

VARIATIONS IN FORMATION OF MEDIAN NERVE AND ITS RELATIONSHIP WITH AXILLARY ARTERY

Anatomy

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ABSTRACT

Anatomy of brachial plexus is very important clinically, surgically and for academic purposes. The current study was carried out in Anatomy department of TSM Medical College, Lucknow and IIMS &R, Lucknow during routine dissection for MBBS student on 20 cadavers (40 brachial plexuses). The infraclavicular part of brachial plexus was studied for formation of median nerve and its relation with axillary artery. We found that there was varied formation of median nerve in 4 (10%) brachial plexuses. In 2 (5%) of brachial plexus we noticed variant relationship between formation of median nerve and axillary artery. These variations are important to note should be kept in mind while intervening in this area.

KEYWORDS

brachial plexus, median nerve, axillary artery, subscapular artery

INTRODUCTION

The median nerve is formed by the union of median root from the median cord (C8, T1), and lateral root from the lateral cord (C5, C7), of brachial plexus anterior or lateral to the third part of axillary artery [1]. Variations in the formation of median nerve were reported by many authors, which included formation by more than one root, differences in location of formation, its relationship with axillary artery and abnormal communication with other nerves [2]. These variations become quite important while performing surgeries in the region of axilla or dealing with fracture, dislocations of humerus or at the time of blocking brachial plexus. In axillary brachial plexus block, the axillary artery is utilized as a landmark for localization of nerves in both in blind as well as USG-guided approach [3, 4,].

Keeping in view of all above facts the anatomy of nerves in axilla and relationship between artery and nerve becomes very important.

Aim of study

To identify anatomical variation of median nerve formation with regards to its site and contribution and variation in the site of formation of median nerve and its relationship with axillary artery and its branches in axilla.

MATERIAL AND METHODS

The present study included 20 cadavers (40 brachial plexus) under routine dissection for undergraduate students in the Department of Anatomy, Integral Institute of Medical Sciences & Research, Lucknow and TSM Medical College Amausi, Lucknow from oct 2015 to oct 2018.

The region of axilla and upper arm was carefully dissected on both side for cords and branches of brachial plexus. Formation of median nerve was identified and its relationship with axillary artery and its branches was carefully observed. Any variation found with regard to formation of median nerve and its relationship with axillary artery was noted.

OBSERVATION AND RESULTS:

Variations in formation of Median Nerve

In present study we found variation in formation of median nerve in four specimens belonging to different cadavers. In one specimen (figure 1), median nerve was found to be formed by 3 roots. In this case the lateral cord was trifurcated in musculocutaneous nerve and two lateral roots of median nerve. These two lateral roots of median nerve join with medial root, medial to the 3rd part of axillary artery to form median nerve.

In another specimen (figure 2) the median nerve was formed by two roots lateral to the axillary artery but an abnormal communication existed between lateral cord and medial root of median just in front of 2nd part of axillary artery. Similarly in a specimen (figure 3) the medial root of median nerve had an abnormal communication with lateral cord.

In one specimen (figure 4), whole of brachial plexus was shifted lateral to the axillary artery. The lateral root of median nerve got an abnormal communication from musculocutaneous nerve.

Table 1: Variations in formation of Median Nerve

	N	%
Formation of median nerve by 2 lateral and 1 medial root	1	2.5%
Abnormal communication of lateral cord and medial root of median	2	5%
Abnormal communication of median nerve and musculocutaneous nerve	1	2.5%
Total	4	10%

Variation in relation of formation of median nerve and brachial artery

In two specimens we found variations in the relation of formation of median and brachial artery. It was observed in one specimen that the nerve was formed medial to the brachial artery (figure 2). In one specimen the median nerve was seen to be formed embracing the subscapular artery, the largest branch of axillary artery from its 3rd part.

