



Variations associated with high division of the superficial brachial artery

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Abstract

The arterial variations of the upper limb are quite common. This variation was found in the left upper limb of a 38-week-old female fetus cadaver during the routine dissection. The axillary artery was continuing as brachial artery after giving the superficial brachial artery. The superficial brachial artery derived from high division brachial artery was extended as superficial inner side of the arm. The superficial brachial artery was crossed to brachial artery 5 cm above the interepicondylar line. This artery was to run as superficial radial artery the outer side of the forearm. In the cubital fossa, the brachial artery continued as ulnar artery at the inner side of the forearm. The other branches of axillary and brachial arteries were observed as usual.

Knowledge of such variations is of clinical importance during the interventions as flap surgery of forearm, intravenous drug applications, amputations, use of radial artery coronary artery bypass surgery and fasciotomy for compartment syndrome.

© *Int J Anat Var (IJAV)*. 2014; 7: 45–47.**Key words** [high division] [superficial brachial artery] [superficial radial artery]

Introduction

Several investigators reported variations in the arterial pattern of upper limb [1–2]. Most of these variations hypothesized by the failure of regression of some paths of embryonic arterial trunks [2]. The presence of superficial brachial artery (SBA) and the usual pattern of its branching in the upper arm or forearm have also been reported with prevalence rate varying from 0.2–25%, usually seen unilaterally [2–5]. Concurrent occurrence of high division of the superficial brachial artery and superficial radial artery in the same extremity is rare.

The radial artery may occasionally arise from the continuation of SBA, or as a high proximal division of an otherwise usual brachial artery. It can give rise to the common interosseous artery [6].

Knowledge of such variations has clinical importance during intravenous drug applications and any operations of the arm and forearm (flap surgery of the forearm, amputations, the use of radial artery coronary artery bypass surgery and fasciotomy to treat compartment syndrome).

Case Report

During a routine dissection in the Gulhane Military Medical Academy, Department of Anatomy, we encountered a case of the SBA in the left upper limb of a 38-week-old formalin-fixed white female fetus cadaver. This study was approved

by Medical Ethics Committee at the Gulhane Military Medical Academy.

There was no pathology of the extremity. The axillary artery was in normal position between roots of median nerve and the teres major muscle. SBA was originated from the third part of the axillary artery proximally the formation of median nerve by union of the roots and then lied on the median nerve (Figures 1, 2). So this variation could be called as high division of the SBA. After this branching, the axillary artery became the brachial artery. There was another variation in the forearm. Brachial artery was thicker and lied on the ulnar (medial) side from the elbow joint and it was giving ulnar and common interosseus arteries. Furthermore, SBA was thinner and superficially crossed brachial artery 5 cm above the interepicondylar line. This artery continued as superficial radial artery in the lateral side of the forearm, where there was no radial artery. There was a connecting blood vessel between radial and ulnar arteries approximately 1 cm below the interepicondylar line (Figure 3). Other branches of axillary and brachial arteries were as usual.

Discussion

In normal morphogenesis, the SBA is not an unexpected variation on the contrary an essential blood vessel. The SBA is an important vessel in fetal life, which replaces or supports

