

## Superficial Brachial Artery Continuing into the Forearm as a Radial Artery: Case Report

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A rare variation of the brachial artery (BA) on the right upper limb was discovered during routine anatomical dissection. The axillary artery bifurcated into two large-sized blood vessels above the teres major muscle - superficial brachial artery (SBA) and deep brachial artery (DBA). The SBA passed between the roots of the median nerve and continued as the radial artery (RA) in the forearm. The deep brachial artery (DBA) was a continuation of the axillary artery (AA). It traversed behind and lateral to the median nerve and in the cubital fossa it turned into the ulnar artery (UA). Detailed knowledge of the variations of the vessels' branching pattern is essential for providing accuracy during vascular diagnosis, reconstructive surgery, and in the evaluation of angiographic images.

*Key words:* superficial brachial artery, brachial artery variations

### Introduction

Accurate knowledge of muscular and neurovascular variations is important for both surgeons and radiologists and may prevent diagnostic errors. The arteries with an abnormal superficial course are often mistaken as superficial veins and accidental injection of certain drugs in these arteries may lead to serious conditions like gangrene or loss of the upper limb. Because their course is superficial, they are more likely to be affected by trauma, which would result in heavy bleeding. According to available medical literature, variations in the branching pattern of the main arteries of the upper limb are discovered in 25% of the studied cases [1, 2, 3].

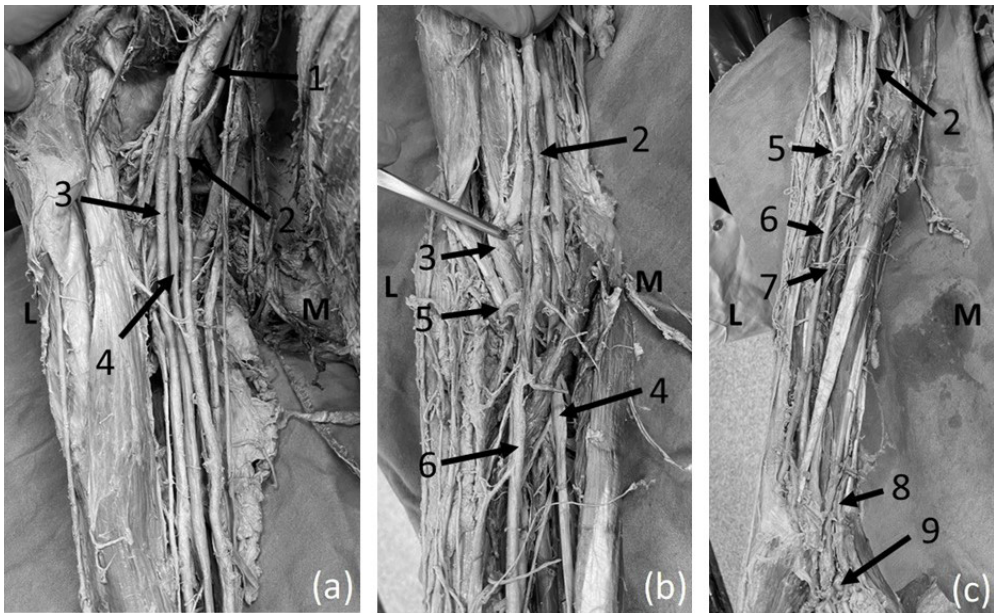
### Material and Methods

The presented case is of a 90-year-old Caucasian male cadaver from the dissection hall of the department of Anatomy and Cell Biology, Medical University-Varna, Bulgaria.

Routine dissection of the axillary fossa and upper limb was performed, according to Vankov's standard dissection guideline. All muscles and neuro-vascular bundles of these regions were exposed, structures were observed for details like origin and orientation, and photographs were taken for documentation. Cadaver material was obtained according to Regulation No 2 from 18.05.2012 of the Bulgarian Ministry of Health.

## Results

A variation of the axillary artery was found. It continued as two brachial arteries (BA). Both of them were traced. The superficially located one originated at the level of teres major muscle and went between the lateral and medial roots of the median nerve. In the cubital fossa, this artery moved laterally, gave off the recurrent radial artery and continued as the radial artery (RA) in the forearm between the pronator teres and the brachioradialis muscles (**Fig. 1b**). The second terminal branch of the axillary artery was located deeper, behind and lateral to the median nerve (**Fig. 1a**). At the level of the forearm, it divided into the ulnar (UA) and interosseous arteries. The radial and ulnar arteries gave branches and formed the superficial palmar arch (**Fig. 1c**). The described variation corresponded to cases with superficial brachial artery (SBA), reported in the literature.



**Fig. 1.** Formation and orientation of superficial and deep brachial arteries. (a) Anterior brachial region. (b) Cubital fossa. (c) Anterior surface of the forearm and palmar region of the hand. 1. Axillary artery; 2. Superficial brachial artery; 3. Deep brachial artery; 4. Median nerve; 5. Recurrent radial artery; 6. Radial artery; 7. Interosseous artery; 8. Ulnar artery; 9. Superficial palmar arch. M – medial side. L – lateral side.

## Discussion

The brachial artery is the major blood vessel of the arm. Variations are important for surgeons and it seems necessary to identify unusual arterial patterns of the upper limb in order to avoid complications with intravenous drug administration and venipuncture. Variations in upper limb arteries have been frequently observed either in routine dissections or in clinical practice.

