

# Unusual Branching Pattern of Axillary Artery Associated with the High Origin of Ulnar Artery

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## Abstract

Axillary artery is a continuation of subclavian artery, extending from the outer border of first rib to the lower border of teres major muscle. During routine dissection for the undergraduate medical students, a rare variations was seen in an approximately 55-year-old male cadaver. This case showed a variation in branching pattern of right axillary and subscapular arteries. The subscapular artery originated from 2<sup>nd</sup> part of axillary artery, gave origin to posterior circumflex humeral and lateral thoracic arteries in addition to its normal branches. The ulnar artery originated from the 3<sup>rd</sup> part of the axillary artery, just above the lower border of teres major muscle. The variant ulnar artery passed deep to the median cubital vein, bicipital aponeurosis, and tendon of palmaris longus muscle. Then, it passed superficial to flexor digitorum superficialis muscle and flexor retinaculum to enter the palm. In the palm, it formed the superficial palmar arch. This variant ulnar artery was much smaller in caliber than the radial artery.

**Keywords:** Axillary artery, Palmar arches, Subscapular artery, Ulnar artery, Variations

## Introduction

Axillary artery is a continuation of subclavian artery, extending from the outer border of first rib to the lower border of teres major muscle. It continues as brachial artery, which divides into radial and ulnar artery in forearm at the level of neck of the radius. Axillary artery normally gives off superior thoracic artery from its first part, lateral thoracic and thoracoacromial arteries from its second part, and subscapular, anterior circumflex humeral and posterior circumflex humeral arteries from its third part. Subscapular artery divides into circumflex scapular and thoracodorsal arteries.<sup>[1]</sup> In the forearm, ulnar artery passes between the flexor carpi ulnaris and flexor digitorum superficialis muscles, then passes over the flexor retinaculum to enter the palm and forms superficial palmar arch. In the palm, ulnar artery gives off deep palmar branch, which contributes to formation of deep palmar arch after joining with radial artery.<sup>[2]</sup> Variation in branching pattern of axillary artery is not uncommon. High origin of ulnar artery

from axillary or brachial artery has been reported earlier. The superficial ulnar artery is also a variant ulnar artery, which takes origin from axillary or brachial artery and lies superficial in the arm and forearm, passes superficial to bicipital aponeurosis and usually forms superficial palmar arch in the hand.<sup>[3,4]</sup>

## Case Report

During routine dissection for undergraduate medical students, we came across an unusual and rare variation of branching pattern in the right axillary and subscapular artery in a male cadaver of approximately 55-years of age. The right subscapular artery was a large branch of second part of axillary artery and gave origin to lateral thoracic and posterior circumflex humeral arteries along with its usual branches. The third part of right axillary artery gave rise to ulnar artery of high origin along with anterior circumflex humeral artery. The variant ulnar artery took origin from axillary artery just above the level of lower border of teres major muscle and emerged in between the two roots of median nerve [Figure 1]. Along with its venae comitantes, variant ulnar artery passed deep to the deep fascia along with the median nerve on the medial side of the arm. It ran deep to the upper part of median cubital vein and the bicipital aponeurosis. In the flexor compartment of forearm, it passed deep to the tendon of palmaris longus muscle and was running over superficial to the flexor digitorum superficialis muscle. Further below, it passed between

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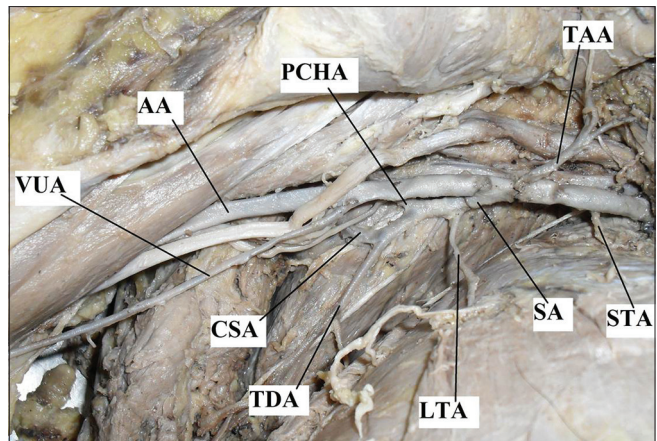
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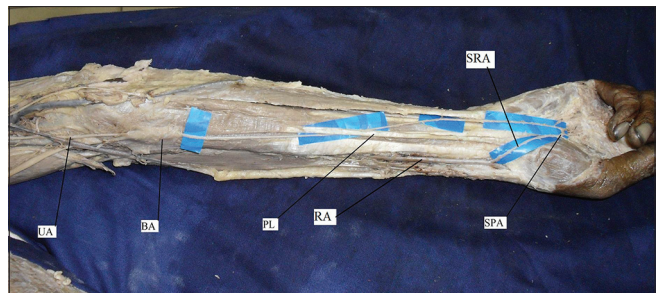
the flexor digitorum superficialis and flexor carpi ulnaris muscles [Figure 2]. It entered the palm after crossing the flexor retinaculum superficially and then passed deep to the palmar aponeurosis, and formed superficial palmar arch after joining with the superficial palmar branch of radial artery [Figure 2]. The superficial branch of radial artery was larger than the variant ulnar artery, thus it was compensating the blood supply to the region through superficial palmar arch. Deep branch of ulnar artery was absent, and the deep palmar arch was formed by the radial artery and a small branch from the palmar carpal arch. During its course, the variant ulnar artery gave numerous small muscular branches. In the cubital fossa, brachial artery divided into the radial and common interosseous arteries, and the normal ulnar artery was absent. The common interosseous artery gave rise to anterior and posterior ulnar recurrent arteries [Figure 3]. However, such variation was absent on the left side.