Table 2: Variation in relation of formation of median nerve and brachial artery

Formation of median nerve medial to axillary artery (figure 1)	1	2.5%
Formation of median nerve embracing subscapular branch of axillary artery (figure 5)	1	2.5%
Total	2	5%

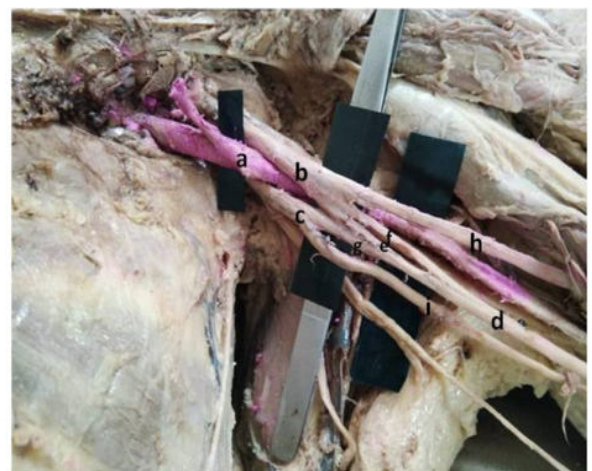


Figure 1 a= axillary artery, b= lateral cord, c= medial cord, g=medial root of median nerve, e&f, = 2 roots of lateral cord, d= median nerve, i= ulnar nerve, h= musculocutaneous nerve.

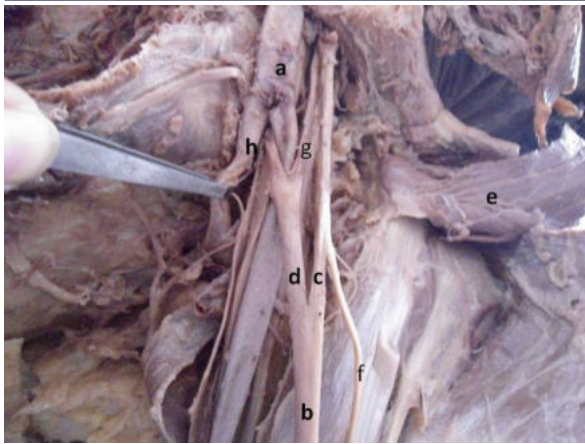


Figure 2 a= axillary artery, b= median nerve, c= lateral root of median, d= medial root of median, e= pectoralis minor, f= musculocutaneous nerve, g= communicating branch between lateral cord to medial root of median, h=subscapular artery.

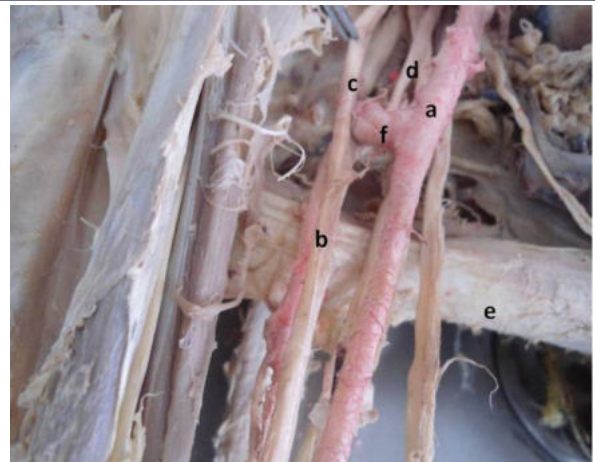


Figure 5: a=axillary artery, b= median nerve, c= medial root of median N, d= lateral root of median N, e= teres major, f =subscapular artery

