



# A Variant Branch of the Axillary Artery Impacting in the Superficial Palmar Arch Composition

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## Abstract

During routine dissection of an approximately 60-year-old female cadaver for the undergraduate medical students at Morphology Department of Federal University of Rio Grande do Norte, Brazil, was observed a variant branch originated from the second part of the axillary artery. The second part of the right axillary artery gave rise to aberrant brachial artery that travels down superficially in the medial aspect of the upper limb. Furthermore, this superficial brachial artery terminates in the superficial palmar arch completely replacing the ulnar artery at this level. Variations in the upper limb arterial distribution are notably important for surgeons performing interventional or diagnostic in vascular diseases.

**Keywords:** Axillary artery; Superficial palmar arch; Anatomic variation

## Introduction

The axillary artery is a continuation of the subclavian artery, extending from the outer border of the first rib to the lower border of the teres major muscle where it continuous as brachial artery. Using as a reference the pectoralis minor muscle, the axillary artery could be divided into three parts: the first part extends from the outer board of the first rib to the superior board of the pectoralis minor muscle; the second part is entirely covered by the pectoralis minor muscle; and the third part extends from the inferior border of the pectoralis minor muscle to the lower board of the teres major muscle [1]. Usually, the second part of the axillary artery gives off the superior thoracic artery and toracoacromial artery, despite some variations have been extensively described previously [2]. Recently, additional papers have been suggested a plenty of possibilities in the arterial arrangement in this region [3-10]. Distally, the brachial artery gives off radial and ulnar arteries in the forearm which provide blood supply to the hand. The Superficial Palmar Arch (SPA) circulation is the most important circulatory system in the hand. The SPA is formed by the superficial branch of the ulnar artery and laterally completed by one of the radial artery branches [11]. Until now, anatomic variations in the configuration of the SPA have been reported referring dominance/codominance, complete/incomplete, and diameters abnormalities in the radial and ulnar arteries in the upper limb extremities. Usually, the ulnar artery is dominant in the composition of the SPA in both hands in 90% of individuals [12]. The clinical significance of the SPA circulation is remarkably relevant to cardiologists, nephrologists, and cardiovascular surgeons during trans-radial or trans-ulnar catheterization, hemodialysis or coronary bypass in which the radial artery is used as a graft to prevent the development of hand ischemia.

Textbook anatomic knowledge is constantly challenged by modern data everyday that provides information concerning anatomical variation in the vascular arrangement throughout the human body. In this report, the authors present a rare case of an unlikely accessory brachial artery arising from the second part of the axillary artery which seems to be devoted just to compose the SPA in the upper limb extremity, completely replacing the ulnar artery. This anatomical variation has not been described earlier; consequently its unusual origin and distribution may possibly serve as a helpful information to radiologists, nephrologists, cardiologists, and vascular surgeons to prevent complications in medical procedures.

## Case Presentation

During a routine dissection classes conducted for 2<sup>nd</sup> medical students in the Department of Morphology of Federal University of Rio Grande do Norte, Brazil, was encountered an unusual

