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Infero-medial humeral head (Caput Accessorium) of biceps brachii

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ABSTRACT

Biceps brachii is a double headed muscle present in the flexor compartment of the arm. It is one of the most variable muscles in the human arm. The unilateral presence of third head or caput accessorium is a common variation but its bilateral occurrence is a rarity. The presences of biceps brachii with four, five up to seven heads have been reported in the world literature. In the present case the long head (LH) and the short head (SH) of the biceps brachii were from the supra glenoid tubercle and coracoid process respectively. It was observed that the third head of the biceps brachii was arising from the infero-medial aspect of the shaft of the right humerus. The origin of the humeral head (HH) was just at the level of insertion of the coraco brachialis (CB). Like the other two heads of the biceps brachii, it was also supplied by the musculocutaneous nerve (MCN). The left arm did not present any such variation. The accessory head might be significant during moments like flexion and supination of the fore arm. They may cause neuro vascular compression due to the close relationship with the brachial artery and median nerve. Also can confuse surgeons and traumatologists performing procedures on the arm leading to iatrogenic injuries.

Key words: Biceps brachii, third head, musculocutaneous nerve.

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Abbreviation: LH- Long head of biceps brachii, SH – Short head of biceps brachii, HH – Humeral head of biceps brachii, MCN – Musculo cutaneous nerve CB – Coraco Brachialis

1. INTRODUCTION

Biceps brachii muscle is basically described as double headed muscle. Its short head arises as a thick flattened tendon from the coracoids apex, together with Coracobrachialis. Long head arises as a long narrow tendon from the supraglenoid tubercle of scapula. Both the heads soon fuse in the upper half of the arm to form the bulk of biceps brachii muscle. It ends as a flattened tendon, which passes ventrally, turns backwards and laterally to get inserted into the rough posterior area of the radial tuberosity. The mode of insertion makes biceps a powerful supinator of the foream. The biceps brachii muscle is innervated by musculocutaneous nerve and supplied by the brachial artery and anterior circumflex humeral arteries (Lee, 2008; Johnson, 2005).

In terms of the number and morphology of its head biceps brachii is one of the most variable muscles in human body (Nakatani, 1998). The most frequently observed variation is a third head of biceps brachii occurring in 10.0% of the subjects. But four, five or even seven heads have also been reported (Asvat, 1993).

Flexion: Movement that approximates the flexor surfaces of the adjoining parts and thus decreases the angle of the joint is called *Flexion*.

The most common slip is one arising from the humerus near the insertion of coracobrachialis and extending downwards between it and brachialis. The third head or Caput Accessorium usually joints the short head. But most of its fibers pass into that part of the tendon which forms the bicipital aponeurosis. In addition, this head may be totally isolated and terminates entirely in the bicipital aponeurosis.

Supination: Rotation of the forearm laterally from midprone position so that the palm of the hand faces anteriorly is called *Supination*.

2. SCOPE OF STUDY

The accessory third head may not give extra strength and may not cause an unusual displacement of fracture fragments of humerus; however, this extra head might cause compression of the Median nerve since it might pass between fibres of accessory head. This might also cause engorgement of veins because of compression exerted by the accessory biceps brachii. Biceps brachii will be useful as a component of flap surgery (Mas et al., 2006) in such cases the knowledge of the innervations of accessory head as well as the compression of vasculature will be very much essential for the surgeons. The biceps brachii is known for its powerful elbow flexion and supination of the forearm. It can be argued that the presence of supemumerary heads of biceps brachii muscle increase its kinematics. Therefore, from anatomical standpoint of view it can be presumed that the presence of a third head may increase the power of flexion and supination of the forearm (Kumar, 2008). In addition to allowing the elbow flexion irrespective of the shoulder joint position, the third head ob biceps brachii may enhance the strength of elbow flexion (Swieter, 1980).

Comparison:

Incidence of variations regarding the additional head of biceps brachii is more frequent in males when compared to females (Rincon F, 2002; Bergman RA, 1984).

The incidence of unilateral three headed biceps brachii is common, but its bilateral occurrence is a rarity (Kosugi et al., 1992).

The accessory heads may also arise from brachialis, brachioradialis, pronator teres or pectoralis major. Also the accessory head may arise from the coracoids process and capsule of the shoulder joint (Lee, 2008).

The incidence of the accessory head of biceps brachii has been reported with varying frequency according to the population from which the cadavers were sampled. Its presence was reported to be 8% in Chinese, 10% in the European whites 12% in African blacks and 18% in Japanese (Bergman et al., 1984).

