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CASE REPORT

MULTIPLE ARTERIAL VARIATIONS IN THE RIGHT UPPER LIMB

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ABSTRACT

During routine dissection, multiple arterial variations were seen in the right upper limb of a female cadaver. These arterial variations include: (1) the second part of axillary artery divided into medial and lateral trunks. (2) The lateral trunk coursed between the two roots of the median nerve; gave off subscapular, anterior and posterior circumflex humeral arteries and continued as profunda brachii artery. (3) The medial trunk continued as superficial brachial artery (SBA). (4) SBA coursed under the bicipital aponeurosis and terminated by diving into radial and common interosseous arteries at the cubital fossa. (5) The SBA gave off superficial ulnar artery (SUA) at the level of the interepicondylar line. (6) The SUA coursed superficial to the flexor muscles in the forearm and passed superficial to the flexor retinaculum to form incomplete superficial palmar arch (SPA) (7) The SPA gave off three common palmar digital arteries and a common trunk for radialis indicis and princeps pollicis arteries. It is important to rule out these variations before performing surgical and invasive procedures to avoid complications.

Keywords: Axillary artery, superficial brachial artery, superficial ulnar artery, superficial palmar arch

INTRODUCTION

Upper limb injuries are the most frequent occupational accidents and various surgical and invasive procedures in the upper limb necessitate the requirement for clear knowledge of vascular anatomy of the upper limb (Jacquemin et al., 2001). Variations in the branching pattern of the upper limb arteries occur in up to 20% of the population (Rodriguez- Niedenfuhr et al., 2001 (b); Casal et al., 2012). Awareness of these variations is important to avoid serious complications. This report describes concomitant presence of rare arterial variations in the right upper, variant formation of median nerve and its clinical significance.

CASE REPORT

During routine dissection multiple unilateral arterial variations were found in the anterior compartment of the right upper limb of an approximately 60-year-old female cadaver. The second part of the axillary artery, after giving off thoracoacromial artery, bifurcated into two almost equal sized medial and lateral trunks. The medial trunk, the superficial among the two continued as the superficial brachial artery (SBA). The abnormal lateral trunk coursed between the two roots of the median nerve, the lateral root was superficial and the medial root was deep to the artery (Figure 1). It gave off anterior & posterior circumflex humeral arteries, subscapular artery and continued as profunda brachii artery (Figure 2). The lateral root of the median nerve crossed infront of the lateral arterial trunk and united with the medial root to form the median nerve lateral to the SBA. The SBA had a normal course and divided into the radial and the common interosseous arteries at the cubital fossa. The median nerve crossed it posteriorly to lie on the medial side in the lower half of the arm. The SBA gave off lateral thoracic artery in the axilla. The superficial ulnar artery, which replaced the normal ulnar

artery (SUA) arose from the medial side of the SBA at the level of the interepicondylar line. SUA coursed superficial to bicipital aponeurosis and median nerve. At the cubital fossa the artery passed superficial to the muscles arising from the medial epicondyle (the palmaris longus muscle was absent) [Figure 3]. It eventually took its usual position on the lateral aspect of the ulnar nerve in the lower third of the forearm and passed superficial to the flexor retinaculum to form incomplete superficial palmar arch (SPA) (Figure 4). There were no branches from SUA throughout its course in the forearm. In addition to three common palmar digital arteries, SPA gave off common trunk, which divided into radialis indicis and princeps pollicis arteries (Figure 4). The arterial pattern of the left upper limb was normal.

