

Original Research Article

Observation of modes of brachial artery termination in south Indian cadavers

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ABSTRACT

Background: Variations in upper limb arteries have been frequently observed. Accurate knowledge of muscular and neurovascular variations is important for both surgeons and radiologists, which may prevent diagnostic errors.

Methods: A study was done to note the variations in the termination of brachial artery in relation to the level of termination and the terminal branches. A total of 60 upper limbs (33 Right, 27 Left) were studied. The level of termination of brachial artery was identified based on the distance between the intercondylar line and the point of termination. The classic textbook description of brachial artery bifurcating into radial and ulnar arteries, 1 cm distal to elbow joint (ICL) was taken as normal.

Results: A high origin of radial artery was noted in 11.67% of cases. Variations in the origin and relationship of median nerve to brachial artery, radial artery and ulnar artery was seen in 4 cases.

Conclusions: Due to higher incidence of anatomical variations of arteries of the upper limb, prior anatomical knowledge of anomalies is of great clinical significance to vascular surgeons, orthopaedicians and radiologists performing angiographic studies.

Keywords: Brachial artery, Level of termination, Terminal branches, Variations

INTRODUCTION

A basic law of vascular anatomy is that the only thing which remains constant is its variability.¹ Brachial artery is the continuation of the axillary artery beyond the lower border of the teres major muscle. Opposite the neck of the radius in the anterior cubital region, it divides into radial and ulnar arteries.^{2,3} The ulnar artery, the deeper and the larger of the two terminal branches of the brachial artery, begins a little below the bend of the elbow, and passing obliquely downward, reaches the flexor carpi ulnaris muscle in its middle third, whereas the ulnar nerve is covered by the muscle throughout its entire course running under the tendon in the wrist region. It then runs along the ulnar border up to the wrist, crosses the transverse carpal ligament on the radial side of the

pisiform bone, and immediately beyond this bone divides into two branches, which enter into the formation of the superficial and deep palmar arches. The radial artery appears, from its direction, to be the continuation of the brachial, but it is smaller in caliber than the ulnar. It commences at the bifurcation of the brachial, just below the bend of the elbow, and passes along the radial side of the forearm to the wrist and takes part in the completion of the superficial and deep palmar arches.⁴ Blood pressure and pulsed Doppler ultrasonographic measurements are routinely assessed through distal part of brachial artery.⁵ Studies done earlier have reported cases of superficial radial artery and high bifurcation of brachial artery. A detailed knowledge of variations of branching pattern of vessels is essential for providing accuracy during vascular diagnosis and re-constructive

surgery and also in evaluation of angiographic images.⁶⁻⁸ Accordingly, the present study was designed to evaluate the anatomical variations of the brachial artery and its morphology, embryogenesis and clinical implications.⁹

METHODS

A routine dissection of 60 formalin-preserved cadaveric upper limbs of South Indian cadavers was done in the Department of Anatomy, JJM Medical College, Davanagere. They comprised of 33 right side and 27 left side upper limbs, irrespective of sex. The arm and cubital fossa were dissected to expose brachial artery as per Cunningham’s manual of practical Anatomy.¹⁰ The skin, superficial fascia, deep fascia and muscles were separated using some scalpel and forceps and the anatomical variations of the brachial artery and its terminal branches with their relation to the surrounding structures were examined and representative anatomy was photographed for the proper documentation. Terminal branches of brachial artery and its level of termination were noted down. The photographs were taken in Normal, as well as specimens showing Anomalous division in the arm. Terminal branches were carefully traced. Level of termination was measured by measuring the distance between the intercondylar line (ICL) of the humerus (line joining the medial and lateral epicondyle of the humerus) and the point of termination using a measuring tape.

RESULTS

A total of 60 upper limbs (33 Right, 27 Left) were included for the study. A high origin of radial artery was noted in 11.67% of cases which is 7 of 60 upper limbs. Of these 5 were in the right limbs and 2 were on the left side. High origin of ulnar artery was not seen. When the level of termination of brachial artery was considered, the most proximal termination was noted at ‘19’cms proximal to the ICL on the right side. On the right side the other proximal terminations were noted at 1 cm, 2cms, 2cms and 2.5cms proximal to the ICL. The most proximal termination on the left side showed brachial artery termination. ‘9’cms proximal to the ICL. On the left side another proximal termination was noted 2cms proximal to the ICL. Variations in the origin and relationship of median nerve to brachial artery, radial artery and ulnar artery was seen in 4 cases.

