LETTER / Cardiovascular imaging

Superficial brachioradial artery: Multidetector-row computed tomography angiography findings in one case

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Various anatomical variations in arterial patterns of upper limb have been frequently observed either in routine dissections or in clinical practice. Individual variations in the branching pattern of the arteries in the arm are important in practical viewpoints because a large number of vascular invasive and noninvasive imaging and surgical procedures are performed in the upper limb [1]. The radial artery having a high origin proximal to the intercondylar line from either the axillary artery or brachial artery is called superficial brachioradial artery [2]. The prevalence of the superficial brachioradial artery with origin at the level of axillary artery was found as 1.25–5.9% in the literature [2,3].

Here, we report the present multidetector-row computed tomography angiography (MD CTA) findings of a rare variant superficial brachioradial artery arising from the second part of the axillary artery in the axillary fossa and discuss its incidence, MD CTA findings, clinical and surgical importance with a detailed review of the literature. To the best of our knowledge, MD CTA findings of this rare vascular variant have not been previously published in the English literature.

Case report

A 19-year-old Caucasian women was admitted to our hospital because of numbness in both of her hands for approximately one month. Her medical history was only significant for smoking for one year. On clinical examination, the pulse of the left radial artery was weak at the wrist, and this prompted further investigation to evaluate the left upper extremity arterial vasculature. Left upper extremity MDCT angiography of range extending from the aortic arch to the palmar arch was performed on a 64-row MDCT unit (Aquilion 64; Toshiba, Tokyo, Japan). For three-dimensional image reconstruction, all acquired data were processed on a separate workstation (Vitrea 2; Vital Images, Plymouth, Minn, USA) with multiplanar reformatting, maximum intensity projection and volume rendering. These images demonstrated a variant branch arising from second part of axillary artery. Thoracoacromial and lateral thoracic arteries were seen arising from the second part of the axillary artery, as usual. About centimeters further distal to the origin of variant artery, anterior circumflex artery arose from the third part of the axillary artery. The course of the variant artery was superficial, running downwards and laterally in the arm, with giving off only one muscular branch. It had superficial course in the forearm over the tendon of the snuffbox. The diameter of the observed branch was smaller than proper one. Distal portion of the variant artery was also hypoplastic. The proper brachial artery followed its usual course and continued through the ulnar artery. It also sent off the radial recurrent artery in front of the radial head. In the upper third of the forearm, the ulnar artery gave off the interosseous arteries. Anterior ulnar recurrent artery emanated from the ulnar artery two centimeters proximal to the origin of the interosseous arteries (Fig. 1). Our findings depicted a case of variant artery which should have been called superficial brachioradial artery.

Discussion

The variations in the arterial anatomy of the upper limbs occur in up to one in five patients, and the variability of the arteries in the arm is reported to one in four patients [1].

The high origin of radial artery is the most common arterial variation observed in the upper limb, showing the incidence rates between 12.3—16.7% in several studies [2,4,5]. The case we reported here had superficial brachioradial artery, a rare variation which originated directly from second part of the axillary artery, proximal its usual level of origin, and coursed over the brachioradial muscle and tendon. This also was hypoplastic in the distal portions, which makes it difficult for the arterial cannulation. The radial artery having a high origin above the elbow from either the axillary artery or brachial artery is called superficial brachioradial artery. According to Rodriguez et al. [2], brachioradial artery could arise from proximal segment of brachial artery 65%, distal segment of axillary artery 23% and less frequently from middle or distal segment of brachial artery in 7.7% and 3.9%. When the superficial brachioradial artery originates from the axillary artery (AA) in the axillary fossa, runs superficially to the median nerve, crosses the cubital fossa, and in some cases anastomoses with the brachial artery (BA) through a vessel with a sling-like loop or a rectilinear form at the antecubital fossa. It may also send off some
muscular (supplying the flexor compartment muscles of arm and forearm) and cutaneous collateral branches as its curse [3]. In some cases, this variant artery may give off recurrent radial artery as a collateral branch at the level of the cubital fossa. Origin of the recurrent radial artery in the presence of brachioradial artery has not been reported so far by authors of large samples. It commonly originated from the brachioradial artery followed by brachial and finally from the anastomosis between the two vessels [2]. Superficial brachioradial artery classically terminates in the hand by participating in the formation of the deep palmar arch [2].

DSA is regarded as the gold standard in the evaluation of vascular structures although its invasive nature significantly limits its role [6]. The capability of computed tomography (CT) in providing precise and high-definition vascular details noninvasively has further improved with the multidetector CT (MDCT) technology [7]. Multidetector-row scanners are particularly beneficial for angiographic applications due to their features of better complete anatomic coverage, contrast enhancement of the arteries, and longitudinal spatial resolution. The number of MDCT angiographic studies performed is gradually increasing; therefore, knowledge of normal and variant anatomic features has become more important than in the past. CTA is an important diagnostic imaging modality for the evaluation of upper extremity arterial abnormalities. Upper extremity CTA shows excellent performance in the evaluation of forearm circulation, whereas the evaluation of the hand remains the realm of DSA in daily radiology practice. MDCT also allows the radiologist to use image post-processing techniques such as 3D (three-dimensional) VR (volume rendering), MIP (maximum intensity projection) and multiplanar imaging to better evaluate the origin and the route of anomalous arteries in the presence of anatomical variations [8,9]. Imaging of the normal anatomical structure and its variations through MDCT contributes to the surgical planning of the patients who will undergo surgery for various reasons [10]. Preoperative knowledge of variant anatomy may assist in the selection of treatment options and surgical planning, which in turn facilitates surgical dissection and helps avoiding iatrogenic injury [11].

In conclusion, unusual origin of the radial artery maybe significant in clinical point of view, especially to vascular and plastic surgeons. When the superficial artery persists, it is also more vulnerable and prone for injury at times of accidents and crush injuries. The knowledge of this type of variation is important in diagnostic purposes, like cardiac catheterization, arterial grafting and other angiographic procedures. MDCT angiography examination of our patient permitted an accurate and detailed evaluation of this rare vascular variant. CTA could be considered as the first-line diagnostic test in case of clinical or ultrasound abnormality.

Disclosure of interest
The authors declare that they have no conflicts of interest concerning this article.

References


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