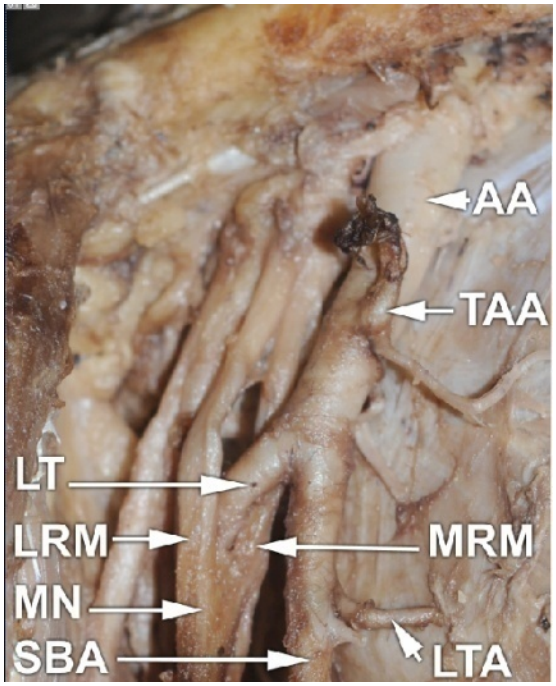

Figure 1: Dissection of the right axilla showing the division of the second part of the axillary artery and formation of median nerve. (AA: Axiallary artery; SBA: Superficial brachial artery; LT: Lateral trunk: LRM: Lateral root of median nerve; MRM: Medial root of median nerve; MN: Median nerve; TAA: Thoracoacromial artery; LTA: Lateral thoracic artery).

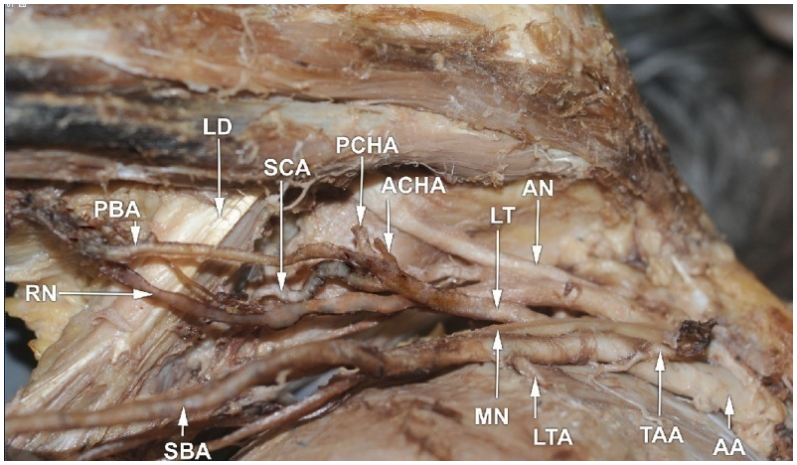

Figure 2: Dissection showing the arterial variations in the right axilla. (AA: Axillary artery; LT: Lateral trunk; SBA: Superficial brachial artery; TAA: thoracoacromial artery; LTA: Lateral Thoracic artery; ACHA: Anterior circumflex humeral artery; PCHA: posterior circumflex humeral artery; SCA: Subscapular artery; PBA: Profunda brachii artery; MN: Median nerve; AN: Axillary artery; RN: Radial nerve; LD: Latissimus dorsi).

