - no delay at wrist in pronator syndrome. Dysesthesia in palmar cutaneous distribution is seen in pronator syndrome.<sup>11</sup>

## DISCUSSION

The extra bellies of biceps brachii muscle are classified as bellies of origin /proximal attachment and bellies of insertional /distal attachment. Thus, an extra belly of muscle is separately attached to capsule of the shoulder joint and later joining the main tendon of biceps brachii is an extra belly of origin. To avoid the confusion of third or fourth heads it is suggested that each belly of origin should be further specifically referred to as brachial, humeral, capsular heads according to their proximal attachments, doing away with the humerus third,

fourth or fifth heads completely. A muscle belly having proximal attachment to biceps brachii muscle itself, but a distal attachment which is separately from main tendon of biceps brachii is an extra belly of insertion. Depending upon whether the extra belly took origin from short head and long head, it can be referred to as extra belly or extra musculo tendinous slip of insertion from short or long head respectively. During evolution, by the process of subdivision, fusion, migration and splitting, the original muscle mass within the limb gave rise to new muscle.<sup>10</sup> The musculature of the limb develops from myogenic precursor cells derived from ventral dermomyotome of somites in response to molecular signals from nearby tissue. As the long bones form, myoblasts aggregate and form a large muscle mass in each limb bud. In general this muscle mass separates into dorsal and ventral components<sup>12</sup>. Small changes in the extra cellular environment of myoblast are believed to induce local fusion some cells, and thus create a gap that further divides the muscle mass and that is how, these blocks of muscle anlagen undergo spatiotemporal sequences of divisions as the limb lengthens, leading to formation of individual muscles.<sup>13</sup>

From the above discussion it is clear that in this case this is an extra belly or extra musculo tendinous slip of insertion from short head of biceps brachii inserting on medial epicondyle of humerus, which might have been formed due to abnormal splitting of original muscle anlagen.

**Surgical and clinical importance:** Damage to the musculo cutaneous nerve causes paralysis of the biceps brachii muscle resulting in loss of flexion of the elbow. Bicipital aponeurosis helps lessen the pressure of the biceps tendon on the radial tuberosity during pronation and supination of the fore-arm. The extra musculo tendinous slips of biceps brachii muscle have been reported to cause compression of surrounding neuro-vascular structures and lead to erroneous interpretation during routine surgeries. Branching pattern of musculocutaneous nerve, while innervating the biceps brachii muscle is clinically

important. Any variant nerve having the abnormal origin, course and distribution may be prone to accidental injuries and impairments. This knowledge is essential in various surgical interventions done in these areas. Variations of the biceps brachii muscle have clinical importance and may confuse surgeons during elbow operations or cause compression of neurovascular structures. Knowledge of the accessory tendon of the biceps is crucial while performing tendon reconstruction and repair. Therefore, surgeons should be aware of this anatomical variation in surgical procedures.<sup>14</sup> Such variations become relevant during surgical intervention of the arm especially after humeral fracture with subsequent unusual bone displacements.<sup>15</sup> During certain arm movements, compression of brachial artery and median nerve may lead to various neurovascular syndromes. Due to compressing the median nerve, causing pain, paresthesia and numbness in the palm, diminishing of sensory and motor functions, along with weakness in grip strength or atrophy of thenar eminence.<sup>16</sup> Median nerve compression or entrapment leads to syndromes such as carpal tunnel syndrome, pronator teres syndrome and anterior interosseous syndrome.<sup>17</sup>

## CONCLUSION

From the above discussion it is clear that in this case this is an extra belly or extra musculo tendinous slip of insertion from short head of biceps brachii inserting on medial epicondyle of humerus, which might have been formed due to abnormal splitting of original muscle anlagen.

This case report may be of relevance in clinical practice when treating entrapment Syndromes of the median nerve, which is relatively common, and ischemia of the upper limb, which is considerably rarer. So this extra musculo tendinous slip of insertion from short head of the biceps brachii might be of practical use in surgical procedures. This case report can thus be useful for clinicians attending patients of neurovascular compression syndrome in

upper limb and surgeons performing tendon grafts. Therefore this anatomic variation is academically, surgically and clinically very important.

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