



ANOMALOUS ORIGIN, BRANCHING PATTERN AND COURSE OF VESSELS OF UPPER EXTREMITIES WITH CLINICAL SIGNIFICANCE.

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ABSTRACT

BACKGROUND: The course and branching pattern of the upper limb vessels deviate with sex, race and ethnic groups. During treatment of axillary artery thrombosis or electrophysiological procedures accurate knowledge of the normal and deviated arterial pattern of the upper extremities is important.

METHOD: During routine dissection of upper limbs in 30 cadavers, as a part of undergraduate teaching schedule, an unusual branching pattern of the axillary and brachial artery was observed.

RESULT: It was observed that in 6.66% cases

1] Second part of axillary artery showed common trunk which divided into lateral thoracic artery and subscapular artery. 2] Brachial plexus cords gave branches at higher level around second part of axillary artery. Arteries of upper limb became tortuous.

In 3.33% cases brachial artery showed higher division with origin of radial artery from medial side which then crossed median nerve and ran on lateral side. Ulnar artery originated from lateral side crossed by radial artery and was present lateral to median nerve in cubital fossa, further course was as usual.

CONCLUSION: Knowledge of normal and anomalous anatomy of the region is important for radiologist, surgeons, diagnostic evaluation and surgical management of vascular diseases and injuries.

KEYWORDS : Axillary artery, Brachial artery, Radial artery, Ulnar artery, Median nerve.

Introduction

Axillary artery is the continuation of subclavian artery from the outer border of the first rib and continues as the brachial artery at the inferior border of teres major. About one cm below the bend of elbow in the cubital fossa at the level of the neck of radius brachial artery divide into terminal branches smaller radial artery and larger ulnar artery (Snell R, 2004). Acute ischemia due to an embolism was associated with high bifurcation of the brachial artery (Cherukupalli, C et al., 2007). Cardiac catheterization for angioplasty, pedicle flaps, or arterial grafting requires careful considerations of anatomical variations of vascular pattern.

Method

A total of 60 upper extremities of 30 cadavers of properly embalmed and formalin fixed cadavers were studied. Skin incision was taken followed by reflection of superficial, deep fascia and muscles to open this region according to the methods described by Romanes in Cunningham's Manual of Practical Anatomy (2003). Course and branches of axillary, brachial, radial and ulnar arteries were traced. Important findings were recorded and photographed. Frequency of divergence from the normal was noted, analysed and discussed.

Results

Total 30 cadavers were studied with 60 right and left upper extremities, out of which, following variation in two right sided upper extremities were observed.

Case 1:

We observed a common trunk for lateral thoracic and subscapular arteries originated from second part of axillary artery in a right side upper limb. Subscapular artery gave a branch to subscapularis muscle and continued as circumflex scapular artery. Course and other branches were as usual [Figure. 1].

High origin of radial and ulnar arteries from brachial artery also observed at the upper third of the arm about four cm distal to the lower border of teres major muscle. Radial artery originated from medial side of brachial artery and crossed the median nerve superficially and descended lateral to it. Ulnar artery originated from lateral side of brachial artery and ran lateral to the median nerve in the cubital fossa [Figure 2].

High origin of branches of cords of brachial plexus was seen around second part of axillary artery under pectorialis major muscle. Axillary, brachial arteries and their branches were tortuous and engorged [Figure 2].

Case 2:

We found a common trunk from second part of axillary artery which gave lateral thoracic and subscapular arteries. One additional branch to lateral thoracic wall was originated from common trunk. Subscapular artery gave a thoracodorsal artery and continued as circumflex scapular artery. [Figure 3].

Discussion

Variations in the origin and course of major upper limb vessels occur due to arrest in development of vessels followed by regression, retention or reappearance at any stage of growth (Hamilton W.J, Mossman H.W, 1972).

Gaur Samta et al (2012) described the variation in branching pattern of axillary artery in 25 cadavers and showed that out of 50 cases 68% cases were having classic pattern of branching and 28% cases were having variation in branching pattern of axillary artery. 12% cases showed variation in second part and 16% in third part of axillary artery. In four percent cases subscapular artery originated from the second part of axillary artery but the circumflex artery did not arise from the subscapular artery.

P. S. Chitra et al (2013) observed an unusual unique variation in branching pattern of axillary artery in the right side of a 60-year-old female cadaver. A common trunk was found to arise from the second part that gave rise to lateral thoracic, posterior circumflex humeral and sub-scapular arteries.

Our study corresponds with the study of Gaur Samta et al (2012) and P. S. Chitra et al (2013) which stated that subscapular artery originated from second part of axillary artery but unlike study of P. S. Chitra et al (2013) only subscapular and lateral thoracic arteries originated from common trunk and not from posterior circumflex humeral.

Swaroop. N et al (2011) found a high origin of radial artery in the left upper limb with superficial course in arm and forearm in a 40 years old male cadaver.

Ilean Dinca et al (2010) studied anatomical variation of the origin, course and distribution area of the radial artery in seven cadavers and revealed a case where the radial artery had high origin was distributed to the anterior brachial space and had a superficial course into the upper half of the forearm.

Ghosh Enakshi et al (2013) noted bilateral high origin of radial artery in a 60-year-old male cadaver.