Content:

In the history it is being reported that not only the humans but also other mammals revealed the third head of the biceps brachii (Dobson, 1881; Le Double, 1897; Primrose, 1899; Sonntag, 1923, 1924). The long head of coracobrachialis in humans is absent unlike the primates. In the subjects with the third head of biceps brachii arising from the insertion area of coracobrachialis, it is possible that it represents a remmant of the long head of coracobrachialis, accounting to the ancestral hominoid condition (Wood, 1870: Primrose, 1889; Sonntag, 1923 & 1924).

2.1. Materials

An embalmed elderly male cadaver along with routine dissection instruments including Scalpel, Blade, Surgical Forceps, Anatomical Forceps, Dissector, along with a pair of gloves were used.

2.2. Methodology

Dissection procedure described in the standard dissection manual was followed. A longitudinal incision was made on the anterior aspect of the right arm extending from the level of acromian process to a point 2.5 cm below the right elbow joint. Two horizontal incision were made on both proximal and distill ends of the longitudinal incision. The skin flaps were reflected laterally. The subcutaneous fat and fascia covering the muscles were dissected meticulously in order to expose the full length of the biceps brachii from its origin to insertion.

3. RESULT / OBSERVATION

During the routine dissection hours for the first

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Figure 1
ANTERIOR VIEW OF DISSECTED RIGHT ARM AND ELBOW;
LH- LONG HEAD OF BICEPS BRACHII,
SH – SHORT HEAD OF BICEPS BRACHII,
HH – HUMERAL HEAD OF BICEPS BRACHII

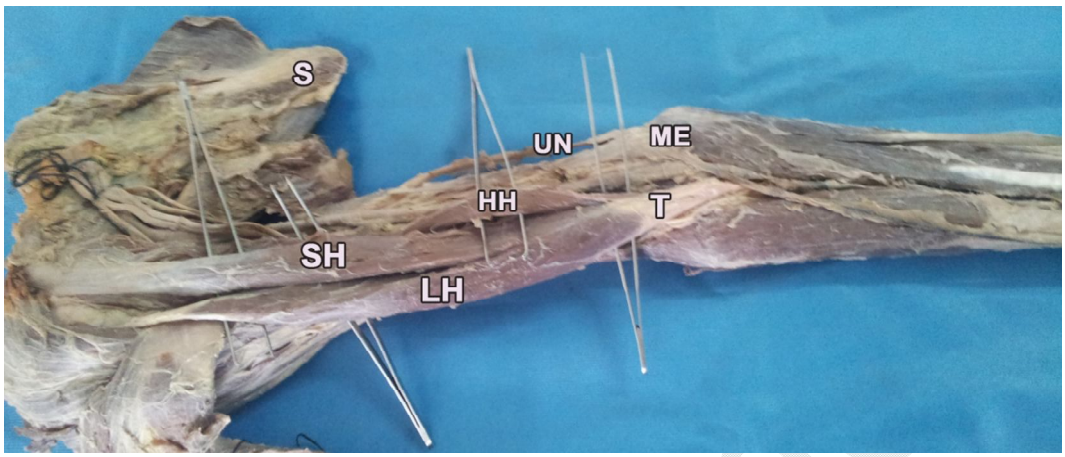

Figure 2
SUPERIOR VIEW OF THE DISSECTED RIGHT ARM AND ELBOW; LH- LONG HEAD OF BICEPS BRACHII, SH – SHORT HEAD OF BICEPS BRACHII, HH – HUMERAL HEAD OF BICEPS BRACHII, T – COMMON TENDON OF INSERTION, ME – MEDIAL EPICONDYLE, UN – ULNAR NERVE, S - SCAPULA

