

Variant of Brachial Plexus with Unusual Branch of Median Nerve

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The variations of Brachial plexus (BP) occur due to several reasons; different interactions of the nerves that make up the BP, the possibility of a different origin from the trunk as well as different location to the brachial artery and other anatomical structures. The frequency of such variations makes this anatomical region quite complicated. Intervention to this region requires specific anaesthetic blockages and a different surgical approach. The current variant of the upper limb was observed during the period from the year 2008 to 2019 – 40 left and 40 right upper limbs in total. In the current case a thin branch coming from the medial cord and thick branch coming from the lateral cord is observed. The thick branch penetrates the fascia of coracobrachial muscle, where it moves along with the musculocutaneous nerve. Certain compressions and consecutive pains and traumas in the region of the muscles or the sensitive innervation of the skin in the axillary region in the lateral zone, can also be consequences of traumas and variations in the region of the musculocutaneous nerve.

Key words: brachial plexus, median nerve variations, anaesthetic blockages

Introduction

The brachial plexus is a combination of nerves, which provide motor and sensitive nerves to the upper limb and a small part of the thorax. The brachial plexus also includes adrenergic post ganglionic fibres. In 1884 the first anaesthesia to the upper limb was accomplished by Halstead, using cocaine [2]. The blockage of the brachial plexus (BP) requires a good understanding of the peripheral nervous system as well as parts of the BP. This part of the nervous system is quite variable, taking this into consideration, every variation is worth describing. At the present time the clinical side as well as the so called applied anatomy are both taken into consideration. During anatomical practical exercises with medical students it is imperative to foresee demonstrations and knowledge aiming at the clinical anatomy, the variations of vessels and nerves in the region of the upper limb and their practical purposes. Local anaesthetics of the upper limb is a typical example of the practical application of anatomy with available variations.

According to B. Hansen's large scale examination demonstrated that 65.3% of the people have variations in their BP. These variations occur due to several reasons; different interactions of the nerves that make up the BP, the possibility of a different origin from the trunk as well as different location to the brachial artery and other anatomical structures. The frequency of such variations makes this anatomical region quite complicated. Intervention to this region requires specific anaesthetic blockages and a different surgical approach. Such approach requires a correct interpretation of the nerve compressions, whether caused by a tumour or a combination of traumatic events in addition to the variations mentioned above.

Materials and Methods

The cadaver in question describes an interesting version of BP during a routine dissection, with medical students from the Department of Anatomy, histology and pathology, from the Medical Faculty of the Sofia University. The variation has been discovered during practical exercises from regular activities of the Gross anatomy of the Upper limb. The Upper limb belongs to a 78-year old male individual. The Upper limb in question was dissected in advance from the thorax. Fixation is accomplished with formaldehyde.

Results



Fig.1 Brachial plexus with uncommon branch of median nerve; 1 – lateral part of median nerve, 2 – medial part of median nerve, 3 – branch cum musculocutaneous nerve, 4 – ulnar nerve, 5 – median cutaneous nerve, 6 – radial nerve, 7 – axillary nerve, 8 – musculocutaneous nerve.

The current variant of the upper limb is observed during the period from the year 2008 to 2019 – 40 left and 40 right upper limbs in total. In the current case a thin branch coming from the medial cord and thick branch coming from the lateral cord is observed. The thick branch penetrates the fascia of coracobrachial muscle, where it moves along with the musculocutaneous nerve. The metric values for the thickness of the nerves are as follows: musculocutaneous nerve – 2 mm; ulnar nerve – 4 mm; medial part of median nerve – 1 mm, and the lateral part is 2,4 mm; median nerve – 3,4 mm. The length of medial part of median nerve which arises from the medial trunk is 4,5 cm, and those one which arise from the lateral trunk is 9,8 cm. The location of the radial nerve and axillary nerve are in their norm, the same applies for the nerves of the brachial artery (**Fig.1**). The sensitive branch of the medial cutaneous nerve of the arm and the branch of the medial cutaneous nerve of the forearm have a common starting point, from the medial cord.

