

AN ANATOMICAL STUDY OF VARIATIONS IN TERMINAL PART OF BRACHIAL ARTERY

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¹Associate Professor, Department of Anatomy, Govt Kilpauk Medical College, India²Assistant Professor, Department of Anatomy, Govt Medical College Krishnagiri, India³Associate Professor, Department of Anatomy, Govt Medical College Krishnagiri, India**ABSTRACT**

Background: The chief artery of the arm is the brachial artery. It begins as a continuation of the third part of the axillary artery, at the lower border of the teres major muscle. It terminates at the level of the neck of the radius by dividing into the small radial artery and large ulnar artery. In the present study we observed higher division of the brachial artery into the radial and ulnar arteries in the middle of the arm. The present study was done on 60 embalmed upper limbs from our department of Anatomy. The upper limbs of the cadavers were dissected and observed for any variations in the branching pattern of the brachial artery. In two limbs of different cadavers we found unilateral higher division of brachial artery. Knowledge of variations in the origin and course of the brachial artery is useful for orthopaedicians, radiologist, and physicians, plastic and vascular surgeons.

INTRODUCTION

Brachial artery is the continuation of the axillary artery from the lower border of the teres major muscle, to the neck of the radius. In the anterior cubital region, where it divides into two terminal branches, radial and ulnar arteries. It gives profunda brachii artery, superior and inferior ulnar collateral arteries, nutrient artery to the humerus and muscular branches in the arm.^[1] It provides the main arterial supply to the arm.^[1] The brachial artery is superficial in its course in the arm, lying immediately deep to the deep fascia of the anteromedial aspect of the arm.^[2] In the proximal arm, the brachial artery lies on the medial side. In the distal arm, it shifts laterally to occupy a central position along the intercondylar line of the humerus. The median nerve crosses superficial to the brachial artery from lateral to medial side. In the cubital fossa it is crossed by bicipital aponeurosis. There are significant variations in the termination and branching pattern of the brachial artery. The radial artery may arise from the brachial (or axillary) artery,^[3] a high bifurcation of the brachial artery,^[4] the continuance of the superficial brachial artery as the radial artery,^[5,6] or a double brachial artery,^[7] Occasionally, the brachial artery divides early, leading to two arteries reaching the cubital fossa rather than one.^[8,9] A similar finding is observed in our present study. Brachial artery plays a key role in multiple clinical applications such as blood pressure recording, Doppler sonographic measurements, angiographies, trauma and reconstructive surgeries. Hence an accurate anatomical knowledge of the origin, course and anomalous branching pattern of

the brachial artery is essential for vascular and plastic surgeons, physicians, orthopaedic surgeons, radiologists and nephrologists, for diagnostic and therapeutic approaches.^[10-14]

MATERIALS AND METHODS

The present study was done on 60 upper limb specimens belonging to the department of Anatomy of Government Medical College Krishnagiri, Tamilnadu. These specimens were taken from embalmed human cadavers used for undergraduate studies irrespective of sex and race, age ranging from 40 to 70 years. The specimens were dissected carefully. The study was approved by the Institutional Ethics Committee (No:(CDSCO):EC/NEW/INST/2023/15250-25012024) Upper limbs having scar marks, congenital anomalies or deformities, pathological fractures were excluded from the study. The brachial artery was followed upward, where it continues from the axillary artery just below the teres major. we traced distally towards the forearm for its further course of terminal arteries to identify any anatomical variations. The measurement of the brachial artery including its terminal level, were taken at two anatomical landmarks, one from the intercondylar line of humerus and the other from the lower border of teres major. Normal and abnormal terminations of the brachial artery were observed, recorded and photographed.

RESULTS

In the present study, out of 60 upper limbs dissected, two cadavers showed unilateral variation in the termination of brachial artery. We found a higher division of the terminal branches, occurring at mid arm level.