## Discussion

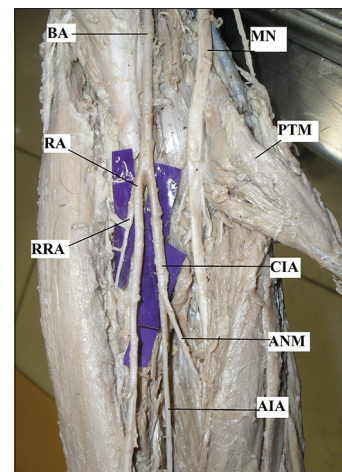
Many reports of variations in the branching pattern of axillary artery are available. A study of branching pattern of axillary artery indicates that 28% of cases have variation in branching pattern of axillary artery, and 16% of variation are found in branching pattern of second part of axillary artery.<sup>[5]</sup> In a case report, it was revealed that the thoracoacromial, posterior circumflex humeral, and lateral thoracic artery were branches of the subscapular artery.<sup>[6]</sup> Another case reports of the third part of the axillary artery dividing into two major arterial stems named as deep brachial artery and superficial brachial artery.<sup>[7]</sup> A common trunk from the third part of axillary artery gave rise to subscapular, anterior, and posterior circumflex humeral, profunda brachii and ulnar collateral arteries has also been reported.<sup>[8]</sup> A study done by Huelke states that subscapular artery arises from first part of axillary artery in 0.6% cases, from second part in 15.7% cases, and from third part in 79.2% cases.<sup>[9]</sup> Lateral thoracic artery arises from first part of axillary artery in 10.7% cases, from second part in 52.2% cases, and from third part in 1.7% cases. In 67.5% cases, the posterior circumflex humeral artery arises from the third part of axillary artery and in 15.2% cases from subscapular artery.<sup>[9]</sup> In present case, the second part of axillary artery gave rise to the subscapular and thoracoacromial artery. The subscapular artery gave origin to lateral thoracic and posterior circumflex humeral artery along with its usual branches. Moreover, the variant high origin of ulnar artery arose from the third part of axillary artery, making this a unique case. There are reports of superficial ulnar artery, which took origin from axillary or brachial arteries; in these cases, the variant superficial ulnar artery passes superficially in the arm and forearm.<sup>[10-12]</sup> A case of superficial ulnar artery passing deep to bicipital aponeurosis was reported.<sup>[3]</sup> Another case of high origin of ulnar artery, in which the variant ulnar artery passed superficial to bicipital aponeurosis and muscles of the forearm, has also been reported.<sup>[4]</sup> The present case is a unilateral variation of high origin of ulnar artery emerging in between the two roots of median nerve and then passing



**Figure 1:** Dissection of right axilla showing subscapular artery giving origin to posterior circumflex humeral artery, lateral thoracic artery, circumflex scapular artery and thoracodorsal artery. Variant ulnar artery, thoracoacromial artery, superior thoracic artery originating from axillary artery can also be seen



**Figure 2:** Dissection of right upper limb showing variant ulnar artery passing deep to bicipital aponeurosis and palmaris longus muscle. Superficial palmar arch, radial artery, superficial branch of radial artery can be seen



**Figure 3:** Dissection of cubital fossa showing the brachial artery dividing into radial artery and common interosseous artery. Pronator teres muscle has been reflected. Absence of normal ulnar artery originating from brachial artery can be noted. Radial recurrent artery, arteria nervei mediana, anterior interosseous artery, median nerve can also be seen

deep to the deep fascia of arm and forearm. The artery also passes deep to the median cubital vein, bicipital aponeurosis, and palmaris longus muscle.

Variant high origin of ulnar artery as in the present case with small caliber as compared that to radial artery should be known to surgeons performing free radial forearm flap, as the blood supply of forearm after surgery would depend entirely on the variant ulnar artery. Using radial arteries as conduits in coronary bypass surgeries increases the importance of this variant artery as blood supply to the forearm will be depend on ulnar artery.<sup>[13]</sup> Orthopedic surgeons operating through anterior incision on the ruptured distal bicipital tendon should take care not to injure a variant ulnar artery, which may be present superficially in the region.<sup>[14]</sup> Such a variant artery can also be used as conduits for coronary bypass surgeries.

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