Case Report

Unilateral accessory brachial artery: A case report with embryological background and review of the literature

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ABSTRACT

Introduction: The accessory brachial artery is a rare arterial variation of the upper limb. It was observed in 0.1–0.8% of upper extremities. In comparison with the brachial artery, the accessory brachial artery has a narrow caliber.

Case presentation: During dissection of an old African male cadaver, the brachial artery was observed bifurcating into accessory brachial artery medially and main brachial artery laterally. These two arteries then rejoined in the cubital fossa, forming a common stem, which bifurcated directly into radial and ulnar arteries.

Clinical discussion: Detailed knowledge about such arterial variation is clinically essential for angiographic images evaluation, trans-ulnar or trans-radial coronary catheterization, venipuncture, traumatic injuries and fracture management, and many other procedures in the arm or the forearm.

Conclusion: The accessory brachial artery is a rare upper limb arterial variation. Knowing such variation is essential for medical workers, especially for surgeons and radiologists.

1. Introduction

Many vascular variations can be encountered in clinical practice or cadaveric dissection. Arterial variations are not as common as venous ones. They can be seen at the origin, through the course, or at the branching of the artery. Arterial variations are frequently observed in the femoral, axillary, hepatic, superior mesenteric, and renal arteries [1]. In regards to the upper limb, variations are rarely observed in the radial, ulnar, and brachial arteries. Those variations were reported in 11–24.4% of the cases [2]. Several upper limb arterial variations have been reported in the literature, among those, accessory brachial artery has the least prevalence [3].

The brachial artery is the main arterial supplier of the arm, forearm, and hand. It arises beyond the lower border of teres major muscle as an extension of the axillary artery. Then, it passes distally along the ventral surface of the arm to end in the cubital fossa by dividing into ulnar and radial arteries. Brachial artery variations were reported in 20% of the cases [4]. The accessory brachial artery is an upper limb arterial variation that presents in 0.1%–0.8% of the population. It originates from the axillary or the brachial artery and rejoins the brachial artery later in the cubital fossa. Compared to the brachial artery, the accessory brachial artery has a two or three times narrower caliber [5].

This variation was firstly reported by Green, in 1839 [6]. After that, Ruge suggested naming it ‘inselbildung’ (the island) because of the island shape resulting from its bifurcation and reunion [7]. Finally, McCormack named it the accessory brachial artery [8], and Rodriguez-Niedenfuhr then applied this name in his comprehensive studies [3,9]. Being aware of such variations and different courses of blood vessels is crucially important, especially for medical workers in the radiology field and surgeons in different subspecialties.

2. Case description

This case was reported according to the Surgical CAse REport (SCARE) Guidelines [10]. During a routine dissection at the Department of Anatomy, a rare arterial variation has been observed in the left upper limb of an old African male cadaver preserved in formaldehyde solution. A longitudinal incision was applied through the skin and subcutaneous tissue–in the midline of the ventral surface of the arm—which were then pulled apart. After that, a longitudinal cut was made through the deep fascia along the medial border of the biceps brachii muscle, which was retracted laterally to observe the brachial artery. On dissection, the brachial artery was bifurcated into two arteries, namely the accessory brachial artery and the main brachial artery that run medially &
laterally, respectively. The bifurcation was detected at the joining point of the upper two-thirds of the brachialis muscle, 17.4 cm distal to the acromion. The two arteries rejoined in the cubital fossa at the level of the neck of the radius, forming a common stem. When the dissection was extended to the forearm anteriorly, bifurcation of the common stem into ulnar and radial arteries was noticed (Figs. 1–3). The calibers of the arteries mentioned above are listed in Table 1. Along the course of both the brachial and the accessory brachial arteries, two small veins were observed (vena comitans), which terminated by draining to the axillary vein (Figs. 2 and 3).

3. Discussion

The right subclavian artery has two embryological origins; its proximal part originates from the aortic arch, and its distal part originates from the seventh cervical intersegmental artery. In contrast, the whole left subclavian artery originates from the seventh cervical intersegmental artery. Thereafter, bilaterally, the seventh cervical intersegmental artery gives a lateral branch to the upper limb. This lateral branch becomes the axial artery of the upper limb, which gives the axillary and brachial arteries proximally, and ulnar and radial arteries distally. The radial artery arises proximal to the ulnar one; that is why it rejoins the main artery again at the origin of the ulnar artery. Normally, the part of the radial artery proximal to this rejoining point disappears. Abnormalities that lead to the persistence of this part give rise to the accessory brachial artery. In rare occasions, the accessory brachial artery may arise from the abnormal branching and rejoining of the axial artery [11]. It may also arise from the persistence of more than one cervical intersegmental artery on other occasions. These arteries enlarge into two axial arteries, one of them gives the brachial artery, and the other gives the accessory brachial artery [12].

