CASE REPORT

Eur. J. Anat. 23 (2): 137-140 (2019)

A case of biceps brachii accessory humeral head associated with variant musculocutaneous and median nerve communications with clinical implications

Aaron Z. Katrikh[1], Diane P. Savarese[2], Christopher Ferrigno[3]

[1] Rush Medical College, Rush University, Chicago IL, USA, [2] Rush College of Health Sciences, Rush University, Chicago IL, USA, [3] Department of Cell & Molecular Medicine, Rush University, Chicago IL, USA

SUMMARY

We present a unique case of an accessory head to the biceps brachii arising from the humerus accompanied by bilateral connections of the musculocutaneous and median nerves identified during routine anatomical dissection in the anatomy lab of Rush University. On the left side, the accessory head attached proximally to the anteromedial surface of the midshaft humerus and joined the rest of the muscle via the common biceps tendon to attach distally onto the radius. It was innervated by a separate branch of the musculocutaneous nerve. Bilaterally, both connections between the musculocutaneous and median nerves occurred distal to the traditional contribution from the lateral cord of the brachial plexus. On the right side, the musculocutaneous nerve pierced the substance of the coracobrachialis muscle before giving a branch to innervate the biceps brachii muscle. These variations have clinical relevance for surgeons operating in the region and any clinician investigating peripheral nerve symptoms in the arm.

Key words: Biceps brachii humeral head – Biceps brachii accessory head – Musculocutaneous and median nerve connection

Corresponding author: Christopher Ferrigno. 600 S. Paulina St., Suite 512G, Chicago, IL 60612, USA. Phone: (312) 563-2692; Fax: (312) 942-5744.

E-mail: christopher_ferrigno@rush.edu

INTRODUCTION

The biceps brachii muscle is traditionally a two-headed muscle that has proximal attachments of the long and short heads to the supraglenoid tubercle and coracoid process of the scapula, respectively, and a common distal attachment to the radial tuberosity. The presence of an accessory humeral head of the biceps brachii muscle has been well documented in the literature in both studies and case reports. Rodriguez-Niedenfuhr et al. conducted a study in 2003 that showed the presence of an additional humeral head in 27 of 175 (15.4%) of cadavers. A study in the Nepalese population showed accessory heads to the muscle in 12.5% of arms (Poudel et al., 2009). A study in India concluded that only 3 of 42 (7%) cadavers presented with this variant (Rai et al., 2007). A 1992 study in the South African population showed the existence of a third head to the biceps brachii in 20.5% of South African blacks and only an 8.3% incidence in the South African white population (Asvat et al., 1992). Yershov and Hudak (2015) presented a case report of the existence of a humeral head potentially causing entrapment of the median nerve or compression of the brachial artery. Indrasingh et al. (2014) discussed a case report of an individual with communicating rami between the musculocutaneous (McN) and median (MdN) nerves piercing an accessory humeral head. Song et al. (2018), Lee et al. (2011), and Warner et al. (1992) also published case reports presenting an accessory humeral head, the latter

Submitted: 31 July, 2018. *Accepted:* 26 December, 2018.

discovered intraoperatively during routine shoulder replacement.

Many studies and case reports have described variant connections between the McN and the MdN. A 2002 study by Choi et al. (2002) examined 138 cadavers and discovered these variations in 46% of cadavers. This study further categorized three patterns of variations: Pattern 1 (19.2% of cases) is described as having both nerves arise from a common fused trunk with contributions from the lateral and medial cords. Patterns 2 (72.6%) and 3 (6.8%) are described as having one and two connections between the McN and the MdN, respectively. Pattern 2 can be further subdivided into 2a, where a single branch of the McN contributed to the connection, and 2b where there are two branches that contribute to form the one connection to the MdN. A combination of patterns 1 and 2a were seen in one case (1.4%). Similar studies by Caetano et al. (2016), Mat Taib et al. (2016), Ballesteros et al. (2015), Kumar et al. (2013) and Maeda et al. (2009) reported 25.0%, 13.6%, 19.8%, 28.0%, and 41.5% incidence of anastomotic connection between the two nerves, respectively.

CASE REPORT

Variations of the upper limb neuromusculature were found bilaterally in a 77-year-old Caucasian male during a routine anatomical dissection in the instructional gross anatomy laboratory of the Medical College of Rush University. The cause of death for this individual was intracranial hemorrhage.

