

Bifurcated Bicipital Aponeurosis Giving Origin to Flexor and Extensor Muscles of the Forearm – A Case Report

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ABSTRACT

Bicipital aponeurosis is usually attached to the antebrachial fascia on the medial side of forearm and to posterior border of ulna assisting in the supination of the forearm along with biceps brachii muscle. Variations in the bicipital aponeurosis may lead to neurovascular compression as reported earlier. In the present case, the bicipital aponeurosis had two slips i.e. medial and lateral. Medial slip gave origin to some fibers of pronator teres and flexor carpi radialis and the lateral slip gave origin to some fibers of brachioradialis. Such unusual slips of bicipital aponeurosis may distribute the stress concentration and may work in different directions affecting the supination of forearm by biceps brachii muscle and bicipital aponeurosis.

Keywords: Biceps brachii muscle, Nerves, Vessels.

CASE REPORT

During dissection classes for medical students, a rare unilateral variation of the bicipital aponeurosis was noted in the left upper limb of an adult male cadaver aged about 75 years. The biceps brachii had its usual attachments, innervation and relations. Just above the elbow, its fleshy belly ended into bicipital tendon and aponeurosis. Bicipital tendon had its insertion on the radial tuberosity. The aponeurosis bifurcated into a larger medial slip (MBA) and a smaller lateral slip (LBA) as shown in [Table/Fig-1]. The medialsip, instead of getting inserted to the deep fascia on the medial side of the forearm, merged with the common flexor muscles. Roughly ten percent of fleshy fibers of humeral head of pronator teres (PT) and fifteen percent of fleshy fibers of flexor carpi radialis muscle (FCR) took origin from this medial slip of the aponeurosis, while remaining portion of these muscle fibers took origin from the medial epicondyle of humerus. The lateral smaller slip merged with the brachioradialis and gave origin to roughly five percent fleshy fibers of brachioradialis while remaining fibers took origin from the upper two third of supracondylar ridge of humerus. The median nerve, brachial artery and radial artery were located deep to the medial part of bicipital aponeurosis, whereas the radial nerve was covered by the lateral part of the aponeurosis. The

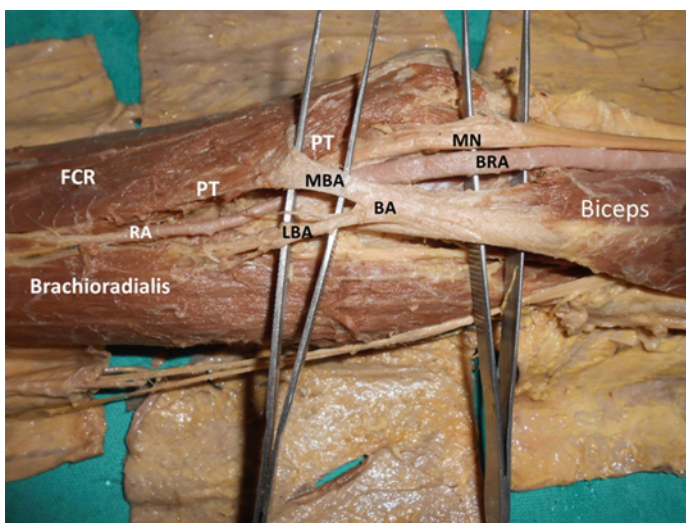
right upper arm had normal morphological structures and had no variations of bicipital aponeurosis.

DISCUSSION

Bicipital aponeurosis or lacertus fibrosus is an aponeurosis from the tendon of biceps brachii muscle in the cubital fossa. It gets attached to the deep fascia of the medial side of forearm after covering the brachial, radial and ulnar artery along with the median nerve. Bicipital aponeurosis performs the function of drawing the posterior border of the ulna medially during supination of the forearm [1]. The bicipital aponeurosis is presumed to protect the neurovascular bundle in the cubital fossa such as median nerve and the brachial artery, which pass deep to it [1].