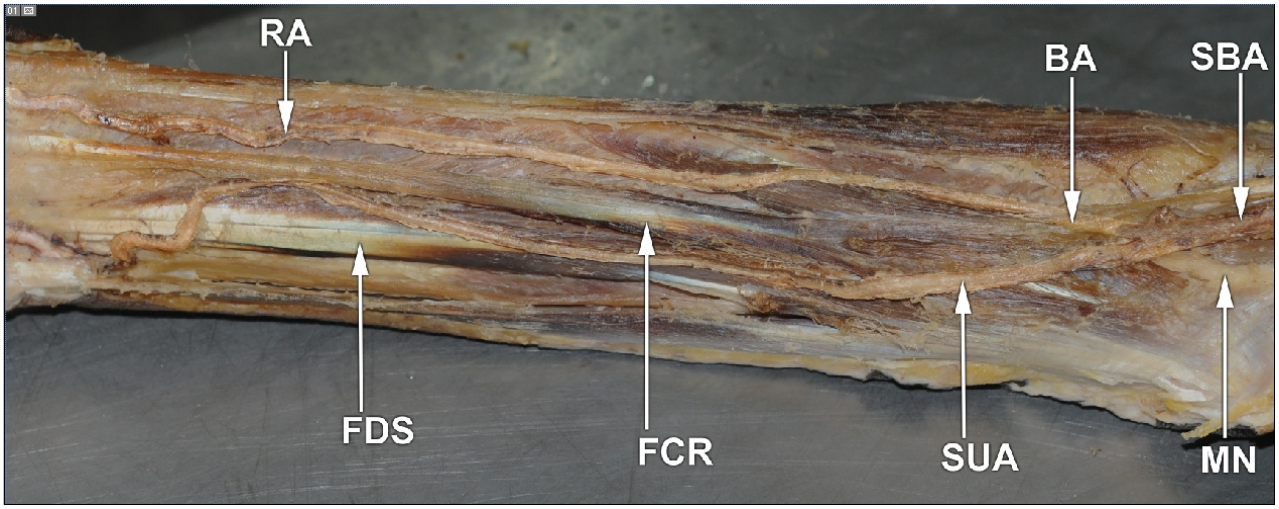

Figure 3. Dissection of the right forearm showing the origin and course of the superficial ulnar artery. (SBA: Superficial brachial artery; SUA: Superficial ulnar artery; RA: Radial artery; MN: Median nerve; BA: Bicipitalaponeurosis; FCR: Flexor carpi radialis; FDS: Flexor digitorum superficialis)

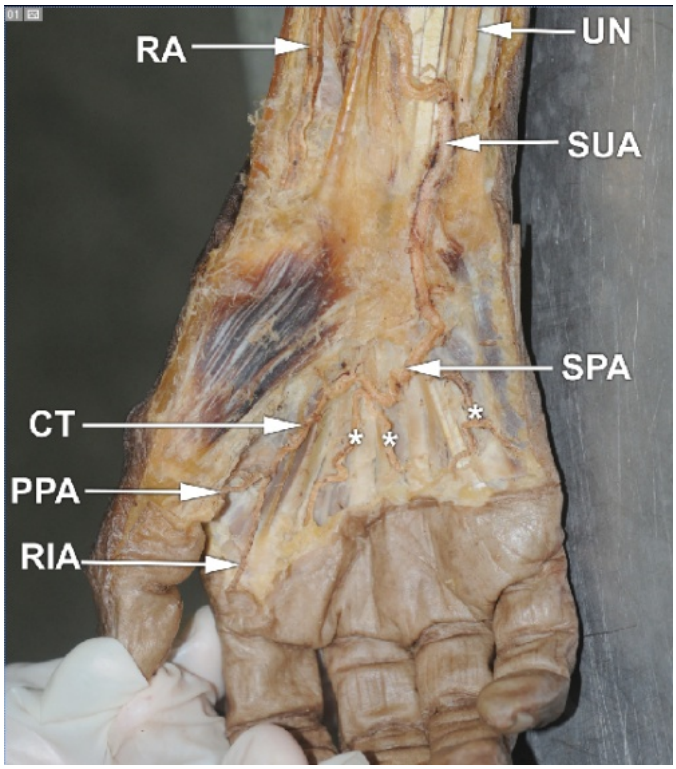

Figure 4. Dissection of the right hand showing the branches of the superficial palmar arch. (UN: Ulnar nerve; RA: Radial artery; SUA: Superficial ulnar artery; SPA: Superficial palmar arch; CT: Common trunk; PPA: Princeps pollicis artery; RIA: Radialis indicis artery; *: Common palmar digital arteries)

DISCUSSION

Variations of the arterial pattern in the upper limb have been the subject of many anatomical studies due to their higher incidence. These variations are the range of morphologies that are normal but less frequent. The arterial variations have been implicated in different clinical situations.

Few authors reported similar abnormal division of the second or third part of the axillary artery

with some changed pattern of branches (George et al, 2007; Rao et al., 2008; Kachlik et al., 2011). Variant formation of the median nerve is quiet common. But abnormal arterial trunk and its relation with median nerve is not common as reported in the present case (George et al, 2007; Rao et al., 2008). Abnormal formation of median nerve may strangulate the large abnormal lateral trunk leading to decreased blood flow through its branches. In addition the median root of the median nerve might get compressed when passing deep to the abnormal lateral trunk, leading to nerve compression symptoms (George et al., 2007).

The SBA is defined as the artery coursing in front of, rather than behind the median nerve and the reported that the incidence of SBA ranges 3.6 -9.6 % (Rodriguez-Niedenfuhr et al., 2001 (b); Kachlik et al., 2011). The SBA does not present any further deviation from the normal and at the elbow it branches into the forearm arteries and when the SUA arises from the SBA, the usual mode of termination of SBA is bifurcation into radial and common interosseous arteries (Rodriguez-Niedenfuhr et al., 2001(b)).