In the left arm (Fig. 1, panel A), the McN and lateral root contribution to the MdN arose in normal fashion from the lateral cord of the brachial plexus. Off the McN, approximately 1.6 cm distal of the lateral cord, a muscular branch arose to innervate the coracobrachialis muscle. Further distally, the McN gave off a large communicating branch to the MdN. This branch was 11.4 cm distal to the aforementioned muscular branch to coracobrachialis. Before continuing as the lateral cutaneous nerve of the forearm, four branches subsequently arose from the McN, including two short branches to innervate the biceps brachii muscle belly proper and two short branches to innervate the accessory humeral head. Measuring 10.8 cm in length and 1.6 cm in width, the humeral head attached proximally to the anteromedial surface of the midshaft humerus. Distally it joined the rest of the muscle via the common biceps tendon to attach onto the radial tuberosity. The humeral head received its blood supply from a branch of the brachial artery and drained via a tributary of the brachial vein.

In the right arm (Fig. 1, panel B), the McN and the lateral root to the MdN arose normally from the lateral cord of the brachial plexus. The McN pierced the substance of the coracobrachialis muscle 13.8 cm distal from the nerve's origin off the lateral cord. Upon leaving the muscle belly, the McN immediately gave a branch supplying the common belly of the biceps brachii muscle. The McN, 2.3 cm further distally, gave off a contribution to the MdN and continued before terminating with a nerve to the brachialis muscle as the lateral cutaneous nerve of the forearm.

DISCUSSION

In accordance with the classification system used by Choi et al. (2002), we present a case report of bilateral, type 2 anastomotic connections between the McN and MdN. According to Choi et al., this is the most commonly observed communication pattern. Since unilateral occurrences predominate bilateral variations, this case is unique (Ballesteros et al., 2015), and is most similar to that presented by Indrasingh et al. (2014), who describe a variant connection between the McN and the MdN passing through the substance of a humeral head of the biceps brachii muscle. The aberrant communication in the current case report, however, occurs prior to the accessory muscle; the specific pattern of the McN branching differs from that of Indrasingh et al. (2014). This nerve variation is present bilaterally, whereas other reports present unilateral aberrations.

To our knowledge, this is the only report of a biceps brachii humeral head associated with bilateral musculocutaneous and median nerve communications (MEDLINE; 1920-2018; English language; search terms: "biceps brachii" and "musculocutaneous median nerve"). This anatomy poses some potential clinical considerations. Bilaterally, the McN was in a position susceptible to entrapment. In the left arm, the McN passed between the biceps brachii proper and the humeral head, a location of potential compromise, especially when the biceps is most shortened in forearm flexion and supination. In the right arm, the McN passed through a slip in the coracobrachialis muscle, putting the nerve at risk for entrapment, especially during flexion of the shoulder joint. Entrapment would present as weakness in the muscles innervated distally, as well as paresthesia in the distribution of the lateral cutaneous nerve of the forearm. Gheno et al. (2010) describes how the existence of an accessory belly of the biceps brachii muscle can be misinterpreted on MRI as evidence of partial tearing of the biceps tendon. Warner et al. (1992) discusses a case of a humeral head being discovered intraoperatively. Therefore, knowledge of the variations in the musculature and nervous tissue of the upper limb is of interest to clinicians when evaluating peripheral neurologic symptoms and to radiologists, surgeons, and anatomists.

ACKNOWLEDGEMENTS

We would like to thank the individuals who graciously and generously donate their remains to the Anatomical Gift Association of Illinois for education and research purposes. We would like to thank James Williams, PhD and Anthony Serici, MPH the Director and Lab Manager, respectively, of the

Fig 1. Bilateral variations in upper limb neuromusculature. Proximal to distal orientation is from left to right. **Panel A** depicts the left upper limb. An accessory humeral head is present which attaches proximally to the anteromedial surface of the midshaft humerus and attaches distally to the common biceps tendon. The musculocutaneous nerve can be seen giving separate branches to coracobrachialis, biceps brachii proper, and the accessory humeral head. **Panel B** shows the right upper limb in the same cadaver in which the musculocutaneous nerve pierces the coracobrachialis muscle before giving its motor and cutaneous branches. The dashed lines illustrate the two connections between the musculocutaneous and median nerves seen on both upper limbs, with the distal communication being variant.