In one Lt. upper limb Brachial artery terminated 9cms proximal to ICL. In this limb following termination radial artery descended from its point of origin with a lateral course and descended into the forearm and rest of the course of radial artery was normal. In this same limb following termination Ulnar artery descended from its point of origin with a medial course and descended into the forearm and rest of the course of ulnar artery was normal. In one Rt. upper limb showing Brachial artery termination 19cms proximal to ICL the radial artery following its origin from the medial side of brachial artery, immediately crossed superficial to the median

nerve from medial to lateral side and descended into the forearm from where onwards its course was normal. The course of ulnar artery in forearm was normal in this case.

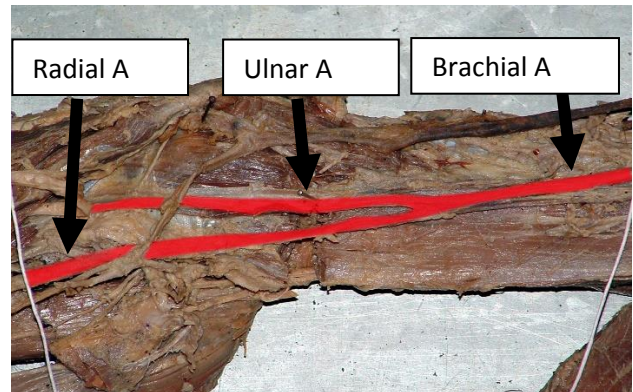


Figure 1: Left Upper limb showing brachial artery termination 9cms proximal to ICL.

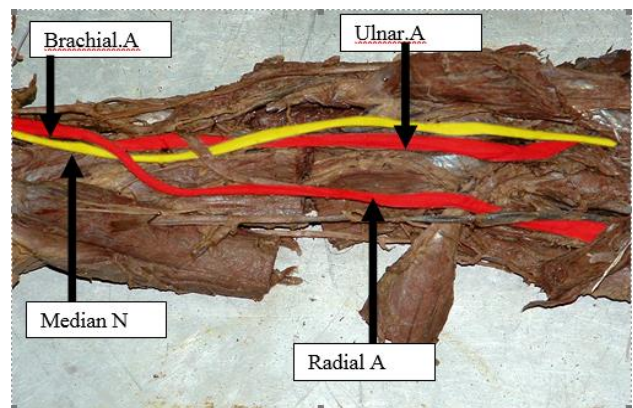


Figure 2: Right upper limb showing Brachial artery termination 19cms proximal to ICL.

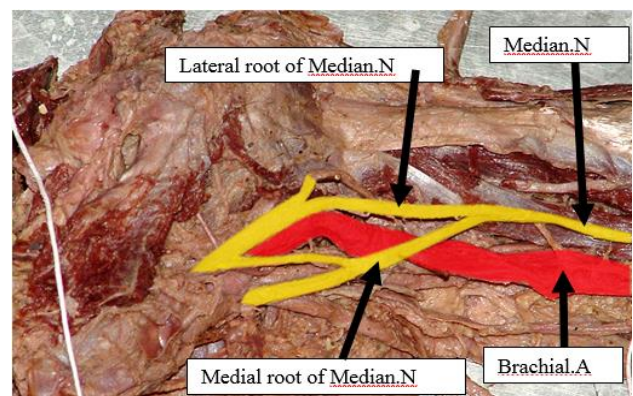


Figure 3: Left Upper Limb with normal course of brachial artery and variation of median nerve origin.

In one Left Upper Limb with normal course of brachial artery, variation of median nerve origin was noted. Median nerve was formed by both medial and lateral roots but received an additional twig from the lateral root to the medial root.

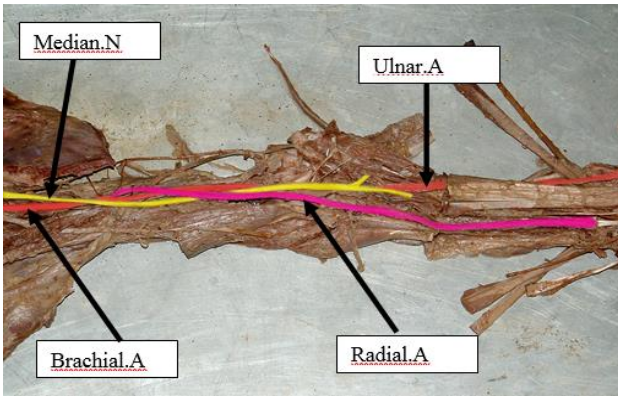


Figure 4: Right upper limb showing Brachial artery termination 19cms proximal to ICL.