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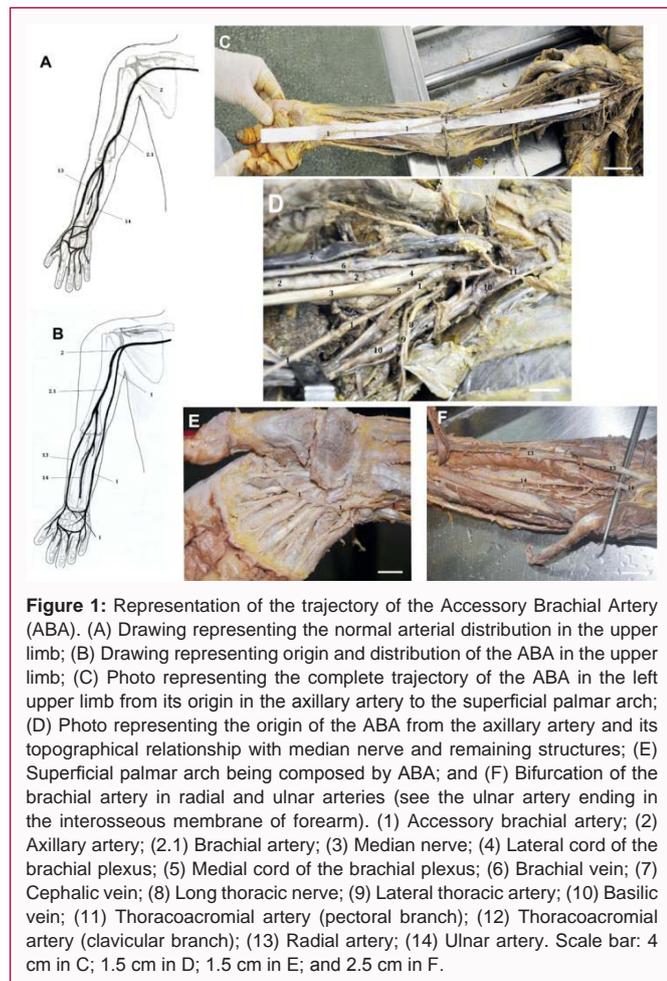
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anatomic variation in right upper limb of a female cadaver. A long collateral branch arose from the second part of the axillary artery, proximally to the median nerve formation in the brachial plexus (Figure 1B-D). We called this collateral branch of Accessory Brachial Artery (ABA). The ABA descended superficial to the medial edge of the arm passed ventrally through the medial epicondylus and continuous medially in the forearm without leave branches along its path (Figure 1B and C). In addition, the ABA was accompanied by two satellite veins through the forearm. As expected, was observed in the right upper limb the usual bifurcation of the brachial artery below the elbow joint given rise to the ulnar and radial arteries. However, the ulnar artery abruptly ended at the distally in the anterior surface of interosseous membrane of forearm (Figure 1F). Interestingly, the ABA completely replaced the ulnar artery in the SPA (Figure 1E). The axillary artery, the brachial artery, and the SPA of the left side had normal pattern of branching.

## Discussion

Anatomical variations in the vascular arrangement in the upper limb have been shown by several anatomical studies. It is usually reported these variations in the axillary artery branches [3,8,13]. The variability in the axillary artery branches' origin and distribution is a usual feature in its anatomy. The classic pattern of six branches originating distinctly from the axillary artery is encountered in just 28% of the cases [6,10,14]. Huelke in his study demonstrated the subscapular artery arises from 0.6% cases from the first part of the axillary artery, from the second part in 15.72% cases, and from third

part 79.2% cases [2]. Additionally, variation in branching of the axillary artery has been reported by Rao and colleagues, in which the third part of the axillary artery gave origin to subscapular, anterior, and posterior circumflex humeral arteries, profund brachii, and ulnar collateral arteries from a common trunk [5]. In the present case, the second part of the axillary artery gave origin to a brachial superficial branch which runs throughout the medial edge of the upper limb and finally makes up the SPA in substitution to the ulnar artery in the right hand. Furthermore, the ulnar artery ended in the end of the forearm, ventrally to the interosseum membrane. Variation in branching pattern of the axillary artery may be due to the defects in embryonic vascular network occurred at any stage by the arrest of development. The developmental defects of surrounding tissue may also lead to vascular variation [15].

Several studies have recommended classify the SPA as complete or incomplete in accordance with the absence of anastomoses or a connection between vascular structures forming the arch [16]. In the literature, it has been reported that complete SPA is present in approximately 80% of hands [17-19]. Furthermore, it has been reported the ulnar artery dominance in more than 90% of cases [12,20]. The anatomical knowledge of the palmar circulation and its possible variation represents a key aspect during trans-radial or trans-ulnar catheterization, hemodialysis or coronary bypass. Surgeons require a health SPA to maintain an adequate perfusion of the hand and digits and not to cause them any harm prior to surgical procedures [16].

During safe dissections in the surgery room, surgical skills and profound knowledge of regional anatomy is indispensable. Surgeons need to know the usual anatomy and the commoner anatomical variations and be prepared to unexpected situations. Taking that in account, unpredictable variation described here may convert the surgical field in an unsafe "road map". Furthermore, the ABA may complicate intravenous drug administration, and venipuncture in general, also percutaneous brachial catheterization. It may be mistaken for a vein. Finally, the unusual presence of ABA may induce misinterpretations of incomplete angiographic images.

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## Author Contributions

ESNJ, FVLL, and NMA supervised the dissection sessions and preparer the figures of the manuscript. All authors were involved in dissections, interpreting and preparing the figures for publication.

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