Legend: n. to CB: Branch of musculocutaneous nerve to coracobrachialis muscle; McN: Musculocutaneous nerve; Ax a.: Axillary artery; Mdn: Median nerve; MABC: Medial antebrachial cutaneous nerve; SH: Short head of biceps brachii; LH: Long head of biceps brachii; AH: Accessory head of biceps brachii; CB m.: Coracobrachialis muscle.

Rush University Anatomy laboratory. We would also like to thank Cindy Peng for her assistance with dissection and Diana Vázquez Parker for assistance in preparing the figure.

REFERENCES

ASVAT R, CANDLER P, SARMIENTO EE (1992) High incidence of the third head of biceps brachii in South African populations. *J Anat*, 182: 101-104.

BALLESTEROS LE, FORERO PL, BUITRAGO ER (2015) Communication between the musculocutaneous and median nerves in the arm: an anatomical study and clinical implications. *Rev Bras Ortop*, 50: 567-572.

CAETANO EB, VIEIRA LA, CAVALHEIRO CS, FILHO MR, ALMARGO MAP, CAETANO MF (2016) Anatomic study of the nervous communication between the median and musculocutaneous nerve. *Acta Ortop Bras*, 24: 200-203.

CHOI D, RODRIGUEZ-NIEDENFUHR M, VAZQUEZ T, PARKIN I, SANUDO JR (2002) Patterns of connections between the musculocutaneous and median nerves in the axilla and arm. *Clin Anat*, 15: 11-17.

GHENO R, ZONER CS, BUCK FM, NICO MAC, HAGHIGHI P, TRUDELL DJ, RESNICK D (2010) Accessory head of biceps brachii muscle: anatomy, histology, and MRI in cadavers. *Am J Roentgenol*, 194: W80-W83.

INDRASINGH I, JACOB TM, PANDURANGAN T, PADMAVATHY KM (2014) A case of communicating rami between the median and musculocutaneous nerves passing through the substance of an accessory head of the biceps brachii. *J Neurosci Rural Pract*, 5: S95-S96.

KUMAR N, GURU A, D'SOUZA MR, PATIL JS, NAYAK B (2013) Incidences and clinical implications of communications between musculocutaneous nerve and median nerve in the arm – a cadaveric study. *West Indian Med J*, 62: 744.

LEE SE, JUNG C, AHN KY, NAM KI (2011) Bilateral asymmetric supernumerary heads of biceps brachii. *Anat Cell Biol*, 44: 238-240.

MAEDA S, KAWAI K, KOIZUMI M, IDE J, TOKIYOSHI

A, MIZUTA H, KODAMA K (2009) Morphological study of the communication between the musculocutaneous and median nerves. *Anat Sci Int*, 84: 34-40.

MAT TAIB CN, HASSAN SN, ESA N, MOHD MOKLAS MA, SAN AA (2016) Anatomical variations of median nerve formation, distribution and possible communication with other nerves in preserved human cadavers. *Folia Morphol*, 76: 38-43.

POUDEL PP, BHATTARAI C (2009) Study on the supernumerary heads of biceps brachii muscle in Nepalese. *Nepal Med Coll J*, 11: 96-98.

RAI R, RANADE AV, PRABHU LV, PAI MM, PRAKASH (2007) Third head of biceps brachii in an Indian population. *Singapore Med J*, 48: 929-931.

RODRIGUEZ-NIEDENFUHR M, VAZQUEZ T, CHOI D, PARKIN I, SANUDO JR (2003) Supernumerary humeral heads of the biceps brachii muscle revisited. *Clin Anat*, 16: 197-203.

SONG H, KIM J, YOON S (2018) Coexistence of a pectoralis quartus muscle, a supernumerary head of biceps brachii muscle and an accessory head of flexor digitorum profundus muscle. *Folia Morphol*, doi: 10.5603/FM.a2018.0048.

WARNER JJ, PALETTA GA, WARREN RF (1992) Accessory head of the biceps brachii: case report demonstrating clinical relevance. *Clin Orthop Relat Res*, 280: 179-181.

YERSHOV D, HUDAK R (2015) Unusual variation of the biceps brachii with possible median nerve entrapment. *Prague Med Rep*, 116: 167-172.