

Case Report: A Case Report of Variance in the External Cord of the Brachial Plexus: The Absence of Musculocutaneous Nerve



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ABSTRACT

The anatomical variations of the brachial plexus are well documented. However, it is important to review the components of the brachial plexus, as it is significant in everyday clinical practices. The lateral pectoral and musculocutaneous nerves emerge from the lateral side of the lateral cord, in the brachial plexus. Before the piercing of the coracobrachialis muscle, the cord gives a muscular branch to this muscle from its lateral side. After sending muscular branches to biceps brachii and brachialis, the cord pierces the coracobrachialis muscle. Then, it courses downwards for a long distance at the middle of the arm into the lateral forearm skin; this branch is named as lateral forearm cutaneous nerve. The variations of the musculocutaneous nerve are extremely important for surgeons and radiologists, especially in the surgical explorations involving this region. In this study, we reported the absence of musculocutaneous nerve on the left side of a 25-year-old male cadaver. The case was detected during the routine dissection of the upper limb, in the dissection hall of the Bam University of Medical Sciences. The left median nerve supplied the coracobrachialis, biceps brachii, and brachialis, thereafter, it gave way to the lateral forearm cutaneous nerve, close to the elbow joint. These branches crossed the brachial artery to supply the muscles. This absence of musculocutaneous nerve and such type of variations are very rare during the embryologic development. Thus, the awareness of such variations helps for the diagnosis of the related neurological disorders and in surgical procedures.

1. Introduction

The brachial plexus is a complex somatic network consisted of the anterior branch of the nerves C5 to C8 and the first thoracic nerve (T1). This network begins at the neck, then, extends from the first rib to the outside and down and enters the axilla. The various parts of the brachial plexus from inside to outside include roots,

trunks, branches, and cords. All of the big nerves that innervate the upper limb stem from the brachial plexus and often come from cords. The upper parts of the brachial plexus in the neck are located in the posterior part of the subclavian arteries, while most of the lower parts of the network are located around the axillary arteries [1-3]. Also, the lateral cord is formed from the anterior branches of the upper and middle trunks (C5, C6, and C7). Subsequently, it gives rise to the following nerves:

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- The external pectoral nerve for the pectoralis major muscle;
- The musculocutaneous nerve terminated by the lateral cutaneous nerve of the forearm;
- The lateral branch of the median nerve [4-7].

Variants are very common in the formation of lateral brachial nerve roots. Also, many researchers have reported the absence of some branches or the associations between them. However, the lateral cord with no musculocutaneous nerve has been recognized in rare cases [8]. In the majority of cases, the first branch of the lateral cord is the external pectoral nerve that travels to the pectoral muscle, then, the lateral cord divides into the musculocutaneous nerve and the lateral root of the median nerve. Next, the musculocutaneous nerve pierces the coracobrachialis muscle and runs between the biceps and brachialis muscles.

Ultimately, it runs deeply into the fascia at the top of the elbow and continues as the lateral cutaneous nerve of the forearm. On the other hand, the median nerve develops from the medial and lateral cords of the brachial plexus. These two roots cover the third part of the axillary artery. Also, the mediastinal nerve lands in the anterior axillary artery and the upper arm of the brachial artery to form the brachial artery in the lower midbrain [9].

Some previous studies have reported the lack of musculocutaneous nerve [5-7]. Also, Venieratos and Anagnostopoulou observed a cadaver with no musculocutaneous nerve. In this case, the median nerve was formed 5 cm below the latissimus dorsi muscle, in the margin of the medial nerve root medially and laterally [10].

The present report examines a variety of variations in the brachial plexus and presents an absence of musculocutaneous nerve in the external cord of the brachial plexus. In the present case, the left median nerve supplied the coracobrachialis, biceps brachii, and brachialis muscles, thereafter, it gave way to the lateral brachial cutaneous nerve above the arm and the lateral forearm cutaneous close to the elbow joint. These branches crossed the brachial artery to supply the muscles.

