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# The anastomotic artery connecting the axillary or brachial artery to one of the forearm arteries

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*A vessel connecting the axillary or brachial artery to one of the forearm arteries was found in a 65 year old male cadaver, during the gross anatomy dissection of the upper extremity of 20 adult cadavers at the Department of Cellular Biology and Anatomy, Louisiana State University Medical Center. The right radial artery originated from the brachial artery nearly at the usual level and was connected to the axillary or brachial artery by a long slender anastomotic artery (vasa aberrantia). The anastomotic artery coursed under the medial side of the biceps muscle between the median and musculocutaneous nerves, and gave off two muscular branches to the biceps muscle. The anastomotic artery coursed between the median and musculocutaneous nerves in the arm, it passed to the forearm under the bicipital aponeurosis and connected the main radial artery on the radial side of the forearm. The anastomotic artery can be explained on the basis of its embryologic development and also ought to be distinguished from the other common arterial variations in the upper extremity.*

**key words: human anatomy, axillary artery, brachial artery, radial artery, ulnar artery, anastomotic artery**

## INTRODUCTION

Anatomic variations in the arterial system of the upper extremity have been well described by many authors [1,8–10,15,17]. The variations of the arterial supply to the upper limb can be explained on the basis of the embryologic development of the vascular plexuses of the limb buds. On each side of the seventh cervical intersegmental artery it becomes enlarged to form the axial artery of the upper extremity. The proximal portion of the axial artery, beyond the lateral border of the teres major tendon, can be recognized as the brachial artery while the distal position, beyond the cubital fossa, is the interosseous artery. Both the radial and ulnar arteries arise comparatively late in development as new vessels off the brachial and interosseous arteries, respectively [19–21].

As these new vessels arise, the interosseous artery becomes reduced in size. The radial artery originates embryologically as a branch of the brachial artery in the arm, giving off the branches to the biceps muscle. As it crosses the elbow joint, the radial artery establishes a connection with the main trunk of the brachial artery at or near side of the origin of the ulnar artery. Later, the part in the arm, disappears to a large extent, resulting in one main artery running along the flexor aspect of the limb [6].

During the past decade, some papers have been presented on variations of the arterial system of the upper extremity [13,14,19].

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Sometimes the radial atery arises proximally, usually from the axillary or beginning of the brachial artery. The origin of the radial artery is higer than usual in about 12% of cases [3].

Charles (1894) recorded a case of absence of the radial artery, its place at the wrist was taken by the anterior interosseous artery; real anomalies of the radial artery in the forearm are apparently rare [5]. McCromack and his co-workers [10] found a superficial radial artery (one arising high, above the intercondylar line) in 14.27% of 750 upper extremities.

Cases have shown variations in the radial artery [16] and the presence of a superficial brachial artery [13], as well as a superficial ulnar artery [14,19].

The aim of this study is to report a case of an anastomotic artery connecting the axillary or brachial artery to one of the forearm arteries, usually join the radial artery.

## RESULTS

We observed a vessel connecting the axillary or brachial artery to the radial one in a 65 year old male cadaver during the dissection of the upper limb of 20 adult cadavers at the Department of Cellular Biology and Anatomy, Louisiana State University Medical Center in 1997. The anastomotic artery was originating from the medial side of the axillary artery or the initial portion of the brachial artery and coursed between the median and musculocutaneous nerves in the arm to become located in the lateral of the cubital fossa on the medial and anterior side of the main tendon of the biceps muscle. It connected the initial portion of the main radial artery on the radial side in the proximal of the forearm.The anastomotic artery gave off two branches to the biceps muscle during its course in the arm. It passed from the arm to the forearm under the aponeurosis of the biceps brachii muscle. The relation of the anastomotic artery to other structures in shown in Figure 1. The brachial artery had a normal course in the arm, ending as the ulnar and radial arteries in the cubital fossa. The anterior humeral circumflex and posterior humeral circumflex arteries originated from the axillary artery near the lower border of the subscapularis muscle and at the distal border of the subscapularis muscle, respectively. The superior ulnar collateral and inferior ulnar collateral arteries arised from the brachial artery. The course of arteries in the forearm, wrist and hand was normal. The formation of the brachial plexus was also normal.

The left brachial artery was the continuation of the axillary artery and originated at the lower margin of the tendon of the teres major muscle. It passed down the arm and ended about 1 cm distal to the bend of the elbow , where it divided into the radial and ulnar arteries.