On an average, the length of brachial artery was 24.25cm and its terminal branches bifurcated 2.85cm above to intercondylar line. Among the 60 upper limbs studied, a few limbs showed mild deviation from the normal bifurcation level. It ranged from 1.5 to 2cm just below the neck of the radius. In a few limbs, the level of bifurcation was above the neck of radius ranged from 1.5 to 2cm. In 2 upper limbs, bifurcation occurs 11.5 -12.5cm from the lower border of teres major muscle.

DISCUSSION

Arterial variations of the upper limb are commonly reported in many articles. A high bifurcation of the brachial artery at the mid-arm level was observed in the right upper limb, which is an extremely rare anatomical variation. Proximal to this early division, the vessel exhibited a normal branching pattern, originating the profunda brachii artery and the usual muscular branches. A high bifurcation of the brachial artery was observed in the right upper limb. The artery bifurcated into the radial and ulnar arteries at the mid-arm. Prior to this division, it followed a normal proximal course, giving off the profunda brachii and typical muscular branches.



Figure 1: Bifurcation of brachial artery on right upper limb. (MN – median nerve, BA – brachial artery, RA – radial artery, UA – ulnar artery.)

On the right upper limb, the brachial artery bifurcates at the mid-arm level into the radial and ulnar arteries. In the arm, the radial artery was located lateral to the median nerve. In the forearm, it followed a more superficial course, accompanied laterally by the brachioradialis tendon (in its lower part) and medially by the flexor carpi radialis muscle. Thus, the radial and ulnar arteries followed their normal courses in the forearm, except for the radial artery's superficial position.



Figure 2: Bifurcation of brachial artery on right upper limb. (MN – median nerve, BA – brachial artery, RA – radial artery, UA – ulnar artery.)

Embryological Explanation: A high origin, due to persistent duplication or precocious bifurcation. The intersegmental artery is the axial artery of the upper extremity.^[7] The proximal part of this artery is recognized as brachial artery. Beyond the cubital fossa, it continues as the interosseous artery. Embryologically, the radial artery arising proximally from the brachial artery and distally from the interosseous artery. It establishes a connection between these roots at the level of the origin of the ulnar artery which is derived from the interosseous artery. Later the proximal segment disappears.^[6] Abnormalities in morphogenesis during embryonic development can result in variations in the origin and course of the upper limb vessels.^[15,16]

The present study describes a variant in which the proximal origin of the radial artery persisted and failed to connect with the main arterial trunk near the origin of the ulnar artery. Thus, the radial artery arose more proximally, and the brachial artery continued distally as the ulnar artery, demonstrating a high division of the brachial artery.

Clinical Importance: The study was carried out to determine the variations in the level of termination of the brachial artery. A brief knowledge about the variations of blood vessels is important during vascular and reconstructive surgery. Being superficial, the radial artery may be accidentally injured and also mistaken as a vein which may cause reflex vascular occlusion, resulting in disastrous gangrene of the hand.^[17] Cardiac catheterization for angioplasty and arterial grafting, the course and branching pattern of the brachial artery are very important. Arterial thrombosis, producing ischemia after radial cannulation, may be related to high risk of tissue gangrene or amputation.

The incidence of variations in the vascularity of the upper limb varies from 18.53% to 20%. The incidence of high origin of the radial artery ranges from 4.17% to 15.60% in cadavers and is 9.75% in angiographic images and Doppler ultrasound images. Therefore surgeons should be aware of arterial variations in the region before embarking on the procedure.

CONCLUSION

Faulty embryological development of limb vessels may lead to anomalies in the level of division of

major arteries. The present study revealed higher termination of the brachial artery. Hence, an intimate knowledge of variations in the course and branching pattern of brachial artery is important for vascular and plastic surgeons, physicians, orthopaedic surgeons, radiologists and nephrologists, to avoid complications. Awareness of such variations is valuable during diagnostic and surgical procedures.