Madhyastha Sampath (2009) observed the variant right brachial artery in a 70 years old female cadaver divided into radial and ulnar arteries, about four cm distal to the lower border of teres major muscle. In the upper part of the arm the radial artery crossed median nerve superficially and then descended lateral to it and the ulnar artery descended medial to the median nerve, but lower down, the median nerve crossed the ulnar artery superficially from the lateral to the medial side.

Panicker J.B et al (2003) reported unusual origin and course of ulnar artery. They revealed unusual large branch, originated from the lateral side of the brachial artery, upto the cubital fossa it was on the lateral side and then crossed the fossa from lateral to medial, superficial to median nerve.

The present study correlates with studies of Swaroop. N et al (2011) and Ilean Dinca et al (2010) stating high origin of radial artery in arm and its superficial course in arm and forearm. Ghosh Enakshi et al (2013) and Madhyastha Sampath (2009) found radial artery originated from the medial side of brachial artery and crossed median nerve superficially and then descended lateral to it and had its superficial lateral course in forearm. Madhyastha Sampath (2009) and Panicker J.B et al (2003) reported high lateral origin of ulnar artery from brachial artery in arm which crossed from lateral to medial side.

Embryology

According to Moore and Persaud (1998) seventh cervical, first and second thoracic inter segmental arteries form primary axial artery during embryological development and continues as the brachial artery in the arm and common interosseous artery in the forearm. The brachial artery divides into radial and ulnar arteries. The ulnar artery develops from a new arterial bud just above the point at which the median artery arises. The radial artery sprouts from two other arterial buds arising from the lateral side of the brachial artery and coalesce with each other. Initially the radial artery arises proximal to the ulnar artery. After forming a new connection with the main trunk which is near the level of origin of the ulnar artery, the upper original stem disappears. In the present case initial segment of radial artery persist give rise to high origin of radial artery (2010).

The present anomaly can be explained by sprouting of radial artery from the medial side of the brachial artery and crossing the median nerve was observed with lateral origin of ulnar artery.

Conclusion

Superficially placed arteries get accidental punctured while attempting venipuncture and may get damaged in orthopaedic and plastic surgery operations. In the reconstructive surgery of the upper limb it can be ligated or cut considering it as a vein leading to disorder in circulation of the hand.

Vascular surgeons involved in the procedure in this region should be conscientious to the possible anatomical alteration. Compression of median nerve due to unusual origins of radial and ulnar artery may get easily confused with radiculopathy and neuropathies. Also knowledge of anomalous high origin of branches of brachial plexus cords could explain the tortuosity of upper limb vessels.

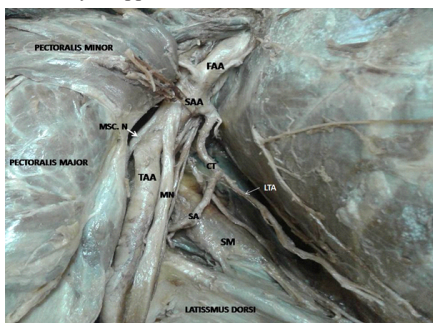


Figure 1 showing a common trunk (CT) from second part of axillary artery giving lateral thoracic (LTA) and subscapular arteries (SA). High origin of branches of cords of brachial plexus around second part of axillary artery. Tortused and engorged axillary, brachial arteries and their branches.

FAA- First part of axillary artery, SAA- Second part of axillary artery,

TAA- Third part of axillary artery, MN- Median nerve, MSC. N- Musculocutaneous nerve, SM- Subscapularis muscle.

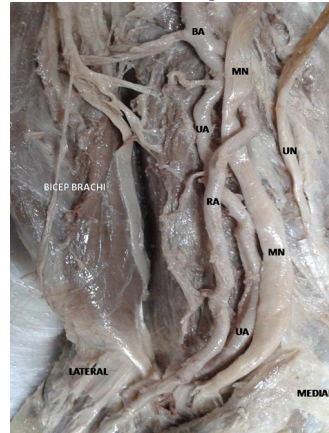


Figure 2 showing high division of brachial artery (BA) into radial artery (RA) arising from medial side and ulnar artery (UA) from lateral side. Radial artery is crossing median nerve (MN) from medial to lateral side. Ulnar artery originated from laterally and ran laterally to median nerve. UN- Ulnar nerve.

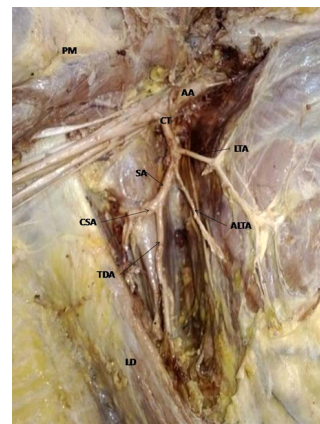


Figure 3 showing common trunk (CT) from second part of axillary artery (AA) which gave lateral thoracic (LTA) and subscapular arteries (SA). One additional branch (ALTA) to lateral thoracic wall originated from common trunk. TDA- Thoracodorsal artery, CSA- Circumflexed scapular artery, PM- Pectoralis major, LD- Latissimus dorsi.

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