Many morphological studies of bicipital aponeurosis have been published. Cadaveric study of the bicipital aponeurosis by Joshi et al., stated that the average width of bicipital aponeurosis at its commencement was 15.74 mm and 17.57 mm on the right and left side respectively. The average angle was found to be 21.16° and 21.78° on the right and left side respectively between the aponeurosis and the tendon of biceps [2]. A Study by Deopujari found three variations of bicipital aponeurosis, one of the cases reported about thickened tendinous slip along the border of the aponeurosis, while in another case the bicipital aponeurosis was emerging from a third head of biceps brachii muscle and in the third case the aponeurosis gave origin to some muscle fibers which joined the extensor carpi radialis muscle [1]. Kinking of brachial artery due to the bicipital aponeurosis was observed in a case reported by Clark et al., [3]. Cevirme reported a case of brachial artery entrapped by perforating the bicipital aponeurosis leading to right upper extremity ischemia [4]. The bicipital aponeurosis was attached to the proximal part of flexor carpi radialis instead of blending with deep fascia of forearm as reported by Sabnis [5]. Additional muscle slips to pronator teres and flexor carpi radialis muscles from the bicipital aponeurosis has been reported [6] but in the present case in addition to the medial slip (MBA) providing origin to pronator teres and flexor carpi radialis muscle there was an lateral slip (LBA) which gave origin to brachioradialis muscle.

Neurovascular symptoms may appear due to variant bicipital aponeurosis as a result of entrapment of underlying vessels and nerves [1]. By examining the integrity of the bicipital aponeurosis, the accurate diagnosis of complete distal biceps tendon rupture can be assessed clinically [7] and additional slips may lead to wrong diagnosis as in present case. Attachment of a tendon or



[Table/Fig-1]: Dissection of the left cubital fossa showing variant bicipital aponeurosis (BA) along with its medial slip (MBA) and lateral slip (LBA). Brachioradialis and Flexor carpi radialis (FCR) muscles can be seen taking origin from the MBA and LBA respectively. PT- Pronator teres muscle, BRA –Brachial artery, MN- median nerve, BA- bicipital aponeurosis, RA- radial artery.

ligament to a bony area is subjected to great stress concentration and thus have expansions and flare out to gain a wide grip on the bone or neighboring structures to reduce this stress [8]. Extra slips from the bicipital aponeurosis may distribute stress concentration on bony areas of attachment and may function independently [1] as in the present case. In case of avulsion injuries or tendon rupture, the surgery should be done on both tendon of biceps brachii muscle and the bicipital aponeurosis in order to maintain the stress distribution and provide a full range of supination [1]. In the present case the medial and lateral slips of bicipital aponeurosis are providing attachment to some muscles of forearm which may change the stress concentration on the attachment area. As the variant aponeurosis has unusual medial and lateral slips, it may effect the supination of the forearm by the biceps brachii muscle and the bicipital aponeurosis. During flexion of the forearm at the elbow joint and supination of forearm, extra slips of bicipital aponeurosis may produce some undue stretching of muscles in the front of forearm resulting in undesired movements in forearm wrist and palm region. Medial and lateral slips of bicipital aponeurosis may also compress the underlying neurovascular structures.

CONCLUSION

Extra slips of bicipital aponeurosis providing attachment to some muscles of forearm may change the stress concentration on the

attachment area, may affect the movements of the forearm and may produce some undue stretching of front muscles of forearm. Thus such variant bicipital aponeurosis may result in undesired movements apart from compressing the underlying neurovascular structures making such cases clinically and surgically important.

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FINANCIAL OR OTHER COMPETING INTERESTS: None.

Date of Submission: **Nov 09, 2015**
Date of Peer Review: **Dec 14, 2015**
Date of Acceptance: **Dec 20, 2015**
Date of Publishing: **Feb 01, 2016**