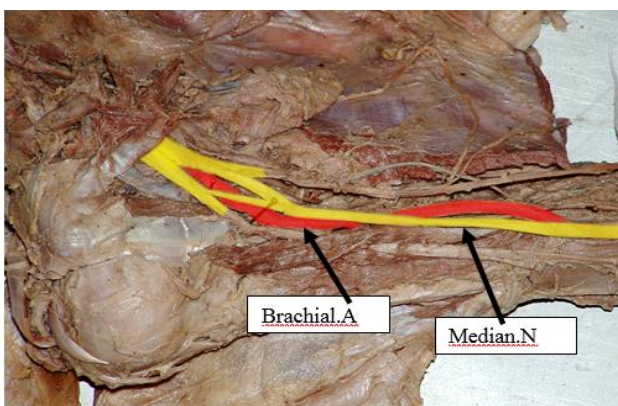


Figure 5: Right Upper limb showing the variation of median nerve.

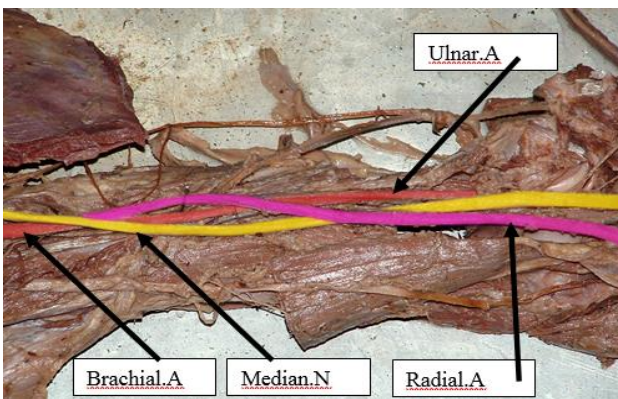


Figure 6: Right Upper limb showing at the pin-radial and ulnar artery and median nerve.

A Right Upper limb showed variation of median nerve. Normally median nerve lies on the lateral side of the 3rd part of axillary artery and continues on the lateral side of the brachial artery in the upper part before crossing superficial to the brachial artery from lateral to medial side in the middle of the arm. In this case however the median nerve was formed on the medial side of the 3rd part of axillary artery and lay on the medial side of brachial artery in its uppermost part from where it

crossed from medial to lateral side of brachial artery superficial to brachial artery. In the middle of the arm the median nerve crossed normally from lateral to medial side of brachial artery and superficial to brachial artery.

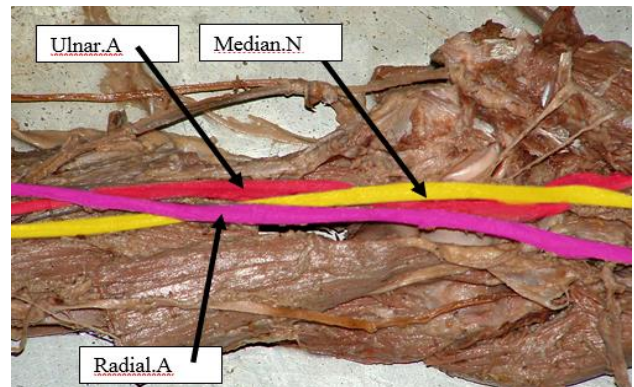


Figure 7: Right Upper limb shows median nerve overlying ulnar artery.

DISCUSSION

Anomalies of the upper limb arterial tree are fairly common. This is mainly because of their multiple and plexiform sources, anastomoses and periarticular networks and functional dominance followed by regression of some paths.¹¹ High origin of radial and ulnar artery forms the highest percentage of variations of brachial artery. High origin of radial artery occurrence is 3 to 15 %, as reported by different authors.¹²⁻¹⁵

They found high origin of ulnar artery in 1% cases only and compared it with similar reports by others.^{14,15} High origin of radial artery is the commonest vascular pattern variation of the upper extremity.^{16,17} In this study the high occurrence of radial artery is seen in 11.67% of cases and high origin of ulnar artery was not seen.

Clinical importance

The Radial artery approach for percutaneous coronary intervention has been proved efficacious. The high division of Brachial artery is a hidden hazard in percutaneous brachial catheterization. Such variations may present a superficial pulse and hazard to venipuncture. Such variations may lead to intra-arterial injections instead of vein in the cubital fossa. Surgically important in pedicle flaps and arterial grafting.

CONCLUSION

Our study confirms the findings of existing literature that high division of Brachial artery is a common variation. In such cases the terminal branches of Brachial artery follow a more superficial course than normal. The clinicians should keep the possibility of such variations in cardiac catheterization and arterial grafting.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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