

Full length research paper

Variation of musculocutaneous nerve in arm with additional muscular slip in forearm

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The Musculocutaneous nerve arises from the lateral cord of the brachial plexus, passes inferolaterally and then pierces through the coracobrachialis, after supplying it descends between the biceps and the brachialis, sending branches to both and continues as the lateral cutaneous nerve of the forearm. Variations in the origin, course, branching pattern, termination and the connections of the musculocutaneous nerve are not uncommon. These variations have clinical significance during surgical procedures, in the brachial plexus block and in diagnostic clinical neurophysiology. A detailed study was carried out on 80 upper limbs by using 40 embalmed cadavers during 4 years in anatomy department during routine undergraduates' dissection classes. Dissection of the infraclavicular part of the brachial plexus was done. The variations in the origin, number and course, and their correlations to the coracobrachialis were noted. Absence of the musculocutaneous nerve was noted in 2 upper limbs (2.5 %). The musculocutaneous nerve was found but not piercing the coracobrachialis in 1 upper limb. (1.25%) and the nerve was found to rejoin the median nerve. The observations show that the musculocutaneous nerve has significant variations and that these variations have clinical significance in post traumatic evaluations and in the exploratory innervations of the arm for peripheral nerve repair. It is important for surgeons, clinicians and anatomist to be aware of possible anatomical variations to avoid unexpected complications.

Key words: Musculocutaneous nerve, brachial plexus, median nerve, coracobrachialis, biceps brachii.

INTRODUCTION

Variations in the formation of the brachial plexus and its terminal branches in the upper extremity are common and have been reported in the literature [Kerr AT., 1918, Linel EA., 1921]. Buch Hansen [Buch – Hansen K., 1955] reported these variations in 65.3% of the population. Variations of the musculocutaneous nerve and its branches have been previously reported [Bergman RA et al., 2000, Williams PL et al., 1995]. The musculocutaneous nerve was found to be absent, by Prasada Rao [PrasadaRao PVV, Chaudhary SC., 2001]. The reported variations of the musculocutaneous nerve also include the nerve not piercing the coracobrachialis [Nakatani T et al., 1997]. The complete absence of the musculocutaneous nerve and the assumption of its innervations by the median nerve are uncommon [Ihunwo

AO et al., 1997]. Such variations may be present clinically or may be observed during surgery. Since there is a high incidence of variations, they are important for neurologist, orthopaedicians and traumatologists. So, a detailed study was done to observe the variations of the musculocutaneous nerve in the arm and axilla.

MATERIALS AND METHODS

Eighty limbs (Right: 40; Left: 40) from 40 embalmed cadavers fixed in 38% formalin were utilized during the study period of four years. The pectoral region, the axilla and the arm were dissected. The cords and the branches of the cords in the infraclavicular part of the brachial plexus were dissected. The variations of the musculocutaneous nerve were noted. The origin and course of the musculocutaneous nerve and the correlation of the musculocutaneous nerve to the coracobrachialis were noted.

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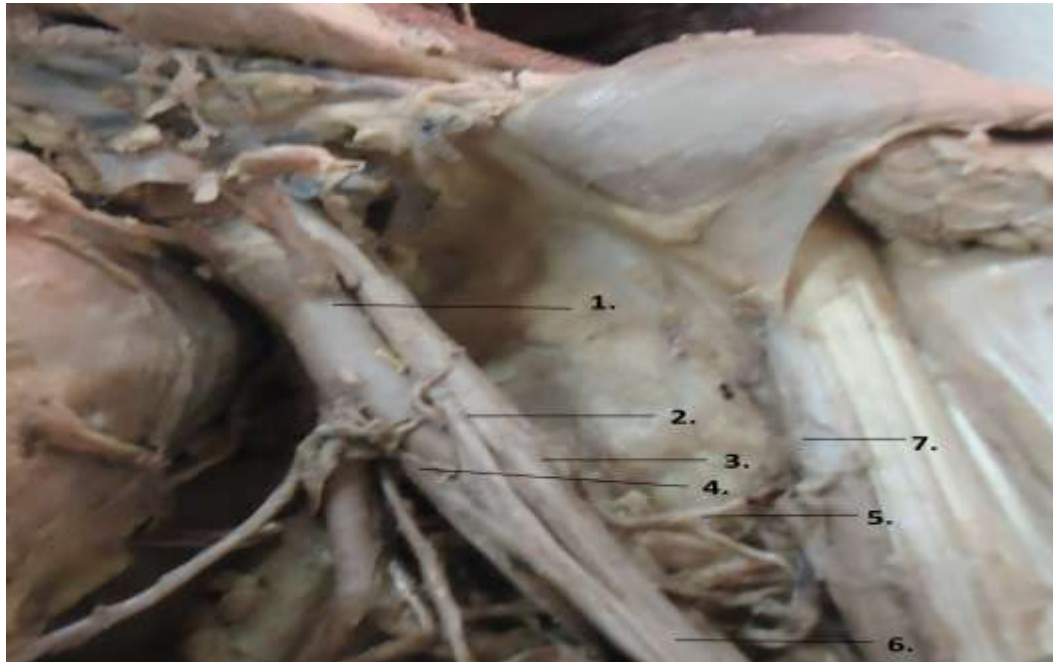


