Concomitant variations of the brachial plexus and third part of axillary artery in a middle aged female cadaver: an original case report

Introduction

The brachial plexus is a complex network of nerves extending from the neck to axilla supplying motor sensory and sympathetic fibers to the upper extremity and superficial muscles of the back. It is formed by the fusion of the anterior primary rami of the C5, C6, C7, C8, and T1 spinal nerves, with occasional communications from C4 and T2 making it either pre-fixed or post-fixed, respectively.

The C5 and C6 form the upper trunk, the C7 continues as the middle trunk and the C8 and T1 join to form the lower trunk. The anterior divisions of the upper and middle trunks form the lateral cord, the lower trunk continues as the medial cord, and the posterior divisions of all three trunks form the posterior cord, which gives terminal branches at the lower border of pectoralis minor, the various branches that form the peripheral nerves of the upper limb [1]. The brachial plexus is divided into supraclavicular and infraclavicular parts. The roots and the trunk lie in the neck, the divisions behind the clavicle, cords and branches in the axilla [1]. The various branches of the plexus are derived from the roots, trunks and cords but none from the divisions [2]. The cords of the brachial plexus, i.e. the lateral, medial and posterior cords lie lateral, medial and posterior respectively, to the second part axillary artery. The axillary artery gives three separate branches in its third part which are the subscapular artery, anterior and posterior humeral circumflex arteries.

Case Report

During undergraduate dissection at Jawaharlal Nehru Medical College, Sawangi, (Meghe) Wardha, variations of the brachial plexus and axillary artery were found in the left side of a female cadaver during undergraduate dissection in Jawaharlal Nehru Institute of Medical Sciences, Sawangi (Meghe) Wardha. The C5 and C6 root ran individually till above the upper border of clavicle and joined to form the upper trunk, which, bifurcated into anterior and posterior divisions. The posterior divisions of the middle and lower trunks united first and then with that of the upper at the lateral border of the subscapularis and continued as the radial nerve. The upper subscapular, lower subscapular and the axillary nerves were branches of the posterior divisions of the upper trunk. This was associated with variation in the third part of axillary artery, which was in form of a common vascular pedicle which encircled the roots of radial nerve. The variations as found, assume importance during therapeutic and invasive procedures undertaken in this region.

Abstract

Variations of the brachial plexus and axillary artery were found in the left side of a female cadaver during undergraduate dissection in Jawaharlal Nehru Institute of Medical Sciences, Sawangi (Meghe) Wardha. The C5 and C6 root ran individually till above the upper border of clavicle and joined to form the upper trunk, which, bifurcated into anterior and posterior divisions. The posterior divisions of the middle and lower trunks united first and then with that of the upper at the lateral border of the subscapularis and continued as the radial nerve. The upper subscapular, lower subscapular and the axillary nerves were branches of the posterior divisions of the upper trunk. This was associated with variation in the third part of axillary artery, which was in form of a common vascular pedicle which encircled the roots of radial nerve. The variations as found, assume importance during therapeutic and invasive procedures undertaken in this region.

Key words (posterior cord) (common vascular pedicle) (axillary artery) (upper limb)
Variations of brachial plexus and axillary artery (Figure 2). Communication was seen between the posterior division of the middle trunk and the lower subscapular nerve (Figure 3). The thoracodorsal nerve arose from the posterior divisions of the middle and lower trunk by two roots before their fusion (Figures 1–4). The lateral pectoral nerve and the medial pectoral nerve were branches of anterior divisions of the upper trunk and middle trunk, respectively (Figures 4, 5).

Variations were observed in relations of the nerves to axillary artery (Figures 4, 5). The terminal portion of the anterior divisions of the upper and middle trunk and the lateral cord, were anterior to the axillary artery in its second part. The posterior division of the upper trunk was posterolateral, while the middle and lower divisions of the same were posterior to the axillary artery.

The axillary artery gave only a single branch in its third part in form of a common vascular pedicle which coursed upwards inferior to the musculocutaneous nerve (Figures 4, 5), encircled the roots of the radial nerve and continued downwards to inferior angle of scapula as the thoracodorsal artery. The anterior circumflex humeral artery, the posterior circumflex humeral artery, the circumflex scapular artery and unnamed muscular branches were given from this pedicle (Figures 1, 2). The brachial plexus and the axillary artery of right side had usual anatomy.

Discussion

The limbs are formed by the somites which bring their own nerve supply as they migrate during the embryonic life. The brachial plexus appears as a single radical cone in the upper limb which divides longitudinally into dorsal (radial and axillary nerves) and ventral (median and ulnar nerves) divisions [3]. The guidance of the developing axons is regulated by chemo-attractants and chemo-repulsants in a highly coordinated and a specific fashion [4]. Any alterations in signaling manner between mesenchymal cells and neuronal growth lead to significant variations which once formed persists postnatally [3]. Also in embryos, the seventh cervical
intersegmental artery enlarges and becomes the dominant vessel of axilla. The other segmental arteries and most of the longitudinal anastomoses degenerate. The numerous alternatives that exist during the formation of upper limb vessels seem to be responsible for unusual arterial branching patterns [4, 5]. Variations of posterior cord [3, 6], the upper subscapular nerve arising as a direct branch from the posterior division of the upper trunk [7, 8], the lateral and the medial pectoral nerves arising from anterior divisions of the upper and middle trunks, respectively [8, 9] and a common vascular pedicle from the third part of axillary artery [10, 11] has been found in recent literature. However, encircling of the radial nerve by the common vascular pedicle has not been described as yet, to the best of our knowledge.

Knowledge of variations in anatomy of the brachial plexus is very important to anatomist, radiologist, anesthetists and surgeons as they have important clinical bearings. Such variations are vulnerable to damage in radical neck dissections and other surgical exploration of axilla and upper arm. Knowledge of the pectoral nerves is essential in limb neurotizations, mastectomies [9], etc. Encircling of the radial nerve by the common vascular pedicle could lead to sign and symptoms of nerve entrapment and compression of artery itself by the musculocutaneous or roots of radial nerve. The variations found here, therefore assume great significance during diverse therapeutic and invasive procedures, undertaken in treatment of ailments of this region.

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References
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