Persistent superficial brachial artery in humans

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Abstract

Introduction
The normal vascular development, including the pattern of the blood vessels, is influenced greatly by local haemodynamic factors. Altered haemodynamic environment often gives rise to varying patterns of blood vessels in upper limbs. This article discusses persistent superficial brachial artery in humans.

Case report
During a routine dissection of an upper limb carried out in the anatomy department, a persistent superficial brachial artery was encountered in a 40-year-old male cadaver. It branched off from the second part of the axillary artery and passed forward between the two roots of the median nerve deviating laterally along the arm.

Discussion
This article reviews and discusses the course and branching of the superficial brachial artery and its relationship with the median nerve and the brachial artery as well as the ontogenic basis of the vascular pattern of the upper limb. Knowledge of such variations is important for carrying out surgical procedures in the arm.

Conclusion
The superficial brachial artery acting as an additional artery in the arm may be beneficial for collateral circulation connecting the distal part of axillary artery with the branches of radial and ulnar arteries at anastomosis around the elbow.

Introduction
The superficial brachial artery is a constant embryonic vessel that plays an important role in the normal arterial morphogenesis of upper limb. As a rule, it presents in an embryo of 18-mm length and totally regresses when the embryo reaches the length of 23 mm. Sometimes, it still persists in adults, leading to misinterpretation of angiograms and unexpected difficulties during surgical procedures. We present a case of persistent superficial brachial artery in humans.

Case report
During a routine dissection done in the Anatomy Department of Tabuk University (KSA, Tabuk), a superficial brachial artery was observed. The limb belonged to the left side of an approximately 40-year-old male cadaver. The superficial brachial artery arose from the second part of the axillary artery 2.6 cm proximal to the lower border of the teres major and 8.4 cm from the outer border of the first rib. The artery passed forward between the two roots of the median nerve that hook it in a loop (Figure 1), and then it coursed downward, superficial to the median nerve, from the medial to the lateral side of the arm.

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Figure 1: Origin of the superficial brachial artery and its relations with the roots of median nerve.
Ax, axillary artery; SBA, superficial brachial artery; BA, brachial artery; MR, medial root of median nerve; LR, lateral root of median nerve.
(Figure 2), and continued in the forearm as the radial artery. The artery gave no branches on the arm, but it anastomosed with the brachial artery 3 cm below the cubital fossa (Figure 3). The anterior and posterior circumflex humeral, subscapular and profunda brachii arteries branched from the brachial artery that coursed deep into the median nerve from the lateral to the medial side and terminated in the forearm as the ulnar artery. Further course, branches and termination of the radial and ulnar arteries in the forearm and hand were typical.

**Discussion**

Arterial variations in the upper limb are very common. The radial artery arising from the brachial artery in the arm is known as the radiobrachial artery and has been reported to occur in as much as 13.8% of cases. According to some authors, the persistent superficial brachial artery that arises from the second or third parts of the axillary artery, above the junction of the roots of the median nerve, was found only in 0.26% cases. Some other works had also reported a very wide range of prevalence, from 0.2% to as much as 25%, with no concrete reasons attributed to the prevalence, however. There are three variants of topography of the superficial brachial artery that were described in the literature: (a) the artery passes the cubital fossa and bifurcates into radial and ulnar arteries (29%), (b) it continues as a superficial radial artery (48%), (c) it continues as an ulnar artery and known as the “High origin of ulnar artery” (22.7%). In particular this article reports the study findings on the persistent superficial brachial artery, which terminates in the radial artery with the usual course and branching out in the forearm, and even more peculiar, this artery does not belong to any of the subgroups listed previously. The anastomotic vessel between the ulnar and the radial arteries detected in the upper third of the forearm is worth noting.

The appearance of such arterial pattern of the upper limb can be explained in embryological light. In an embryo of 10-mm length, the main supply of the upper limb is a primitive axial artery that branches off from the seventh inter-segmental artery. The superficial brachial artery branches from the axial artery in front of the cords of the brachial plexus. Two terminal branches of superficial brachial artery are a superficial antebrachial artery medially and a part of the definitive radial artery laterally. The superficial antebrachial artery divides in the forearm into median and ulnar arteries, which anastomose with corresponding branches of the primitive axial artery. In an embryo of 23-mm length, the primitive axial artery attains haemodynamic predominance and persists as axillary and brachial arteries, giving anastomosis to the superficial brachial artery at the elbow. Then, the pre-anastomotic proximal portion of the superficial brachial artery regresses, and its distal part enlarges forming the radial artery.

In the present study, both the pre-anastomotic segment of the superficial brachial artery and its anastomosis with the primitive axial artery still are not obliterated. As a result, it can be concluded that the radial artery here is the continuation of the subclavian artery, which continues as the axillary artery and has a variable origin of the brachial artery. Further, anastomoses between the ulnar and radial arteries detected in the upper third of the forearm are worth noting. The appearance of such arterial pattern of the upper limb can be explained in embryological light.
of the superficial brachial artery, while the axial artery continues at the forearm as the ulnar one.

**Conclusion**

The superficial brachial artery acting as an additional artery in the arm may be beneficial for collateral circulation connecting the distal part of the axillary artery with branches of radial and ulnar arteries at anastomosis around the elbow. As is well known, ligation of the brachial artery over its proximal third often leads to gangrene of dependent tissues. On the other hand, it can provide unexpected heavy bleeding in orthopaedic and surgical procedures. Variation in the branching patterns of brachial artery is of significance in cardiology and vascular surgery. The radial artery is often used as a route for conducting coronary angiography and other endovascular operations with relatively low level of vascular complications. Anomalous higher origin of the radial artery can make these procedures difficult because of the irregular diameter of superficial brachial artery and compression of its lumen between the two roots of median nerve. Hence, specialists involved in the procedure should be attentive to these possibilities of encountering anatomical variants and conduct an ultrasound examination of the limb before proceeding to the main intervention.

**References**