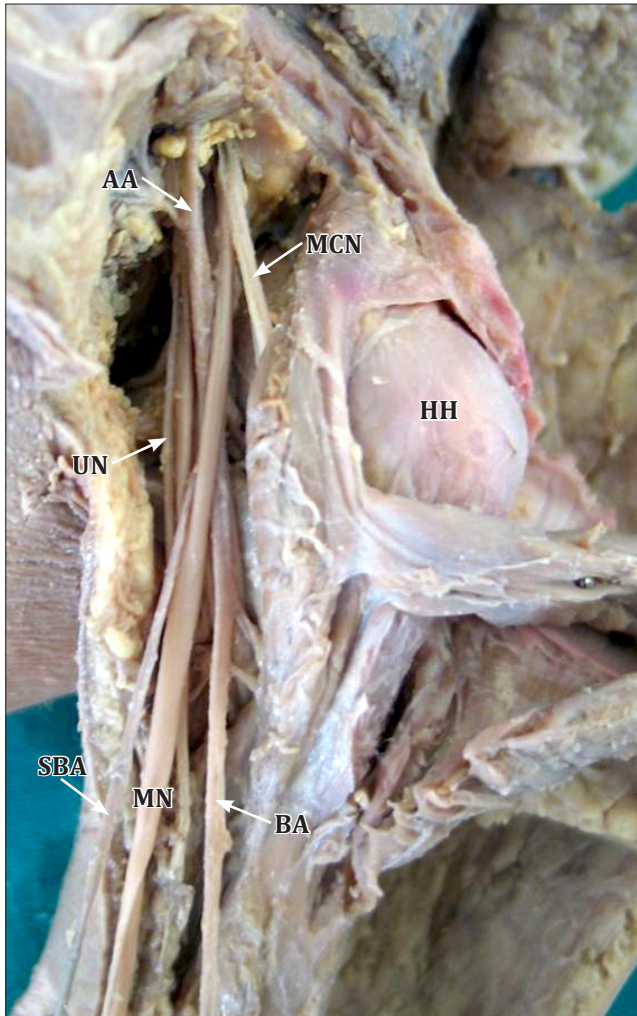


Figure 1. Left arm, anterior aspect. (*SBA: superficial brachial artery; HH: head of the humerus; BA: brachial artery; MCN: musculocutaneous nerve; AA: axillary artery; UN: ulnar nerve; MN: median nerve*)

the definitive brachial artery [7]. SBA anastomoses with the distal segment of the brachial artery plays an increasing hemodynamic role that leads to involution of the proximal segment of the superficial brachial artery. This may represent the origin of the radial artery [4].

SBA is named so because it runs superficially to median nerve and replaces the main trunk [8]. The SBA classified as superior, median and inferior due to its origin in the proximal arm. Although Adachi called the radial artery of the SBA as *arteria brachialis superficialis lateralis inferior* [8], some investigators called this variation as high originated radial artery [3]. Yang et al. reported type II SBA which continued as radial artery after giving muscular branches to the biceps and brachialis in 2.3% of cases [9]. McCormack et al. found 105 examples in 750 arms (14%) of a 'radial artery' originating proximally to the intercondylar line [3].

If SBA is an aberrant artery and connected with brachial artery or its terminal branches, Adachi called this variation as "Inselbildung" [8] and the incidence of this artery reported as 0.66% [3], 0.7% [4], 1.25% [2].

Similar to our case, Lippert and Pabst reported that in 4% of cases, axillary artery divided into two branches, one of which ran behind the median nerve and the other in front of the roots of the median nerve [5]. Superficial arteries of the forearm usually originated from the SBA which was parallel to the brachial artery. Lippert and Pabst also reported that origin of the brachial artery from the SBA with ulnar and common

