An Amazing Abnormality in the Course of the Musculocutaneous Nerve

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ABSTRACT

The musculocutaneous nerve drive from the brachial plexus's lateral cord and it is one of the terminal branches of this plexus. Commonly, it pierces the coracobrachialis muscle and then innervates the anterior department muscles of the arm. It also course at the lateral part of the the forearm while it terminates as the lateral antebrachial cutaneous nerve. The course and branching pattern variations of the musculocutaneous nerve are reported by several authors previously. We found a very rare variation during the dissection of a 60 years old male cadaver. In our case, the musculocutaneous nerve had a varied course which hasn't been determined until now. It was terminating in the distal third of the arm as divided into two major branches. While the lateral branch continued as the lateral antebrachial cutaneous nerve, the medial branch, which was thicker than the lateral branch, descended downward in the medial side of the arm and passed into the cubital fossa. This medial branch was nearly close to the vessels. Eventually it was attaching to the median nerve at the forearm. The information about these variations are very important for clinicians and surgeons because of the relationships between the medial branch's course and the important of anatomical structures in the forearm.

Key words: *Musculocutaneous nerve, communicating branch, connecting branch, course variation.*

Nervus Musculocutaneous'un Seyrinde Şaşırtıcı Bir Varyasyon

ÖZET

Nervus musculocutaneus (NMC) plexus brachialis'in fasciculus lateralis bölümünden ayrılan iki terminal dalından ince olanıdır. Axilla'dan geçerek, oblik bir şekilde m. coracobrachialis'i deler ve m. brachialis ile m. biceps brachii arasında kolun medialinde aşağıya doğru uzanır. Kolun anterior kompartmanında bulunan kasların innervasyonunu sağlar. Dirsek ekleminin bir kaç santim yukarısında derin fasciayı deler ve önkolun dış yan bölümünde n. cutaneous antebrachii lateralis olarak uzanır. NMC'nin seyri ve dallanma biçimi ile ilgili varyasyonlar oldukça sık görülmekle birlikte, literatürden farklı varyasyonlarda görülebilmektedir.Bizim olgumuzda, 60 yaşında erkek bir kadavranın diseksiyonu sırasında NMC'nin normal seyrinden farklı bir seyir gösterdiği görüldü. NMC kolun alt 1/3'lük bölümünde

beklenemedik bir şekilde lateral ve medial iki major dala (medialde olan daha kalın) ayrılarak sonlandığı görüldü. Lateral dal n. cutaneous antebrachii lateralis olarak devam etmekte iken, daha kalın olan medial dal aponeurosis bicipitalis'in altından damar yapılarına oldukça yakın bir şekilde geçerek fossa cubiti içerisinde n. medianus ile birleştiği tespit edildi. Ön koldaki önemli anatomik yapılar ile NMC'nin medial dalı arasındaki yakın ilişki nedeniyle bu varyasyonun bilinmesi klinisyenler ve cerrahlar açısından önem arz etmektedir.

Anahtar kelimeler: *Nervus musculocutaneous, sinir varyasyonu, dallanma biçimi, plexus brachialis.*

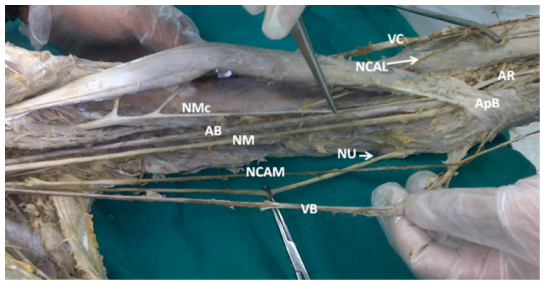

Figure 1*. Left upper limb: A. brachialis (AB), A. ulnaris (AU), A. radialis (AR), N. ulnaris (NU), N. medianus (NM), N. musculocutaneous (NMc), Nervus cutaneous antebrachii medialis (NCAM), N cutaneous antebrachii lateralis (NCAL), Aponeurosis bicipitalis (ApB), Vena cephalica (VC), Vena basilica (VB)*