The knowledge of anatomical variations in this region is important for surgical, radiological, medical, and anesthetic diagnoses with computer imaging [11]. For example, accurate information on variances is needed for the localized anesthesia in the brachial network [12], and the prevention of nerve damage in arm and wrist surgery [13, 14]. Besides, the importance of this recognition is undeniable in restoration surgery and shoulder arthroscopy [9, 15].

2. Case Report

We ran across a variation in the lateral cord of the brachial plexus and its lateral branches in a different path. The case was detected during the dissection of the axillary cavity on the left side of a 25-year-old anonymous male body, at a training course, in the anatomy department of the Bam University of Medical Sciences, in 2017. Dissection showed that in the lateral cord of the left arm, the left median nerve innervated coracobrachialis, biceps brachii, and brachialis muscles, then, it was converted to the lateral forearm cutaneous nerve located near the elbow joint. These nerves supplied the relevant muscles after passing through the brachial artery (Figures 1 and 2).

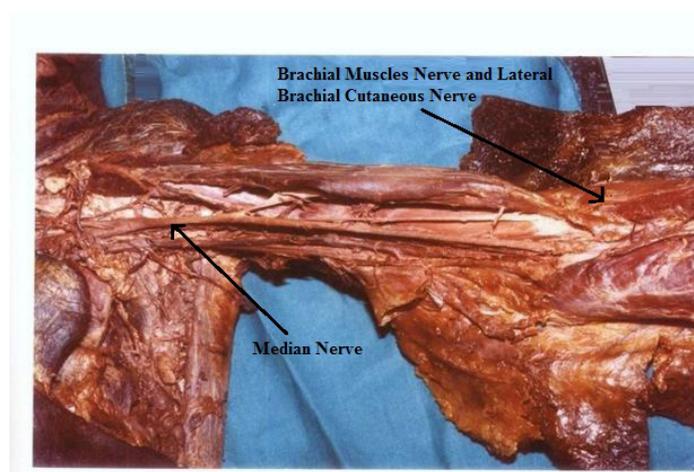


Figure 1. Variants of the median nerve and its branches

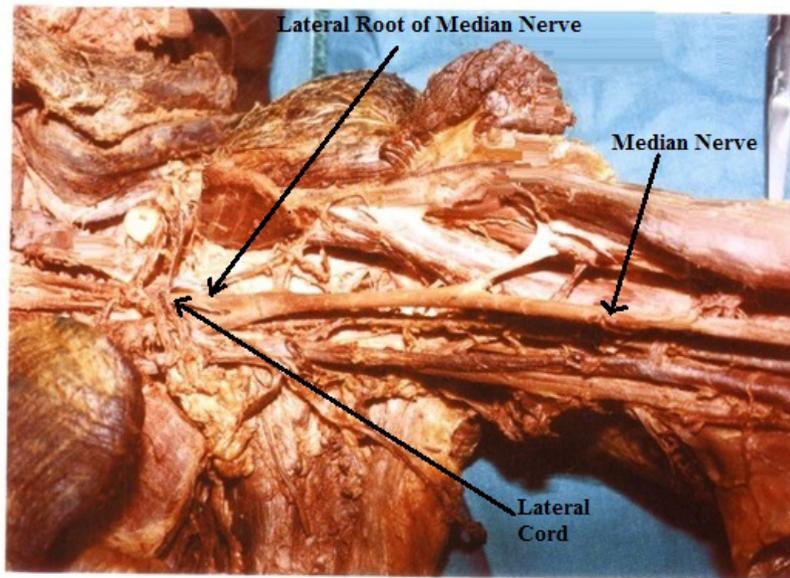


Figure 2. Variants in the lateral cord of the brachial plexus

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3. Discussion

The lack of musculocutaneous nerve is clinically significant in the diagnosis of neurological diseases and surgical procedures in this area. Therefore, the clinical examination of these two nerves is necessary, because of the special neuropathy in the upper limb.