The SUA is an ulnar artery with a high origin, either from axillary or brachial artery and which courses over the superficial forearm muscles (Mannan et al., 2005). It has been reported with different terminologies. The presence of SUA seems to be a rare variable with an incidence of 0.7 – 9.4 % in the literature (Jacquemin et al., 2001; Rodriguez-Niedenfuhr et al., 2001 (b); Mannan et al., 2005). SUA is more prone to trauma and haemorrhage and its superficial course makes it more accessible for cannulation (Jacquemin et al., 2001; Casal et al., 2012). Similarly, intra-arterial injection of drugs into superficial arteries due to the proximity of normal vein puncture sites has also been reported (Ohana et al., 1999). SUA may get damaged during elevation of the radial forearm flap and on the other hand, it may provide additional options for preparing flaps with this vessel as arterial paddles (Jacquemin et al.,2001; Shankar et al., 2009 Casal et al., 2012).

The termination of the SUA by forming the incomplete SPA is in accordance with the reported literature (Mannan et al., 2005; Shankar et al., 2009). The origin or radialis indicis and princeps pollicis artery from the incomplete SPA is a rare observation and has been reported by Vollala et al (2011). During surgical procedures in the thumb, when the ulnar artery gives off the thumb branches, ligation of the radial artery may not be sufficient to stop the bleeding (Vollara et al., 2011).

Many theories on the development of the arterial system of the upper limb have been proposed. Rodriguez-Niedenfuhr et al., (2001) carried out a large embryological study and suggested that the arterial pattern of the upper limb develops from an initial capillary plexus by a proximal to distal differentiation due to maintenance, enlargement and differentiation of certain capillary vessels and the regression of others. Normally the 7^{th} cervical intersegmental artery enlarges and becomes dominant vessel of upper limb. The embryological basis of arterial variations could be described by modification of the normal pattern of capillary maintenance and regression.

In conclusion, multiple variations can occur concomitantly in one upper limb arterial system. Knowledge of these variations is important for surgeons and radiologists and it is therefore important to confirm the presence of these variations by careful palpation or Doppler ultrasound before performing the procedures at the upper limb.

REFERENCES

1. Casal D, Pais D, Toscano T, Bilhim T, Rodrigues L, Figueiredo I, Aradio S, Angelica-Almeida M, Goyri-O'Neill J. 2012. A rare variant of the ulnar artery with important clinical implications: a case report. URL: http://www.biomedcentral.com/1756-0500/5/660 (accessed October 2013)
2. George BM, Nayak S and Kumar P. 2007. Clinically significant neurovascular variations in the axilla and the arm – a case report. Neuroanat 6:36-38
3. Jacquemin G, Lemaire V, Medot M, Fissette J. 2001. Bilateral case of superficial ulnar artery originating from axillary artery. Surg Radiol Anat 23: 139 – 143.
4. Kachlik D, Konarik M and Baca V.2011. Vascular patterns of upper limb: an anatomical study with accent on superficial brachial artery. Bosnian Journal of Basic medical Sciences 11 (1): 5 – 10
5. Mannan A, Sarikcioglu L, Ghani S, Hunter A. 2005. Superficial ulnar artery terminating in a normal ulnar artery. Clin Anat 18: 602 - 605
6. Ohana E, Sheiner E, Gurman GM. 1999. Accidental intra-arterial injection of propofol. Eur J Anesthesiol 16: 569-570.
7. Rao TR, Shetty P and Suresh R. 2008. Abnormal branching pattern of the axillary artery and its clinical significance. Int. J. Morphol 26 (2): 389 – 392
8. Rodriguez-Niedenfuhr M, Burton GJ, Deu J and Sanudo JR. 2001 (a). Development of the arterial pattern in the upper limb of staged human embryos: normal development and anatomic variations. Journal of Anatomy 199: 407 – 416.
9. Rodriguez-Niedenfuhr M, Vazquez T, Nearn L, Ferreira B, Parkin I, Sanudo JR. 2001 (b). Variations of the arterial pattern in the upper limb revisited: a morphological and statistical study, with a review of the literature. Journal of Anatomy 199:547-566.
10. Shankar N, Veeramani R. 2009. Bilateral superficial ulnar arteries with an unusual arterial arch in the forearm. International Journal of Anatomical Variations 2: 24 – 26.
11. Vollala VR, Jetti R, Soni S. 2011. High Origin of an Ulnar Artery- Development and Surgical Significance. Chang Gung Med J 34: 39 – 42.