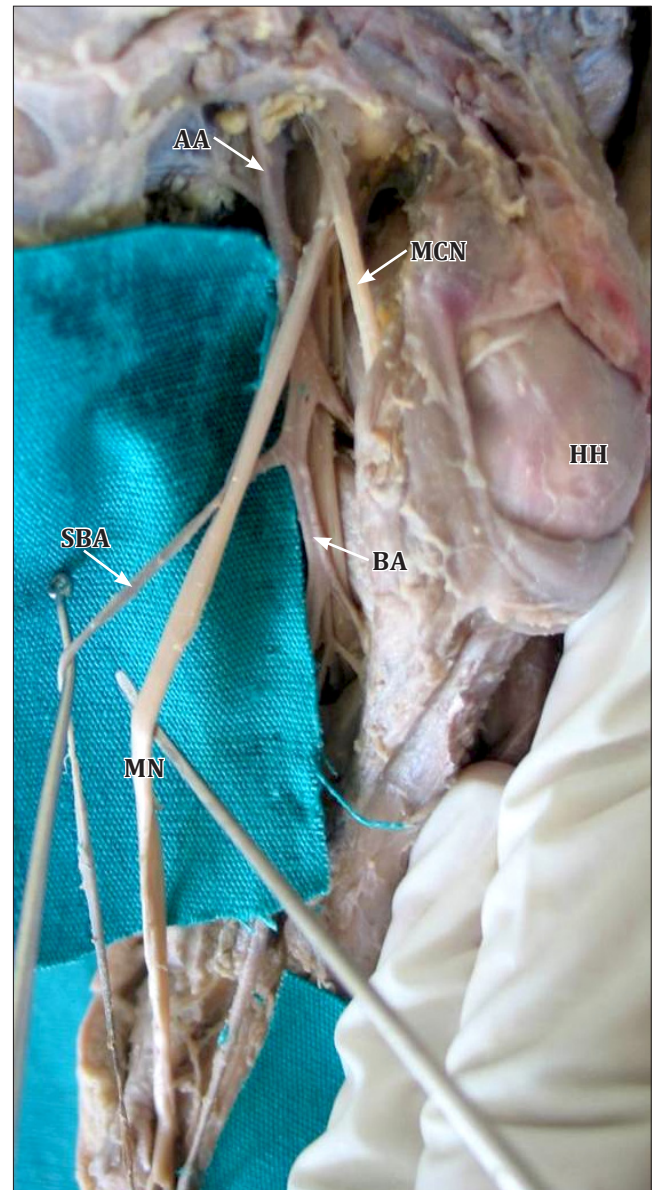


Figure 2. Left arm, anterior aspect. (*SBA: superficial brachial artery; HH: head of the humerus; BA: brachial artery; MCN: musculocutaneous nerve; AA: axillary artery; MN: median nerve*)

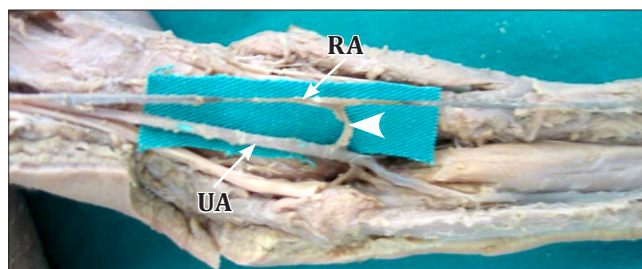


Figure 3. Connecting blood vessel (**white arrowhead**) between radial (RA) and ulnar arteries (UA).

interosseous arteries from the brachial artery was 5% of cases; and continuation as radial artery which anastomosed with the brachial artery in the cubital fossa was 3% of cases [5]. In our case, it anastomosed approximately 1 cm below the interepicondylar line.

In our case we found a high originated brachial artery and SBA which originated from the axillary artery and a superficial radial artery originated from the SBA. Also in this case ulnar and common interosseous arteries originated from the brachial artery. Encountering all these variations in a single case is very uncommon.

Krstonosić et al. reported a SBA continued as radial artery and in the cubital fossa, about 3 cm below the crease of the elbow, the SBA connected to the brachial artery with an anastomotic branch placed deep to the aponeurosis of the biceps brachii muscle. This connecting blood vessel was about 1-1.5 cm long and 0.4-0.7 cm wide. In the forearm, the SBA continued as radial artery, whereas the brachial artery continued as ulnar artery [10]. In our case, approximately 1 cm below the intercondylar line there was a connection between SBA and ulnar artery.

The Type II SBA continued in the forearm as the radial artery with a frequency of 6% by Keen ("Type B"), 7% by Fuss et al. ("Type 5"), and 2.3% by Yang et al. [1, 4, 9].

SBA, if exists, usually runs superficial to the the bicipital aponeurosis, thus it may be easily confused with a vein. It may complicate intravenous drug administration and venipuncture in general and also percutaneous brachial catheterization. Artery may be mistaken for a vein. Its superficial course makes it more prone to injury, which may result in bleeding [5]. The presence of SBA can cause misinterpretation of the angiographic images as well. So knowledge of this variation is important, not only to the anatomist, but also to the radiologist and surgeon.

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