The accessory brachial artery relation to the median and musculocutaneous nerves differs among cases, as described by McCormack et al. [8] and Chakravarthi et al. [11]. However, we could not figure out this relation in our case because the two nerves were cut. Furthermore, we could not find branches from the accessory brachial artery or the brachial artery. In many cases, the accessory brachial artery continued beyond the elbow as a superficial accessory ulnar artery and contributed to the formation of the superficial and the deep palmar arches [11,13,14]. In our case, the main brachial artery was normally divided into the ulnar and radial arteries at the cubital fossa. In some cases, the axillary artery gave rise to the main brachial, accessory brachial, and profunda brachi arteries [11]. However, in our case, the accessory brachial artery rejoined the main one in the cubital fossa, forming a common trunk that divided instantly into ulnar and radial arteries.

Detailed knowledge of this vascular variation, its origin, course, relations, branches, bifurcation, reunion and bifurcation again, and its dimensions (length and caliber) is essential. This knowledge is not needed merely for being an anatomist, but it is required in many medical fields, such as radiology, orthopedics, oncology, intensive care unit, and different surgical subspecialties (vascular, reconstructive, etc.). The possibility of having a persistent accessory brachial artery should be considered during dye injection in angiographic studies preparation, especially for coronary surgeries. In addition, it is essential for angiographic images evaluation. This knowledge is essential for all surgical procedures in the arm or the forearm, especially in traumatic injuries, fracture management, and trans-ulnar or trans-radial approaches for coronary catheterization.

Regarding coronary catheterization, this variation is especially essential in the trans-radial approach. The radial artery shares the same longitudinal axis with the accessory brachial artery. Therefore, the catheters can inter from the radial to the accessory brachial artery rather
than the brachial artery. The narrow caliber and the spasms of the accessory brachial artery make it difficult for the catheter to pass through; this may dangerously complicate the procedure [5]. These complications of the narrow caliber may also occur during percutaneous brachial catheterization if the catheter was infused in the accessory brachial artery instead of the brachial artery. The accessory brachial artery is highly susceptible to damage during lateral arm flap harvesting, which is supplied by the radial collateral artery, a branch of the brachial artery. The accessory brachial artery might be mistakenly considered as vein at the cubital fossa, which makes venipuncture and intravenous drug administration very difficult. Because of its superficial course, the accessory brachial artery is vulnerable to damage that can cause massive bleeding, resulting in ischemia. On the other hand, the accessory brachial artery can provide collateral circulation in cases of brachial artery occlusion.

As the course and the branching pattern of this artery varies across the cases, reporting this case with its anatomy and comparing it the previously reported cases can help the medical workers in radiology, orthopedics, oncology, intensive care unit, and different surgical sub-specialties to take all these forms into consideration.

4. Conclusion

The accessory brachial artery is a rare arterial variation of the upper limb. It has been reported in 0.1–0.8% of the population, with different courses and different relations to nerves. Knowing such arterial variation with its various anatomical courses is essential for medical workers in different fields, especially in surgery, radiology, oncology, orthopedics, and intensive care unit.

Ethical approval

The study was performed in a cadaver of an unknown identity. Ethical approval was taken from the ethics committee at the Faculty of Medicine, University of Khartoum, Sudan.

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The study was not funded.

Authors contribution

Walaa Elhaiem participated in study design, data collection, data interpretation, writing the paper, and submitting the article to the journal. Wejdan Gad Alsaid Alhussain participated in study design, data collection, data interpretation, writing the paper, and approving the paper for publication. Mugahid A. Salih participated in study design, data collection, data interpretation, and approving the paper for publication.

Trial registry number

1. Name of the registry: The study was not registered.
2. Unique identifying number or registration ID: N/A.
3. Hyperlink to your specific registration: N/A.

Consent

This study was performed on a cadaver of an unknown identity. The Anatomy department is considered the legal guardian of such cadavers. Written informed consent was obtained from the Anatomy Department, Faculty of Medicine, University of Khartoum, Sudan.

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The authors declare any conflict of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.
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