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Case Report

Variant innervation of flexors of the arm associated with additional head of biceps brachii

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ABSTRACT

Biceps brachii is known for its variations; 3rd and 4th head being present are reported. Similarly, musculocutaneous nerve is also known to show variations. In the present case, we report the absence of musculocutaneous nerve bilaterally and the presence of third head of biceps brachii in the left arm. Branches of median nerve in a single cadaver innervate all the flexors in both the arms. We report this case as a unique one because of the combination of variations. ***Neuroanatomy; 2006; 5: 24–26.***

Key words [musculocutaneous nerve] [median nerve] [biceps brachii] [variation]

Introduction

Variations in the flexor muscles of the arm and brachial plexuses are common. The combination of variations seen in a single cadaver is a rarity.

Biceps brachii is a large fusiform muscle deriving its name by its two proximally attached parts. This muscle is known for its variable anatomy [1]. Biceps with 3 or more heads innervated by musculocutaneous nerve is reported in a number cases [2-4].

The musculocutaneous nerve has frequently shown variations - it may be doubled, short or totally absent. The musculocutaneous nerve arise from lateral cord (90.5%), from lateral and posterior cord (4%), from median nerve (2%) as 2 separate bundles from medial and lateral cords (1.4%) and from posterior cord (1.4%) [1]. Very rarely the nerve instead of piercing coracobrachialis, it may adhere to the median nerve for some distance down the arm, then either as a single trunk or several branches pass between biceps and brachialis. Communication between median nerve and musculocutaneous nerve occur in the distal part of the arm, but in the proximal region of arm it occurs in 8% of the cases [5, 6].

The present case deals with the variation in the flexor muscles of the arm, associated with the variation in innervations, which is a rare phenomenon. It needs critical reasoning for the cause, with the emphasis on morphology and clinical significance. To the best of our knowledge we report for the first time combination of a case of innervation of median nerve to all the flexors of arm associated with the absence of musculocutaneous nerve bilaterally and unilateral presence of third head of biceps brachii which is also innervated by median nerve.

Case Report

During the dissection of upper limbs in a middle aged male cadaver fixed in 10% formalin, it was noted that bilateral absence of musculocutaneous nerve and presence of third head of Biceps brachii unilaterally. Branches of median nerve supplied all the muscles in the anterior compartment of the both the arms. The lateral cord branches into lateral pectoral nerve, lateral root of median nerve. Musculocutaneous nerve was absent.

On the left side, the lateral root joined with the medial root to form median nerve in front of the brachial artery. Then descends lateral to the artery, along its lateral side it give branches to coracobrachialis, all the heads of biceps and brachialis. The branches are passing between 3rd head of biceps brachii and brachialis muscle. The main nerve continues as median nerve proper to the elbow. The nerve does not pierce the coracobrachialis muscle (Fig. 1).

On the right side, the median nerve is formed lateral to the artery, descends laterally, and crosses the artery posteriorly to become medial in position. This relation of median nerve to the artery is a deviation from the normal. From its lateral side branches are given to all the flexors of the right arm. The third head of biceps brachii is absent on the right side (Fig. 2).

Figure 1. Figure shows the absence of musculocutaneous nerve, presence of 3rd head of biceps brachii in the left limb. Arrow indicates 3rd head of biceps brachii. Arrowhead indicates branches of median nerve supplying the flexors of arm. Color version of figure is available online.

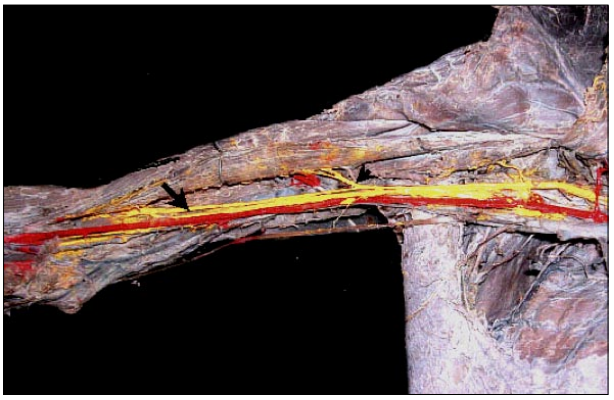

Figure 2. Figure shows the absence of musculocutaneous nerve, innervation of flexors by median nerve in the right upper limb. Arrow and arrowhead indicates branches of median nerve supplying flexors of arm. Color version of figure is available online.

Discussion

In the present case the origin of third head is from the insertion of coracobrachialis and inserted to the bicipital aponeurosis. It is anterior to the brachialis muscle. The functional importance of the third head with the humeral origin is to strengthen the flexion of elbow joint irrespective of the position of shoulder joint.

In some instances third head has 2 muscle slips, one in front of the artery and one behind the artery in its course down the arm, concealing the vessel. In the present case, the brachial artery was not concealed which is indicative of non-involvement of vascular abnormalities. The third head of biceps brachii is probably derived from muscles of anterior compartment. In contrast to other primates, in humans there is a lack of long head of coracobrachialis. In cases in which the third head arises from the insertion area of coracobrachialis, it is possible that it represents a remnant of long head of coracobrachialis, the ancestral hominoid condition. In *Cercopithecus*, the long head of coracobrachialis may find an insertion into the radial tuberosity in common with biceps brachii [2]. With these reports it may be postulated that the present case may be the representation of retainment of ancestral character by developmental modification.

The musculocutaneous nerve is absent and the entire fibers of musculocutaneous nerve pass through the additional lateral root and the fibers to the muscles supplied by musculocutaneous nerve branch out directly from median nerve [7]. In the present case, the musculocutaneous nerve was completely absent and lateral branches of median nerve supplied the flexors of both the arms. On the left side, 3rd head of biceps, received the nerve supply from median nerve. Also, there is no additional lateral root for the median nerve. This accounts for the uniqueness of the present case.

It has been reported that there is only one trunk equivalent to the median nerve in the thoracic limb of the lower vertebrates like amphibians, reptiles and birds [8]. In this context, that ontogeny recapitulates phylogeny; it is possible that variation seen in the current study is the result of developmental anomaly. In man, the forelimb muscles develop from mesenchyme of paraxial mesoderm in the 5th week of embryonic life [9]. The axons of the spinal nerve grow distally to reach the mesenchyme of the limb bud. The peripheral processes of the motor and sensory neurons grow in the mesenchyme in the different directions [5, 9]. This probably accounts for the difference in relation between the median nerve and brachial artery at the formation of median nerve in both the limbs and also for the variation in relation while crossing the artery from lateral to medial side.

Expression of chemoattractants and repellents regulate the developing axon in a very systematic site-specific manner. Variations are the result of alteration of signal between mesenchymal cells and neuronal growth factors. Also, by the circulatory factors at the time of formation of brachial plexus [10]. The combination of the above facts might have taken place during the development, which has resulted in the merging of musculocutaneous nerve with the median nerve probably at the cord level, fibers are traversing through median nerve there by the result i.e., flexors of the arm including 3rd head of biceps brachii are innervated by the median nerve.

We conclude that the present case is unique by the retainment of ancestral character with developmental neuronal modification, which add up to the present knowledge in the field and also the knowledge of this will definitely help clinicians for various clinical invasive procedures.

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