REFERENCES

1. Standring S, Borely NR, Collins P, Crossman AR, Gatzoulis MA, Herly JC, et al. Upper arm. In: Standring S, Borely NR, Collins P, Crossman AR, Gatzoulis MA, Herly JC, et al., eds. *Gray's Anatomy: the Anatomical Basis of Clinical Practice*. 40th ed. London, UK: Elsevier Ltd; 2008: 827-828, 835-836
2. Sinnatamby CS. Upper limb. In: Sinnatamby CS. *Last S Anatomy*. 11th ed. Philadelphia: Churchill Livingstone Elsevier; 2006: 61.
3. L. J. McCormack, E. W. Cauldwell, and B. J. Anson, "Brachial and antebrachial arterial patterns; a study of 750 extremities," *Surgery, Gynecology & Obstetrics*, vol. 96, pp. 43-54, 1953.
4. H. H. Celik, M. F. Sargon, A. Konan, and E. Kural, "High brachial artery bifurcation: a report of 2 cases," *Bulletin De l'Association Des Anatomistes*, vol. 80, pp. 13-14, 1996
5. T. Nakatani, S. Tanaka, and S. Mizukami, "Correspondence. Superficial brachial artery continuing as the common interosseous artery," *Journal of Anatomy*, vol. 191, no. 1, pp. 155-157, 1997.
6. P. Nkomozepi, N. Xhakaza, and E. Swanepoel, "Superficial brachial artery: A possible cause for idiopathic median nerve entrapment neuropathy," *Folia Morphologica*, vol. 76, no. 3, pp.527-531, 2017
7. Y. Fujii, H. Teragawa, J. Soga et al., "Flow-mediated vasodilation and anatomical variation of the brachial artery (Double brachial artery) in healthy subjects and patients with cardiovascular disease," *Circulation Journal*, vol. 77, no. 4, pp. 1073-1080, 2013.
8. Williams PL, Bannister LH, Berry MM, Collins P, Dyson M, Dussek JE, et al. *Grays Anatomy. The Anatomical Basis of Clinical Practice*. 38th edn. London: Churchill Livingstone. 1999; 319:1539.
9. Hollinshead WH, Rosse C. *Textbook of Anatomy*. 4th Ed. New York; Harper and Row. 1962:214
10. J. A. Aragão, A. C. F. da Silva, C. B. Anunciado, and F. P. Reis, "Median artery of the forearm in human fetuses in northeastern Brazil: anatomical study and review of the literature," *Anatomical Science International*, vol. 92, no. 1, pp. 107-111, 2017.
11. U. Cikla, D. Mukherjee, A. Tumturk, and M.K. Baskaya, "Overcoming end-to-end vessel mismatch during superficial temporal artery-radial artery-M2 interposition grafting for cerebral ischemia: tapering technique," *World Neurosurgery*, vol. 110, p.85, 2018.
12. W. C. Jennings, A. Mallios, and N. Mushtaq, "Proximal radial artery arteriovenous fistula for hemodialysis vascular access," *Journal of Vascular Surgery*, vol. 67, no. 1, pp. 244-253, 2017.
13. D. Kachlik, P. Hajek, M. Konarik, M. Krchov, and V. Baca, "Coincidence of superficial brachio median artery and bitendinous palmaris longus: a case report," *Surgical and Radiologic Anatomy*, vol. 38, no. 1, pp. 147-151, 2016.
14. S. D. Shetty, B. S. Nayak, N. V. Madhav, S. R. Sirasanagandla, and P. Abhinitha, "The Abnormal Origin, course and the distribution of the arteries of the upper limb: a case report," *Journal for Clinical and Diagnostic Research*, vol. 6, no. 8, pp. 1414-1416, 2012.
15. Senior HD: A note on the development of the radial artery. *Anat Rec*. 1926, 32:220-221.
16. Singer E: Embryological pattern persisting in the arteries of the arm. *Anat Rec*. 1933, 55:403-409. 10.1002/ar.1090550407.
17. Harbansingh, Neena Gupta, Bargoitra RN, NP Singh - Higher bifurcation of brachial artery with superficial course of radial artery in forearm- *JK science*, vol 12 no:1, jan-mar 2010.