INTRODUCTION

The musculocutaneous nerve (MCN) is one of the terminal branches of the brachial plexus and it's responsible for innervation of the muscles of the anterior compartment in the arm. Its sensory fibers disperse over the lateral surface of the forearm skin. It arises from the ventral rami of the C5-7 spinal nerves, then pierces the corocobrachialis muscle and descends obliquely between the biceps and brachialis muscles of the lateral side of the arm. Afterwards it pierces the deep fascia and continues as the lateral antebrachial cutaneous nerve of the forearm. The MCN lesions may occur due to traumas of the upper arm and the shoulder. In such conditions, weakness is occurred in the elbow flexion because of the paralysis in the brachialis and biceps brachii muscles. On the lateral part of the forearm, pain and paralysis may occur which can be intensified by the elbow extension (1).

CASE

During a routine dissection of a white, 60 years old, male cadaver, we found abnormality in the course of the MCN on the left upper extremity. There was no additional abnormality at four terminal branches and other collateral branches of brachial plexus. MCN was arising from the lateral cord of the brachial plexus. It was piercing the coracobrachialis muscle and passing obliquely to the lateral side of the arm between the brachialis and the biceps brachii muscles. It was innervating by the biceps brachii muscle with two branches and it was sending a single branch to the brachialis muscle. It was terminating with its two main branches on the lower part of arm. It also noted that it's the medial branch was thicker. The lateral branch was piercing the deep fascia at the lateral border of the biceps brachii tendon and continuing at the forearm as lateral antebrachial cutaneous nerve. Interestingly the medial branch was liying under the bicipital aponeurosis and passing above the brachial artery. Then, It was coursing over the brachial artery, passing between the radial and the ulnar arteries and finally attaching to the median nerve (MN) in the cubital fossa.

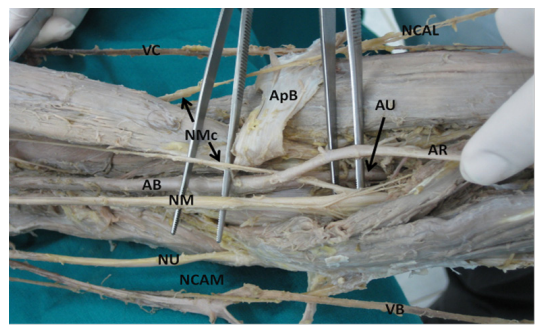

Figure 2*. Left upper extremity: A. brachialis (AB), A. ulnaris (AU), Arteria radialis (AR), N. ulnaris (NU), N. medianus (NM), N. musculocutaneous (NMc), Nervus cutaneous antebrachii medialis (NCAM), N cutaneous antebrachii lateralis (NCAL), Aponeurosis bicipitalis (ApB), Vena cephalica (VC), Vena basilica (VB)*

DISCUSSION

In the literature, a number of studies have been reported to demonstrate for variations and branching patterns of the MCN. Variations of this nerve comprise a wide spectrum and have been seriously documented to be helpful for clinicians and surgeons. In some cases, it have been determined that the absence of the musculocutaneous nerve (2-5). Commonly, its known that the MCN pierces the coracobrachialis muscle but there are some studies which are reporting the MCN does not pierce corocobrachialis muscle (1,6). Resembling variation reported previously by Eglseder ve Goldman as 29,6 percent, by Pacha vicente et al as 6.5 percent, by Choi et al (2002) as 4.7percent and by Uysal et al as 3 percent (7-10). In 2007, the entry point of the MCN to the corocobrachialis muscle has been described by Macchi et al. MCN may pierce one of the three parts of the coracobrachialis muscle (superior, middle or inferior parts). Uysal et al. reported as respectively 43%, 37%, 17%. In our case, the entry point of the MCN is in the approximately middle portion of the coracobrachialis muscle (11). A variety of studies conducted on adult cadavers and human fetuses have been classified the innervation patterns of the arm muscles by MCN (8-10,12). There are three types of the innervation of the biceps brachii. Type I: A single branch from the MCN divided into two branches which one innervates short head and the other innervates long head of the biceps brachii. Type II: Two different branches from the MCN innervates separately two heads of the biceps brachii. Type III: It is similar to type I but the only difference is a separate branch for distal part of the biceps brachii. Uysal et al. reported that the rates were respectively 83.6%, 14.3%, 2.1%. This classification is expanded by Kervancioglu et al. who integrated a new branching pattern as type IV. At type IV two branches begun a common root from the main trunk of the MCN and each one innervated a different head of the biceps brachii. In our case, the motor innervation of the biceps brachii suited to type II.(13).

