Case Report

Brachial Plexus With Two Trunks and Double Axillary Veins: Applied Importance and Clinical Implications

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ABSTRACT
During routine dissection in the Department of Anatomy following important anatomical variations on right side of a 30 years old male cadaver were observed. Brachial plexus comprised of only two trunks, the upper one was formed by union of C5, C6, C7 roots while the lower trunk was formed by union of C8, T1 roots.C5 root of brachial plexus was receiving a communicating branch from phrenic nerve. Double axillary veins were observed in the axillary region. Lesion or injury to upper trunk of brachial plexus in aforesaid case will manifest as wider spectrum of clinical signs with diffuse loss of function entirely different from the classic Erb–Duchenne palsy. This background of anatomical variations can help to minimize damage to important structures in the axilla during axillary dissection.

Key words: Brachial plexus, trunk, anatomical variation, axillary vein, phrenic nerve.

Knowledge of variations in anatomy is important to anatomists, radiologists, anesthesiologists and surgeons, and has gained more importance due to wide use and reliance on computer imaging in diagnostic medicine [1]. Anatomical variations of the brachial plexus and axillary region have been reported time and again by various authors [1, 2, and 3]. It must be remembered that the brachial plexus is merely a routing mechanism to get nerves with a common function in the proper terminal nerves and thus errors in distribution may occur that are corrected distally in the arms, forearm or hand, resulting in anatomical variations of the plexus [4]. The brachial plexus variations could result in failure in brachial plexus loco regional anesthesia [3]. Some variations are vulnerable to damage in radical neck dissection and other surgical operations of the axilla and upper arm [5]. Brachial plexus formed by only two trunks is very rare in literature [6].

CASE REPORT
The following variations were observed only on the right side during routine dissection in a 30 years old male cadaver. Middle trunk of brachial plexus was found missing (Fig.1 & 2). C5, C6, C7 roots of brachial plexus were uniting to form upper trunk and C8, T1 roots were forming its lower trunk (Fig 1 & 2). After giving two branches, suprascapular nerve and nerve to subclavius, the upper trunk divided into two divisions.

Figure 1. Photograph of dissected right side of neck and axilla showing
PN: Phrenic nerve
C5: C5 root of brachial plexus
C6: C6 root of brachial plexus
C7: C7 root of brachial plexus
C8: C8 root of brachial plexus

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Anatör kelimeler: Pleksus Brachialis, trunkus, anatomik varyasyonlar, aksiller ven, prenic sinir.
One case of bilateral fusion of upper and middle trunks of brachial plexus was reported by [6]. An extensive study by Uysal et al., [7] showed superior trunk not being formed in 1% of cases and inferior trunk not being formed in 9% of case. Our case of unilateral variation is associated with phrenic nerve variation (passing anterior to subclavian vein and communicating with C5 root) and double axillary veins.

This case report gains tremendous importance in context of upper trunk brachial plexus injury (Erb’s palsy). Above mentioned case will not manifest characteristic (waiter’s tip position) or typical (porter’s tip) deformity [8 and 9]. Lee Mc Gregor’s book [8] described that abdution of shoulder is dependent on C5, while flexion of the elbow is dependent on C5, C6, on the contrary, adduction of shouleder and extension of wrist and fingers are dependenrt C6, C7, while extension of the elbow is dependent on C7, C8. Hence the spectrum of clinical manifestations produced by upper trunk injury in the present case will be entirely different from the classic Erb’s palsy and may mislead the clinicians. Phrenic nerve’s communicating branch to C5 root may add pericardial and diaphragmatic manifestations along with brachial plexus injuries.

Kutiyanawala [2] reported double axillary veins, but that case was not associated with trunk variation of brachial plexus. The axillary vein variations are important in breast carcinoma treatment, since venous drainage of the breast is mainly to axillary vein, whereas the first part of axillary vein may be used for venepuncture [8 and 9].

**Embryological hypothesis:**

The formation of the brachial plexus begins in early development in the 4th week of gestation. In essence, as axonal growth is directed by sclerotome, nerve formation follows the dorsal rotation of the upper limb bud. The axons from the ventral column motor cells start to grow towards the sclerotome cell mass, thereby forming the ventral root. Similarly the dorsal root forms by axons growing in the opposite direction from the dorsal root ganglion cells. The primitive capillary plexus of the flattened limb buds gives rise to a peripheral border vein which serves as an early drainage channel to blood brought in by the axial arterial vessels. The border vein appears in the arm in the 6th week and the general venous plan becomes outlined within the next two weeks of intrauterine life. The radial extension of the border vein atrophies but the ulnar portion persists, forming at different levels the subclavian, axillary and basilic veins. The cephalic vein develops secondarily in connection with the radial vein but later it anastomoses with the external jugular vein, but finally opens into the axillary vein, as in the adult [10].

As suggested by Sannes et al [11] that the guidance of the developing axons is regulated by expression of chemotactants and chemorepulants in highly coordinated site specific fashion. Any alterations in signaling between mesenchymal cells and neuronal growth cones can lead to significant variations and probably in this case resulted in absence of middle trunk and phrenic nerve communication with C5 root along with double axillary veins. Once formed, any developmental differences would persist postnatally.

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