The most reported variations of the upper limb arteries are described as:

Type 1: This category comprises “normal” anatomy, which is the most common variant – the BA is a continuation of the AA. It is located at the lateral side of the median nerve and ends at the level of the neck of the radius, by dividing into RA and UA [3].

Type 2: SBA is formed as a branch of the AA and distally it gives off the RA and UA of the forearm. The direct continuation of the AA ends as a collateral branch around the elbow joint [3].

Type 3: SBA is formed as a branch of the AA and distally it turns into the RA of the forearm. The AA continues as the deep brachial artery (DBA), which proceeds as the UA [7, 10].

Type 4: SBA is a small vessel that ends in the arm. Its main role is to supply the muscles of the area with blood. DBA follows the “normal” anatomy pattern of the BA [7, 10].

Type 5: Accessory brachial artery (ABA) originating from the BA or AA. After a short course, still within the arm or in the region of the cubital fossa, the ABA rejoins the BA. The fusion of both blood vessels is located proximally to the beginning of RA and UA [7, 10].

Type 6: Superficial brachioradial artery (SBRA) is a RA originating from the upper, middle or lower third of the BA. BA continues as UA [7, 10].

Type 7: Superficial brachioulnar artery (SBUA) has an origin similar to the SBRA but continues as an UA [7, 10].

The findings in our case are corresponding to Type 3 mentioned above.

SBA is observed and reported mostly in the right upper limb [2, 9, 11] with just a few cases in the left upper limb [6]. In our study, we also reported the right location of SBA. In 1961 Keen suggested that the reported variation is a high origin of the radial artery [8]. Such superficial course of accessory brachial artery could be used during coronary catheterization. At the same time existence of a such superficial brachial artery makes it more prone to injuries which can lead to bleeding and ischemia.

## Conclusions

Attention has to be given to the branching pattern of the brachial artery while treating the cases of arterio-venous fistulae, aneurysms and abscesses in the axillary area, arm and cubital fossa. The anatomical position of the BA should be considered while performing cardiac catheterization, intra-arterial injections and angiographic procedures using this pathway. Because of all these factors, studies of the vascular variations of the upper limb have significant implications for preventing complications in medical practice.

## References

1. **Afroze, M., S. Hayat, S. Shirbadgi.** Branching pattern of brachial artery with accent to high up division and clinical significance. – *Academia Anatomica International*, **5(2)**, 2019, 55-58.
2. **AL-Fayez, M., Z. KaimkhanI, M. Zafar, H. Darwish, A. Aldahmash, A. Al-Ahaideb.** Multiple arterial variations in the right upper limb of a Caucasian male cadaver. – *Int. J. Morphol.*, **28**, 2010, 659-665.
3. **Bagal, G., S. Takale.** A Cadaveric study on division of brachial artery with its embryological basis and clinical significance. – *JMSCR*, **3**, 2015, 8708-8712.
4. **Chakravarthi, K., S. Ks, N. Venumadhav, A. Sharma, N. Kumar.** Anatomical variations of brachial artery - its morphology, embryogenesis and clinical implications. – *J. Clin. Diagn. Res.*, **8(12)**, 2014, 17-20.
5. **Chauhan, K, A. Udainia, C. Bhatt, D. Patil, V. Patel, B. Prajapati.** Morphological study of variations in branching pattern of brachial artery. – *Int. J. Basic & Applied Med. Sci.*, **3**, 2013, 10-15.
6. **Coskun, N, L. Sarikcioglu, B. Donmez, M. Sindel.** Arterial, neural and muscular variations in the upper limb. – *Folia Morphol.*, **64**, 2005, 347-352.
7. **Glin, M., N. Zielinska, K. Ruzik, P. Karauda, M. Korschake, L. Olewnik.** Morphological variations of the brachial artery and their clinical significance: a systematic review. – *Surg. Radiol. Anat.*, **45**, 2023, 1125-1134.
8. **Keen, J. A.** A study of the arterial variations in the limb, with special reference to symmetry of vascular patterns. – *Am. J. Anat.*, **108**, 1961, 245-261.
9. **Natsis, K, A. Papadopoulou, G. Paraskevas, T. Totlis, P. Tsikaras.** High origin of a superficial ulnar artery arising from the axillary artery: anatomy, embryology, clinical significance and review of the literature. – *Folia Morphol.*, **65**, 2006, 400-405.
10. **Rodríguez-Niedenführ, M., T. Vázquez, L. Nearn, B. Ferreira, I. Parkin, JR. Sañudo.** Variations of the arterial pattern in the upper limb revisited: a morphological and statistical study, with a review of the literature. – *J. Anat.*, **199(5)**, 2001, 547-566.
11. **Tohno, Y, S. Tohno, C. Azuma, K. Kido, Y. Moriwake.** Superficial brachial artery continuing into the forearm as the radial artery. – *J. Nara Med. Assoc.*, **56**, 2005, 189-193.
12. **Vatsala, A. R., H. Rajashekar, A. Angadi.** Variation in branching pattern of brachial artery: a morphological and statistical study. – *Int. J. Biol. Med. Res.*, **4(1)**, 2013, 2920-2923.
13. **Yagain, V., M. Dave, S. Anadkat.** Unilateral high origin of radial artery from axillary artery. – *Folia Morphol.*, **71(2)**, 2012, 121-124.