Le Minor described five variants of the pathway of the median and musculocutaneous nerves [16]:

Type I: The lack of connection between the musculocutaneous and median nerves;

Type II: Some of the medial fibers of the median nerve get along with the musculocutaneous nerve and join the median nerve, in the middle of the arm;

Type III: The lateral root of the median nerve is associated with the musculocutaneous nerve and joins the median nerve after some distance;

Type IV: The musculocutaneous fibers are attached to the lateral root of the median nerve, and the musculocutaneous nerve is separated from the median nerve at variable intervals;

Type V: There is no musculocutaneous nerve, and the lateral root of the median nerve contains musculocutaneous neural fibers. Therefore, the anterior brachial muscles are directly innervated from the median nerve (Figure 3). The present item is in this category.

Bergman et al. reported the variations in the musculocutaneous roots and nerve [4]. Also, previous studies have reported the lack of musculocutaneous nerve [5-7]. Moreover, Satyanarayana et al. detected the adhesion of the lateral cord of the brachial plexus and median nerve,

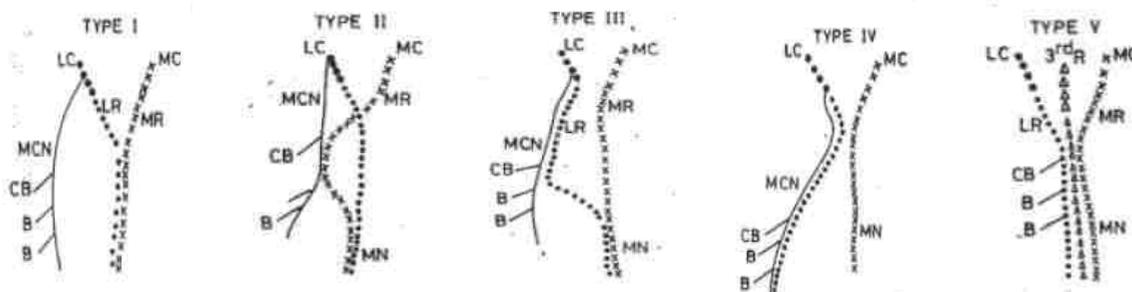


Figure 3. The Le minor variants

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and the absence of musculocutaneous nerve in the right upper limb of a cadaver, in Nepal [17]. Similarly, Budhiraja et al. examined 58 cadavers and reported the association between median and musculocutaneous nerves in 20.7% of the cadavers [18].

In 2003, Abhyaya et al. reported a case of lateral cord pathway from the coracobrachialis muscle. But, the exit path of the lateral branches of the lateral cord was not the same as the muscle. So that, the lateral root of the median nerve emerged from the anterior surface of the muscle, while the musculocutaneous nerve traveled its natural pathway [8].

During the dissection of a cadaver, Kocabigik et al. observed that the musculocutaneous nerve transmitted a median nerve link after passing through the coracobrachialis muscle, which was consistent with the second type of the Nakata classification [19]. Also, Venieratos and Anagnostopoulou reported a cadaver with no musculocutaneous nerve, where the anterior muscle of the arm was innervated by the lateral cord. Besides, the median nerve was not formed in the axillary region, instead, it was formed 5 cm below the latissimus dorsi muscle, in the margin of the medial nerve root medially and laterally [18].

The lack of musculocutaneous nerve does not cause much trouble, but it has clinical value, especially in surgical procedures. The identification of these cases can help the arm surgery. Thus, with the prediction of risks and reasonable precautions, surgeons can carry out surgical operations with more awareness and fewer risks. Therefore, surgeons, radiologists, and anatomists should be aware of the presence of such morphological probabilities in the brachial plexus pattern.

Ethical Considerations

Compliance with ethical guidelines

All ethical principles are considered in this article. The participants were informed about the purpose of the research and its implementation stages.

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Authors' contributions

All authors equally contributed to preparing this article.

Conflict of interest

The authors declared no conflict of interest.

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