Discussion

The embryonal development of the BP starts from the 4th week of the embryonic development. The first differentiation occurs from the mesenchymal cells. The primary dorsal nerves form at the level of the medial part towards the distal end of the shoulder bone in the cleft of the muscle forming the arm. During the 32nd day the size of the nerves extends from C5 to Th1 and the 33rd day marks the starting of their fusion and the primary formation of the BP. Between the 39th and 40th day the medial nerve, ulnar nerve and radial nerve reach the level of the arm. The final arrangement of the nerves against each other as well as their location against the blood occurs during 49th or 50th day. During the embryonic development the somites migrate, so they can form the limbs. They carry their own nervous supply, in this way every dermatome and myotome preserve their primary innervation via segments. In this stage of migration of the somites occurs a complex from nearby nerves, which form complex contacts and develop entanglement or a complex model of correspondence between nerves and vessels in the early stage of fetus. During the growth of the fetus there are changes in the angle in which the future BP will locate, this allows for the development of variations in nerves or vessels in the region of axilla and brachialis.

In normal development BP develops from the front branches of the last four neck nerves and the bigger part of the first pectoral nerve. The combination of the mentioned nerve according to the model is: C5 and C6 join in the superior trunk, C7 separates solely like the medial trunk, whereas C8 and Th1 like the inferior trunk. Each of the three trunks separates in front and rear branch. All posterior branches form the posterior cord. The front branches of the upper and medial trunk form the lateral cord, whereas the front branch of the bottom trunk continues like the medial cord. Consequently, from the proximal to the distal part of the upper limb, develops the radial and axillary nerve from the posterior cord [4]. The lateral cord forms the lateral part of the median nerve and musculocutaneous nerve. The last cord (medial) forms the medial part of median nerve, ulnar and cutaneous brachial and antebrachial nerves.

Most frequently the variations arise during the organisation of the lateral cord, this happens either during migration of the somites or during the growth of the fetus and the formation of the neural muscle split. Such observations are supported by various scientists by Miller in 1934 by Sargon in 1995 by Sharma in 2000 by Roy in 2002, and etc. [3]. The variation which is described in our case is the medial nerve to accompany the musculocutaneous nerve, during their transit movement through the coracobrachialis muscle [5]. Rarely the lateral cord penetrates the coracobrachialis muscle and then separates to musculocutaneous and the lateral root of the median nerve. The variations of the lateral cord need to be taken into account during a surgical intervention in the region of axilla and the arm region, in order to avoid compression or trauma of the above described nerves [1].

In the described from us above variation, there can be observed an interesting outline (or location) of the lateral branch of the median nerve, which under normal circumstances originates from the lateral cord and is significantly thinner than the lateral branch of the median nerve. The musculocutaneous nerve penetrates the fascia of the coracobrachialis muscle, after which anastomoses with a small branch coming from the median nerve, under the brachial artery (**Fig.2**). The branch of the median nerve is thin and transit crosses with musculocutaneous nerve towards the distal part of the upper limb. There are no variations in the vessels and more specifically the pathway of posterior humeral circumflex artery and the deep artery of the arm, these often variate when the axillary nerve and musculocutaneous nerve are out of position.



Fig.2. Variant of brachial plexus; 1 – lateral part of median nerve, 2 – medial part of median nerve, 3 – branch cum musculocutaneous nerve, 4 – ulnar nerve, 5 – median cutaneous nerve, 6 – radial nerve, 7 – axillary nerve, 8 – musculocutaneous nerve.

Conclusion

The described case in this paper is interesting from the perspective of surgery during reconstruction of the upper limb and the entry in the region of the neck and the shoulder bone or interventions with a shoulder joint. Interest arises also from an anaesthetic perspective, during the formation of an anaesthesia in the region of the BP. Certain compressions and pain and traumas in the region of the muscles or the sensitive innervation of the skin in the armpit in the lateral zone. Certain compressions and consecutive pains and traumas in the region of the muscles or the sensitive innervation of the skin in the armpit in the lateral zone, can also be consequences of traumas and variations in the region of the musculocutaneous nerve. Every variation in the nerve-vessel bundle is of importance, as well as to teach and show to the students, same applies for practical operative work of surgeons in this field.

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