Generally known that there are two types in the pattern of motor branching innervating brachialis. In a recent study, two other branching patterns have been added (11). Branching patterns and their rates are; Type I (75%): One branch from the MCN innervates the brachialis. Type II (5%): Two separate branches from the MCN innervates the brachialis. Type III (10%): One branch from the MCN bifurcate to innervate the brachialis. Type IV (10%): Three branches from the MCN which one is at the proximal and alone, the other two begin at distal as a common root from MCN. In our case, the motor innervation of the brachialis conform to type I. Pontel et al. (2011) reported a unique variation that the MCN pierced middle part of the coroacobrachialis and then passed drilling the long head of the biceps brachii (12). Abu Hijleh et al. (2005) executed that there are unilaterally two musculocutaneous nerve to innervate three headed biceps brachii. The proximal MCN arised normally from lateral cord of the brachial plexus and another the distal aberrant MCN arised from the median nerve, which was in the lower third of the arm. It passed laterally over brachial artery and innervated supernumerary of biceps brachii (15). The connecting branches as a variation are frequently encountered between MCN and MN. Choi et al. (2002) documented the patterns of connecting branches between this two nerves in axilla and arm. In their study, they investigated on 138 cadavers and determined variations with the connecting branch or branches on 64 cadavers (9 bilaterally, therefore, 73 arms). The variations were classified into three patterns on the number of the connecting branches. Pattern I: There was no connecting branches in 14 of the arms with the variations but initially, MN and MCN were fused and then MCN arised from MN. Pattern II: A single connecting branch was in 53 of the 73 variant arms. Pattern III: Two connecting branches were in 5 of the whole variant arms. In this study, the incidence of the connecting branches was determined as 79,4 percent except Pattern I. (9)

Another study made to show connecting branches between MN and MCN has been reported by Venieratos and Anagnostopoulou in 1998 and used entry point of MCN into the coracobrachialis for classification. (16). In type I, the connecting branch arises from MCN was at proximal of the entry point, in type II: the connecting branch leaved into the coracobrachialis from MCN and in type III: it leaved from MCN at distal of the entry point. About this topic, a different classification was made by Uysal et al.,in 2009. In their study, the connecting branches between MN and MCN were observed in10% of specimens, which were identified according to beginning and finish points of connecting branches as three types A,B, C. Type A: The connecting branch as called communicating branch derived from proximal part of the MCN and attach the proximal part of the MN. Type B: The connecting branch derived from proximal part of the MCN and attached the middle or distal part of MN,

which is the most frequent observed type. In this study, type B was observed in 64.3%. Type C: The connecting branch derived from the middle part of the MCN within coracobrachialis and attached the middle and distal part of the MN in the arm. Bilaterality of the connecting branches is rare. Bilaterality rates was reported by Choi et al. as 6.52 % (in 9 of the 138 cadavers), besides unilaterality was reported as 71% by Uysal et al. in 10 arms of the 14 arms.

CONCLUSION

The musculocutaneous nerve presents frequently as irregulare. Variations of the course and branching patterns of the MCN have been previously documented. It is seen that the connecting branches can be frequently observed between MCN and MN which one usually in the upper arm and axilla. But there is no information reported in literature about communications between the MCN and MN in the forearm. In our case, MCN divide into two main branches in the distal part of the arm. It is important that because medial branch of the MCN can be affected from compression under bicipital aponeurosis due to muscular hypertrophy and may be cause press symptoms on vessels in the cubital fossa due to stretching of its. Therefore we think that this variation would be important particularly for clinicians, plastic and pediatric surgeons.

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