Figure1. Left arm, 1.Brachial artery, 2.lateral root of median nerve, 3.lateral cord, 4.Medial root of median nerve, 5. Nerve to coracobrachialis, 6. Fusion of median nerve & lateral cord, 7. Coracobrachialis.

OBSERVATION

In this studies two special variations were noted where the musculocutaneous nerve was found to be absent.

Out of 40 human cadavers, two cadavers reflected a unilateral variation i.e. absent musculocutaneous nerve, and in one upper limb we found musculocutaneous nerve which did not pierce the coracobrachialis muscle. The nerve was found to be absent in left upper limb. (Figure1) The medial root of the median nerve from the medial cord was small. The lateral cord continued to run down for 4 cm in the axilla instead of giving away a separate musculocutaneous nerve as a branch. Further in its course the lateral cord got fused with the median root of median nerve. The nerve to the coracobrachialis (usually this muscle is supplied by the musculocutaneous nerve itself) was arising from the lateral aspect of the lateral cord and then fuses with the median root and continue as a median nerve. The muscular branches to the biceps and the brachialis and lateral cutaneous nerve of forearm were arising from the median nerve.

In (Figure 2), the lateral cord divided into lateral root of median nerve which merge with medial root of median nerve and remaining part of lateral cord continue as a musculocutaneous nerve which runs 8 cm down in axilla without piercing coracobrachialis muscle and then merge with the median nerve. During this course it gives one branch which supply coracobrachialis muscle. The muscular branches to the muscles of the anterior

compartment of the arm arose from that median nerve. Branch from the median nerve continue as a lateral cutaneous nerve of forearm.

DISCUSSION

Renata pacholczak et al [Renatapacholczak et al., 2010] observed the musculocutaneous nerve to be absent on the left side, which coincides with the findings from one case Figure 1 in the present study. The complete absence of the musculocutaneous nerve and a complete takeover of the innervations of the coracobrachialis, the biceps and the brachialis muscles by the median nerve is an unusual variation of the brachial plexus [Williams PL et al., 1995, McMinn RMH., 1994, and Moore KL., 1992]. Nayak [Nayak S et al., 2006] reported that in one limb, the musculocutaneous nerve had a low origin and that the nerve was found to not pierce the coracobrachialis, which was coincide with our second case finding in right sided upper limb. (Figure 2). The musculocutaneous nerve was found to be absent completely in 2 limbs, but the nerve did not pierce the coracobrachialis in 1 limb. Chitra [Chitra R., 2007] observed in 2 cases, that the musculocutaneous nerve did not pierce the coracobrachialis. Le minor [Le Minor JM., 1990] reported in the type V of his classification, that the musculocutaneous nerve was absent and that the fibres of the musculocutaneous nerve ran within the median

