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CASE REPORT

Tortuosity in a Bilateral Brachioradial Artery of Dissimilar Arterial Origins and Clinical Implications

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Abstract

Dissection of the upper limb of a 67 year-old male cadaver revealed tortous bilateral brachioradial arteries; these originated in the proximal third of the arm. The left brachioradial artery originated from the brachial artery proper, while the right arose from the superficial brachial artery. The right median nerve was formed within the proximal 1/3rd of the limb from its unusually longer lateral and medial roots, the nerve coursing 3-4 cm distal to its formation passing through the brachial artery and the brachioradial artery forming an island pattern (an inselbildung). With an increased usage of the radial artery as a vascular access route over the femoral artery, Variants of the artery, its origin, morphology and topography are significant in selection of the artery for percutaneous transradial coronary catheterization. Such knowledge will minimize iatrogenic complications or vessel crossover rate. Combination of high-origin brachioradial artery together with tortuosity are uncommon; but known causative etiological factors of procedural complications. Pre-operative angiography, duplex scanning are preoperative studies that useful for candidate selection for coronary percutaneous transradial catheterization.

Keywords: Brachioradial arteries, Superficial brachial artery, Median nerve, Axillary artery, Coronary angiography

Introduction

The brachioradial artery (BRA) is defined as radial artery of a high origin, co-existing in the whole arterial pattern of the limb with a brachial or superficial brachial artery (SBA) those branches into ulnar and common interosseous trunk. The BRA is one of variant arterial trunks of the upper limb with a reported high incidence of 13.8% [1]. The BRA occurs more unilaterally than bilaterally [2, 3] arising more frequently from the brachial than axillary artery. Most frequently from the upper third of the brachium, followed by the middle and least from the distal 1/3rd third brachium respectively [1]. The BRA has been reported crossing the median nerve (MN) and adopting an anterior superficial position to it along the arm, with the brachial artery in its normal position behind the MN, or in the case of the SBA, the artery is placed in front of the MN [4]. Other morphological features of the BRA is the finding of possible anastomosis with the brachial artery at the antecubital fossa, either with a sling like loop or rectilinear form [5,4,1]. In the presence of a BRA, the origin of the radial recurrent artery was most commonly from the brachioradial, followed by the brachial and finally from the anastomosis between both vessels [1]. A rare anastomosis between the BRA and the median artery (MA) had been reported in the forearm [6] which was explained as being normally expected due to the high incidence of the median artery [7]. Anatomic variants of the radial artery that may lead to increased procedural complications when employed as a vessel of choice in percutaneous transradial coronary catheterization include, hypoplasty of the artery (Diam < 2mm) high bifurcating of the artery, increased tortuosity, loops and bends in its morphology and stenosis of the artery.

Case Report

During routine academic dissection we reviewed a pre-dissected upper limbs of a 68 -year- old male cadaver and observed that the left brachial artery gave off a BRA about 5cm distal to the inferior border of the teres major muscle (Figure1). In the right limb, the AA exited between the medial and lateral roots of the MN as the SBA (Figure 2). Another finding in the right limb also was the placement of the MN between the brachial artery and the BRA in the proximal 1/3rd arm, the nerve running through both arteries like an Island formation, an inseldinburg (Ruge). About 5cm distal to the inferior border of the teres major, both BRAs, presented with tortuous configurations comprised of coils, twisting and some kinks, more pronounced in the in the left upper limb (Figure 1) when compared with the right (Figure2) . Both BRA coursed mediolaterally, crossing the MN and placed laterally to the nerve, adopting the usual topographical course of the radial artery in the forearm and distally in the wrist region. We observed that MN formation in the right limb was a deviation from the normal. The SBA escaped between unusually very long lateral and medial roots of the MN, the nerve being formed about the junction of the proximal and middle third of the arm, (Figure2). About 1 ½ cm distal to the formation of the right MN, the nerve passed through both the BRA and the brachial artery in form of an island pattern (an inselbildung). MN formation in the left arm was normal (Figure 1).

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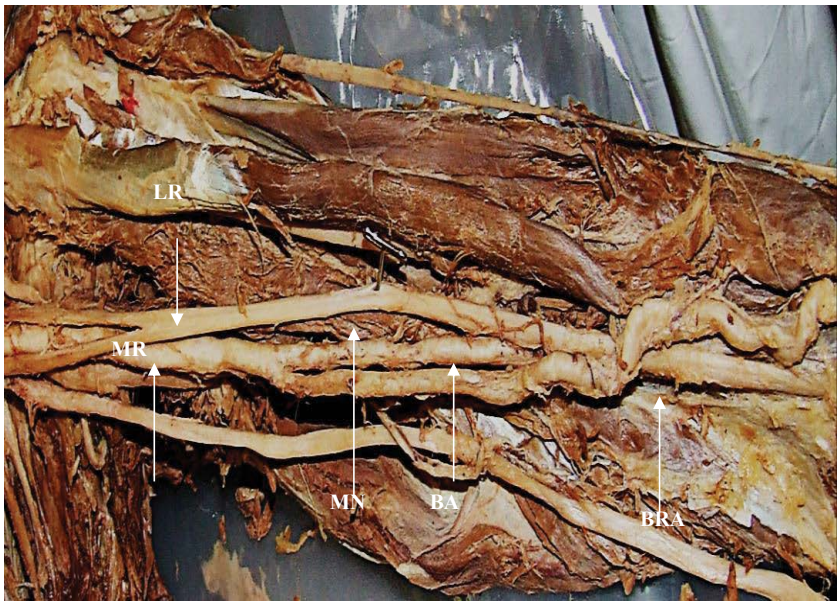
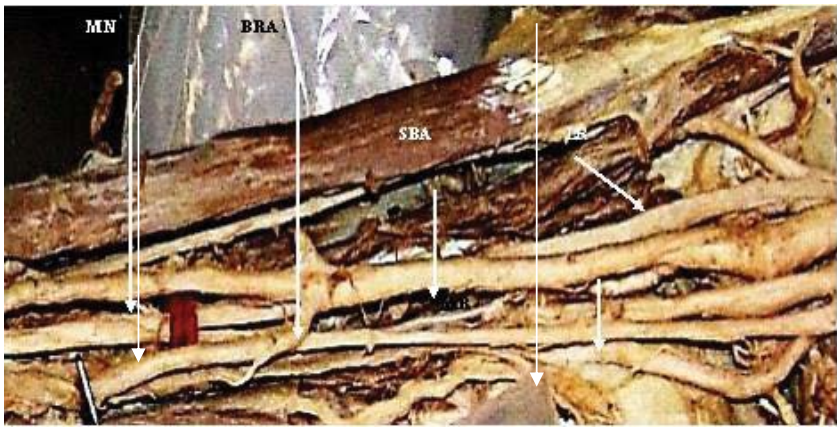