## DISCUSSION

A basic law of vascular anatomy is that the only thing which remains constant is its variability. The vascular anatomy is more variable in the living than in the dead and it varies among people living in different countries. Some arteries have more variations than others. During embryologic development at the beginning of the fifth week, numerous vessels contribute to the primitive capillary plexus. In the upper limb buds, usually only one trunk (the subclavian) persists. This represents the lateral branch of the seventh intersegmental artery. Its major continuation (axis artery) to the upper limb is the axillary artery.

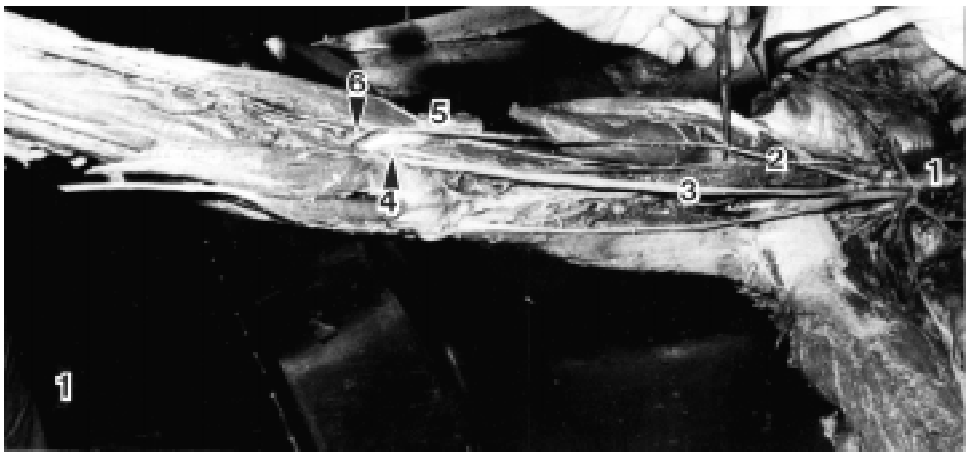


**Figure 1.** A vessel connecting the axillary or brachial artery to the radial one. 1 — axillary artery; 2 — anastomotic artery; 3 — Median nerve; 4 — brachial artery; 5 — tendon of the biceps muscle; 6 — initial portion of the radial artery.

Our paper describes a variation of the arterial pattern of the right arm, consisting in the presence of a long anastomosis between the axillary or brachial and radial arteries. The normal axillary artery anatomy and its variations have been well described [3,22].

There is no standard pattern for its branching. Some branches may derive from uncommon origins, some of the named vessels may arise as common trunks, or their branches may originate separately from the axillary artery.

The upper extremity is supplied by the axillary artery. The axillary artery is called the brachial artery after passing the posterior axillary fold, and then courses on the flexor aspect of the forearm as the anterior interosseous artery [9].

The radial artery takes its origin from the brachial artery proximal to the ulnar artery. In the later development, the radial artery forms a new connection with the main trunk at or close to the level of origin of the ulnar artery. The upper part of its original stem then disappears [2,18]. Failure of the original stem to disappear can result in the more common anatomic variations of the radial artery.

In our case, the right radial artery originates from the brachial artery nearly in the cubital fossa and is connected to the axillary or brachial artery by a long slender anastomotic artery (vasa aberrantia). The anastomotic artery gave off two branches to the biceps muscle. These branches can explain the lack of regression of the long slender anastomotic vessel between the axillary and the radial arteries.

A number of arterial variations in the upper extremity have been reported. The reported frequencies of a superficial brachial artery, which originates from the axillary or brachial arteries and splits into the radial and ulnar arteries were 12% (12 of 100 arms) by Müller [12], 16 % (68 of 410 arms) by Adachi [1] and 0.2% (2 of 960 arms) by Miller [11]. McCromack et al. [10] studied 750 extremities of cadavers and found 2.13% (16 of 750 arms) cases of the radial artery arising from the axillary artery. In the same study, reported frequencies of ulnar arteries arising from the axillary or the brachial arteries were 0.93% and 1.33 %, respectively.

The radial artery (superficial radial artery) arising from the brachial artery has been shown to be most frequent variation in the arterial pattern of the upper extremity in man. The incidence being 14.26% in dissection material and 9.75% in angiographic studies [7]. Hazlett [4] also showed a superficial ulnar artery with a high origin during an intra-arterial injection.

This vascular pattern we encountered is an anatomic variation that has been described in some textbooks. In our study, there was no variation in the formation of the vascular patterns in the forearm, wrist or hand on the right and left upper extremity.

Anatomic variations of the arterial system of the upper extremity in human is important to note during surgery and intra-arterial or intra-venous injections.

Most of the described variations can be identified with a careful preoperative examination. Failure to recognize these anomalies of the upper limb vasculature may result in a compromised surgical outcome.

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