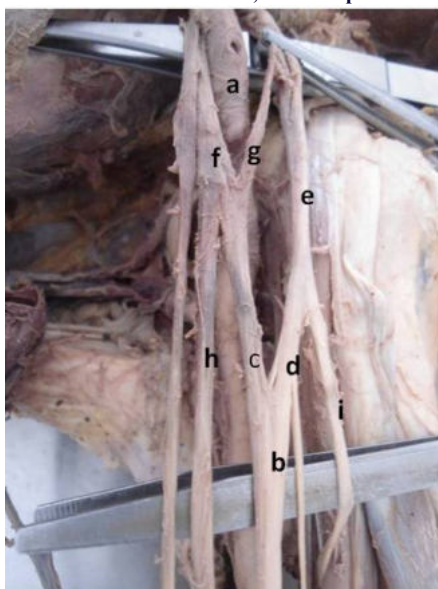


Figure 3: a= axillary artery, b= median nerve, c= medial root of median, d= lateral root of median, e= lateral cord, f= medial cord, g= communicating branch between lateral cord to medial root of median nerve, h= ulnar nerve, i= musculocutaneous nerve

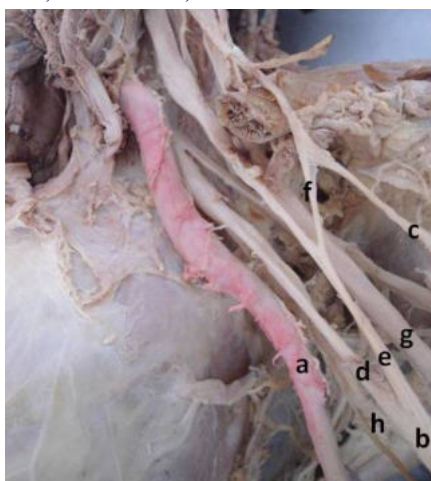


Figure 4 a= axillary artery, b= median nerve, c= musculocutaneous nerve, d= medial root of median nerve, e= lateral root of median, f= communication between musculocutaneous nerve to lateral root of median, g= radial nerve, h= ulnar nerve

DISCUSSION:

The significance of nerve anatomy and their relationship in axillary region is gradually increasing as it is frequently approached for numerous surgical interventions by anesthesiologists, orthopaedicians, radiologists and plastic surgeons [5].

The anatomy of the median nerve is studied constantly through surgical findings and cadaveric dissections. Median nerve as reported in literatures is associated with several variations ranging between 5% to 31%; including additional roots taking part in its formation, abnormal communications with other nerves [6, 7, 8]. Formation of median nerve by more than two roots is the most commonly reported variation out of which incidence of more than one lateral root is commonly reported.

In our study the total variation we found in formation of median nerve was 10%. In two brachial plexus we found an additional root of lateral cord joining the medial root of median nerve. Similar pattern of formation of median nerve was reported by Meenakshisundaram et al in 2016 in their study though the percentage reported by them was very high [9]. In one brachial plexus we found communication of lateral root of median with musculocutaneous nerve. Similar communications that the third root of median nerve had its origin from musculocutaneous nerve were reported by Budhiraja et al [10].

In present study in a brachial plexus we found, that all the three cords of brachial plexus were noted to be present lateral to the third part of axillary artery. Satyanarayana et al. (2009) reported same type of pattern in one brachial plexus in a case [11]. Such anomaly will make it difficult to identify the cords of brachial plexus and that to difficult brachial plexus block, as axillary artery pulsation serves as an important landmark in this procedure [12].

In one case we found a unique variation that formation of median nerve was enclosing the origin of subscapular artery. This type of median nerve formation may compress the vessel and can be a cause of ischemic pain in the distribution of artery. Even after extensive search none of case could be found like formation of median nerve embracing the subscapular artery. Though Bhat et al in 2009 reported a case where the roots of the median nerve forming the neural loops around the axillary artery and vein [13].

Variation in formation of nerves might be explained on the basis of neuronal growth cones [14]. As soon as the buds form, the ventral primary rami of spinal nerves penetrate into the mesenchymal limb bud and established intimate contact with mesodermal condensation. This is helped by the action of site specific chemorepellants and chemoattractants present on the developing axons. Variations can develop because of disturbances in signaling between neuronal growth cones and mesenchymal cells [15].