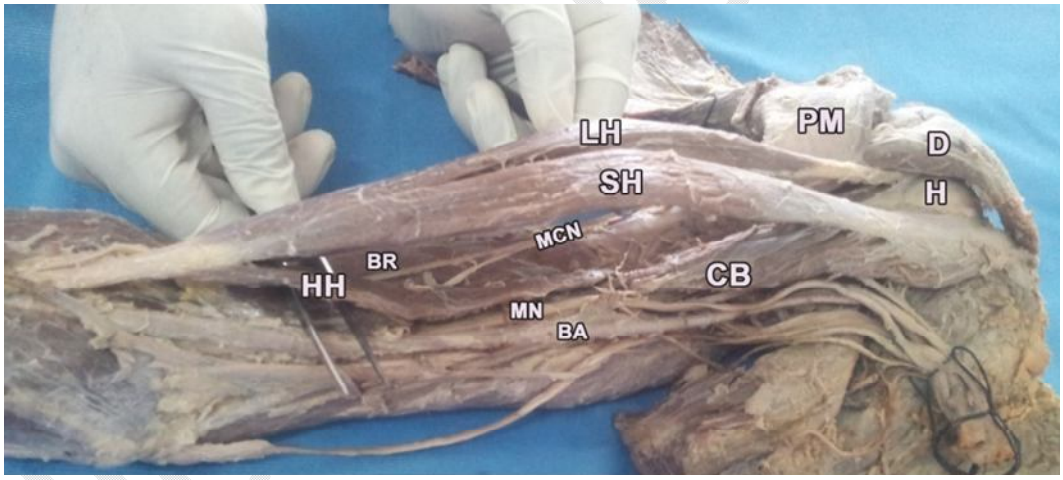

Figure 3
SUPERO-MEDIAL VIEW OF THE RIGHT ARM SHOWING THE BICEPS BRACHII; BEING LIFTED UP, LH- LONG HEAD OF BICEPS BRACHII, SH – SHORT HEAD OF BICEPS BRACHII, HH – HUMERAL HEAD OF BICEPS BRACHII, MCN – MUSCULO CUTANEOUS NERVE, CB – CORACO BRACHIALIS, H – HEAD OF THE HUMERUS, PM – PECTORALIS MAJOR, D – DELTOID, MN – MEDIAN NERVE, BR – BRACHIO RADIALIS, BA – BRACHIAL ARTERY

Extension:
Movement that approximates the extensor surfaces of the adjoining parts and thus increases the angle of the joint is called *Extension*.

year M.B.B.S students at Shadan Institute of Medical Sciences Teaching Hospital and Research Centre, an elderly male cadaver revealed a three headed biceps brachii in the flexor/anterior compartment of the right arm. The long head of the biceps brachii originated from the supra glenoid tubercle, the short head of the biceps brachii originated from the coracoids process of scapula. Both the heads remained separate in the upper two thirds (Figures 1 & 2). They merged with each other in the lower one third and formed a common tendon which got inserted into the radial tuberosity. The bicipital aponeurosis merged with the deep fascia of the fore arm. The third head (Caput accessorium) originated from the antero-medial aspect of the lower one third of the shaft of the humerus at the point of insertion of the coracobrachialis (Figure 4). There was no merging or fusing of its muscle fibers with those of brachioradialis. The tendon of the additional head merged infero-medially with the common tendon of both the long and short heads of the biceps brachii (Figures 2 & 3). All the three heads were innervated by the twigs from musculocutaneous nerve (MCN) which later continued as the lateral cutaneous nerve of fore arm (Figures 3 & 4). The muscle was nourished by the branches of the brachial artery (Figures 3 & 4). The left arm showed no such variation.

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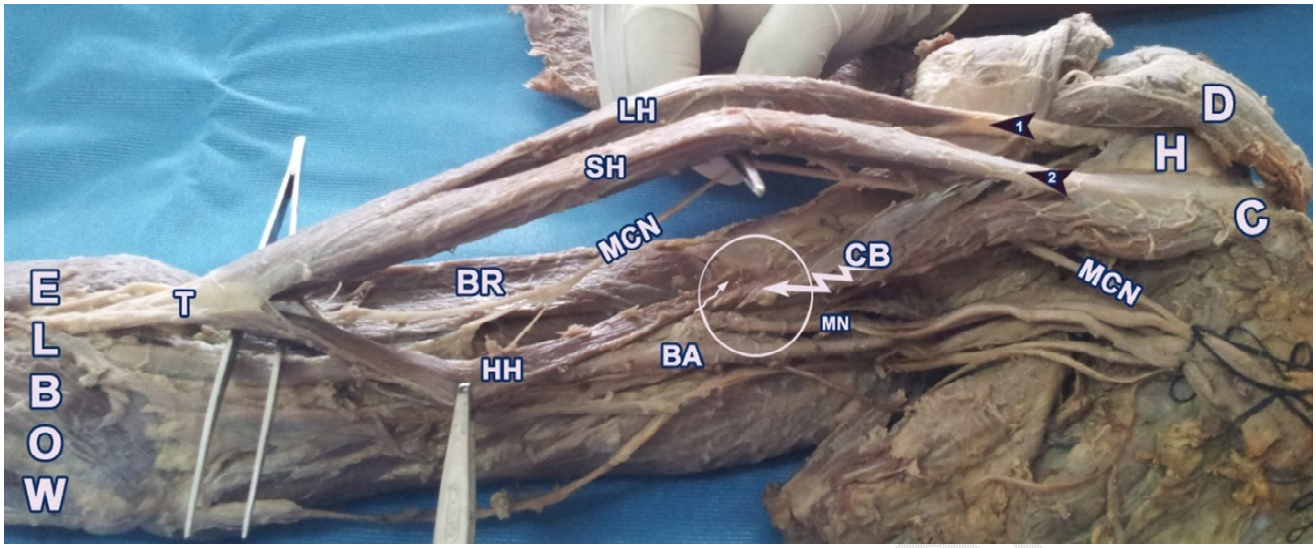