Figure1a: is the image of the left arm showing the brachioradial artery arising from the brachial artery, while the right brachioradial artery is arising from the superficial brachial artery. The median nerve in the left upper limb is formed in the upper 1/3rd of the brachium, while the right median nerve forms at about the junction of the proximal and middle thirds of the brachium. Tortuosity in the brachioradial arteries commence at about 3-4 cm from their respective origins, and more pronounced in the left limb.



Figures2a&2b: Both brachioradial arteries course mediolateralwards, crossing and, impinging on their respective median nerves (Figures2a&b) and in the forearm are placed superficially coursing on their respective pronator teres muscle to run in the usual position of the radial artery. About 1cm distal to its formation, the right median nerve runs between the brachioradial artery medially and the laterally placed brachchial artery (an inselbindugh until the latter travelled mediolaterally to cross anterior to the brachai artery (Figure2b). MN; median nerve, LR; lateral head of MN, MH; medial head of MN, BA;, brachial artery, SBA; superficial brachial artery, PT, pronator teres muscle, UN, ulnar nerve.

Discussions

Vascular malformations are frequently straightforward to detect; anomalies result from deviations from typical vascular development. Development of the arterial pattern in the upper limb occurs between stages 12 through 23 of the developmental process and unrelated to any stage of development [8]. and suggested that the variations arise through the persistence, enlargement and differentiation of parts of the initial network which would normally remain as capillaries or even regress and suggested that arterial patterns develop from an initial capillary plexus and its proximodistal maintenance, enlargement and differentiation of some capillaries and the regression of others [8]. The BRA is one of upper limb arterial trunks classified as located in both the arm MR LR MN BA BRA Figure1a: is the image of the left arm showing the brachioradial artery arising from the brachial artery, while the right brachioradial artery is arising from the superficial brachial artery. The median nerve in the left upper limb is formed in the upper 1/3rd of the brachium, while the right median nerve forms at about the junction of the proximal and middle thirds of the brachium. Tortuosity in the brachioradial arteries commence at about 3-4 cm from their respective origins, and more pronounced in the left limb. MN BRA SBA LR MR Figures2a&2b: Both brachioradial

arteries course mediolateralwards, crossing and, impinging on their respective median nerves (Figures2a & 2b) and in the forearm are placed superficially coursing on their respective pronator teres muscle to run in the usual position of the radial artery. About 1cm distal to its formation, the right median nerve runs between the brachioradial artery medially and the laterally placed brachchial artery (an inselbindugh until the latter travelled mediolaterally to cross anterior to the brachai artery (Figure 2b). MN; median nerve, LR; lateral head of MN, MH; medial head of MN, BA;, brachial artery, SBA; superficial brachial artery, PT, pronator teres muscle, UN, ulnar nerve and forearm with a reported 13.8% incidence [1], one of the highest among the reported variants in the upper limb. Bilateral occurrence of the BRA coexisting with tortuosity bilaterally is very infrequent. These variants, a high origin radial artery with tortuosity are 2 of the various anatomical variants of the radial artery that are etiological in the causation of increased procedural complications including procedural elongation and failure when the artery is employed in diagnostic coronary angiography and percutaneous coronary intervention. In a study of radial artery anomaly and its influence on transradial coronary procedural outcome in 1540 consecutive patients, Lo TS et al (2008) [9] reported overall incidence of radial artery anomaly of 13.8% (n = 212), 108 (7.0%) patients had a high-bifurcating radial origin, 35 (2.3%) had a full radial loop, 30 (2.0%) had extreme radial artery tortuosity and 39 (2.5%) with miscellaneous anomalies such as radial atherosclerosis and accessory branches. Overall transradial procedural success was 96.8% [3]. LO,TS et al also reported procedural failure as being more common in patients with anomalous anatomy than in patients with normal anatomy (14.2% vs 0.9%, p,0.001). Procedural failure in patients with high radial bifurcation, radial loop, severe radial tortuosity and other anomalies were 4.6%, 37.1%, 23.3% and 12.9% [9]. Knowledge of anatomic variants of the radial artery are important to Interventional radiologists in the selection of appropriate procedure and selection and suitability of candidates for diagnostic coronary angiography and percutaneous coronary intervention in order to minimize procedural complications and to neuroradiologists in the interpretation of images [10].

Conflict of Interest

None.

Acknowledgments

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