Variation of relation between artery and nerve can be understood by the developmental origin of subclavian and the axillary arterial system of arteries that are derived from the seventh cervical intersegmental

artery [16]. The lateral and medial cord, represent the fifth, sixth and seventh cervical nerve on the one side and the eighth cervical and first thoracic nerves on the other side, hence axillary artery passes between the two structures. The artery may also arise from the sixth, eighth or ninth intersegmental artery leading to abnormal relations with the brachial plexus [17].

CONCLUSION:

Formation of median nerve and its relationship with axillary artery show different type of variations. Knowledge regarding them can be helpful in avoiding procedural and postprocedural complications.

REFERENCES:

1. Moore, K. L., Arthur F. Dalley, A. F., Agur, A. M. R. (2010). *Clinically Oriented Anatomy*: (6th ed.) Philadelphia: Lippincott Williams & Wilkins, 738-739.
2. Chauhan, R., Roy, T.S. (2002). Communication between the median and musculocutaneous nerve, a case report. *J Anat Soc India*, 51, 72-5.
3. Winnie, A. P. (1990). *Plexus anesthesia: perivascular techniques of brachial plexus block*. (2nd ed.). Philadelphia: W.B. Saunders Company, 126-7.
4. Satapathy, A.R., Coventry, D.M. (2011) "Axillary Brachial Plexus Block". *Anesthesiology Research and Practice*, 173796.
5. Mazurek, M. T., Shin, A.Y. (2001). Upper extremity peripheral nerve anatomy: current concepts and applications. *Clin Orthop Relat Res*, 383, 7-20.
6. Bharti, A., Paranjpe, V.M., Apte, M.V. (2015) Variations in the formation and relation of median nerve. *Int J Anat Res* 2015; 3(3):1298-01.
7. Darji, A., Chauhan, H., Khatri, H., Aterkar, S, Pensi, C.A. (2013). Variations in branching pattern of brachial plexus: A cadaveric study. *Int J Biomed Adv Res*, 4(3), 174-178.
8. Pandey, S. K., Shukla, V. K. (2007). Anatomical variations of the cords of brachial plexus and the median nerve. *Clin Anat*, 20, 150-156.
9. Meenakshisundaram, J., Govindarajan, A., Dharmalingam, M. (2016) A cadaveric study of the formation of median nerve in the infraclavicular part of the brachial plexus. *Int J Health Sci Res*, 6(12):78-82.
10. Budhiraja, V., Rastogi, R., Asthana, A. K. (2011). Anatomical variations of median nerve formation: embryological and clinical correlation. *J Morphol. Sci*, 28(4), 283-286
11. Satyanarayana, N., Vishwakarma, N., Kumar, G. P., Guha, R., Datta, A. K., Sunitha, P. (2009). Variation in Relation of Cords of Brachial Plexus and their Branches with Axillary and Brachial Arteries—A Case Report. *Nepal Med Coll J*, 11, 69-72
12. Berthier, F., Lepage, D., Henry, Y, Vuillier, F., Christophe, J.L., Boillot, A. (2010). Anatomical basis for ultrasound-guided regional anaesthesia at the junction of the axilla and the upper arm. *Surg Radiol Anat*, 32(3), 299-304.
13. Bhat, M. R. K., Gowda, S., Potu, B. K. (2009). Nerve loop around the axillary vessels by the roots of the median nerve a rare variation in a south Indian male cadaver: a case report *Cases Journal*, 2, 179
14. Dent, E. W., Tang, F., Kalil, K. (2003). Axon guidance by growth cones and branches: Common cytoskeletal and signaling mechanisms. *Neuroscientist*, 9(5), 343-53.
15. Sammes, D.H., Reh, T.A., Harris, W.A. (2000). Development of nervous system. New York: Academic Press; 189-197.
16. Wollard, H. H. (1922). *The development of the principal arterial stems in the forelimb of the pig. Contrib. Embryol* 1922, 14:139-154.
17. Yang, H. J., Gil, Y. C., Lee, H. Y. (2009). Intersegmental Origin of the Axillary Artery and Accompanying Variation in the Brachial Plexus. *Clin Anat*, 22, 586-594.