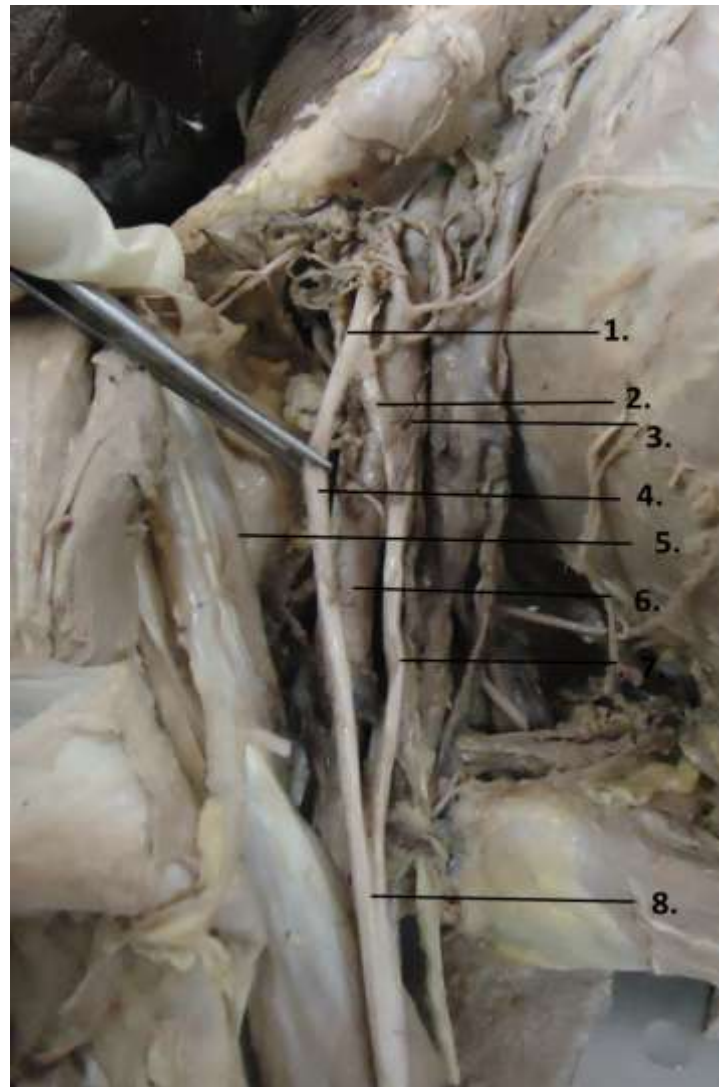


Figure 2. Right Arm 1.Lateral Cord, 2.Lateral Root Of Median Nerve, 3. Medial Root Of Median Nerve, 4.Musculocutaneous Nerve, 5.Coracobrachialis Muscle 6.Brachial Artery, 7. Median Nerve,8. Joining Point Of Median & Musculocutaneous Nerve.

nerve along its course and that in this type, the musculocutaneous nerve did not pierce the coracobrachialis muscle. These reports coincide with those of the present study, where the musculocutaneous nerve did not pierce the coracobrachialis in 1 limb. The musculocutaneous nerve was rejoining the median nerve after piercing the coracobrachialis is a rare variation and this is rarely reported in the literature. The musculocutaneous nerve, after piercing the coracobrachialis, rejoined the median nerve in one case which was reported by Joshi [Joshi SD et al., 2008] and in 3.125% of the cases which were reported by Bhattarai [Bhattarai C, Poudel PP., 2009]. If the musculocutaneous nerve is absent, its fibers run in the median nerve [PrasadaRao PVV, Chaudhary SC., 2001] and muscles

of the anterior compartment of the arm are innervated by it [PrasadaRao PVV, Chaudhary SC., 2001, Ihunwo AO et al., 1997]. In rare cases, innervations are provided by the lateral root of the median nerve [Nakatani T et al., 1997, Le Minor JM., 1990]. These distributions of the muscular branches are different in every case so far published in literature.

The embryological development of the upper limb may help in explaining this anatomical neurological variation. Mesenchyme, which comes from the dorsolateral part of the somites, migrates and forms the muscles into the limb bud. At the same time, the mesenchyme is penetrated by the ventral primary rami of the appropriate spinal nerves, located opposite to the bud. Contact between nerves and muscle cells are necessary to provide mesenchymal

condensation to form muscles. Nerves supplying the limbs are joined by connecting loops of nerve fibres to form plexuses. The median nerve is formed by a combination of ventral segmental branches and the musculocutaneous nerve arises from it. Disturbances in these processes, taking place in the 4th–7th weeks of development, lead to anatomical variations. In the innervations of muscle. In accordance with the study of embryological development, absence of the musculocutaneous nerve is noted meaning that this nerve did not arise from the median nerve, thus its fibres run in the median nerve.. Surgeons should particularly take into consideration these possible anatomical variations when trying to explain unusual symptoms which may occur during examination of patients with median nerve injuries or thoracic outlet syndrome [Beheiry EE. 2004]. Absence of the musculocutaneous nerve is usually not revealed because its fibres run with the median nerve. After injury of the median nerve (with an abnormal distribution) in the region of the armpit or shoulder, unexplainable complications are often presented. Apart from common symptoms such as the loss of pronation and reduction in flexion of the hand and wrist, paralysis of the thenar muscles and loss of sensation in certain regions of the hand which are revealed when the median nerve has its normal anatomical course. Beheiry [Beheiry EE. 2004] suggests a different way to prove the absence of the musculocutaneous nerve in a healthy patient such as unobtainable nerve condition test of the musculocutaneous nerve. During shoulder surgery, it is important to identify or palpate the musculocutaneous nerve, as it is vulnerable to injury from retractors which are placed under the coracoid process. During the coracoids process grafting, shoulder dislocations and frequent arthroscopies may damage the muscle as well as the nerve [Flatow EL et al., 1989]. It is important for surgeons, clinicians and anatomists to be aware of possible anatomical variations to avoid unexpected complications.

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