Figure 4

MEDIAL VIEW OF DISSECTED RIGHT ARM SHOWING ALL THE MUSCLES PRESENT IN THE ANTERIOR COMPARTMENT.
THE BIG ARROW WITH ZIZ ZAG TAIL SHOWS THE POINT OF INSERTION OF CORACO BRACHIALIS. THE SMALL ARROW SHOWS THE POINT OF ORIGIN OF THE THIRD HEAD OF BICEPS BRACHII.
THE TWO SMALL ARROW HEADS WITH NUMBER 1 & 2 SHOWS THE TENDONS OF ORIGIN OF THE LONG HEAD AND THE SHORT HEAD OF BICEPS BRACHII RESPECTIVELY.
NOTE: MUSCULO CUTANEOUS NERVE (MCN) IS LABELLED TWICE.
LH- LONG HEAD OF BICEPS BRACHII
SH – SHORT HEAD OF BICEPS BRACHII
HH – HUMERAL HEAD OF BICEPS BRACHII
MCN – MUSCULO CUTANEOUS NERVE
CB – CORACO BRACHIALIS
H – HEAD OF THE HUMERUS
PM – PECTORALIS MAJOR
D – DELTOID
MN – MEDIAN NERVE
BR – BRACHIO RADIALIS
BA – BRACHIAL ARTERY
C – CORACOID PROCESS

4. DISCUSSION

Out of 270 adult Srilankan cadavers the additional humeral heads of biceps brachii were discovered only in five male arms and they were all unilateral accounting to 3.7%. The heads originated from the antero medial aspect of the lower one third of the humeral shaft (Isurani Ilaperuma; Gananda Nanayakkara, 2011). Out of 50 adult U.P. West population the additional humeral heads of biceps brachii were discovered only in three upper limbs. All of them were unilateral and occurred only in males accounting to 6%. All of them originated from the antero medial aspect of the lower one third of the humeral shaft (Gupta Shalini, Mittal anupama, 2013). The present variation discovered is also an unilateral variant and occurred in a male cadaver and was on the right side.

Pronation: Rotation of the forearm laterally from midprone position so that the palm of the hand faces posteriorly is called *Pronation*.

A bilateral three headed biceps brachii was discovered in sixty year old male cadaver. Both the additional heads originated from the antero medial surface of the humerus at the point of insertion of coraco brachialis. Both of them were innervated by the musculocutaneous nerves (Vinna kota Sunitha and Bhattam Narasingarao, 2011).

5. CONCLUSION

The literature is roaring about the wide range of racial variations in the occurrence of humeral head of biceps brachii as there is massive evidence. From a clinician's point view the muscle anomalies are difficult to differentiate from soft tissue tumors. High median nerve compression around the elbow joint can occur due to a number of clinical and anatomical entities. The existence of an additional muscle at the elbow reason may cause compression of the brachial artery or a high median nerve policy (Nayak e.t. al. 2008). The preoperative diagnosis and the surgical procedures can be facilitated by the knowledge of the incidence of the additional heads of humerus (Rai e.t. al. 2007).

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SUMMARY OF RESEARCH

Depending on origin and location, accessory heads of biceps brachii have been classified as superior, inferomedial, and inferolateral humeral heads. Among all, inferomedial humeral head is the most common variation, which origins from the anteromedial surface of humerus just beyond the insertion of coracobrachialis and inserted into the conjoint tendon of biceps brachii (Rodriguez-Niedenfuhr, 2003 & Abu-Hijleh, 2005).

FUTURE ISSUES

It is presumed that the development of the biceps brachii muscle is likely to influence the course and the branching pattern of musculocutaneous nerve. This may have clinical implication as the musculocutaneous nerve is subjected to compression by the bulky third head. Therefore, knowledge of such variations is essential during surgical manipulations of the arm as well as in diagnosing the nerve impairments. Furthermore, it has been mentioned that any variant nerve with an abnormal origin, course and distribution is prone to accidental injuries and impairments (Roberts, W.H, 1992). This is established by the fact that the additional head of the biceps brachii have been reported to compress the surrounding neurovascular structures leading to erroneous interpretations during surgical procedures (Wamer, 1992).

A rare case of the accessory head of the biceps brachii supplied by the median nerve instead of musculocutaneous nerve is reported (Sharadkumar Pralhad Sawant et al. 2012). Such rare cases are making the awareness of topographical anatomy and the associated neuro vascular variations must and should to the surgeons Orthopaedicians, Radiologists and Anesthetists.

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