

Case Report

Unilateral high- up division of Brachial artery in the arm – A case report

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Abstract:

Brachial artery is the principal artery of the arm. It usually begins as a continuation of axillary artery at the distal border of the tendon of teres major and ends about a centimeter distal to the elbow joint by dividing into radial and ulnar arteries. During meticulous dissection of the upper limbs of both sides in the department of Anatomy, Calcutta National Medical College we found that there was high bifurcation of brachial artery into radial and ulnar arteries near the level of insertion of coracobrachialis muscle in right side. Left arm showed usual arterial distribution pattern. High division of the brachial artery has a profound applied importance for blood pressure measurement and also in the field of vascular surgery and radiology. So the possibility of this variation should be kept in mind before any vascular surgery in the region of the forearm or while interpreting arteriogram of the upper limb.

Key words: Brachial artery, High up division, Radial artery, Ulnar artery.

INTRODUCTION:

The brachial artery usually begins as a continuation of the axillary artery at the distal border of teres major, and ends about a centimeter distal to the elbow joint by dividing into radial and ulnar arteries.¹ Brachial artery gives arteria profunda brachii, superior ulnar collateral artery, inferior ulnar collateral artery and muscular branches in the arm. Ulnar artery gives common interosseous artery in cubital fossa and enters into the forearm deep to ulnar head of pronator teres muscle.

Some variations along with this brachial artery were noted – occasionally the artery divides proximally into two trunks, which may reunite. In some cases there is a superficial brachial artery arising from the axillary and continues in the forearm as radial artery². Sometimes it divides more proximally than usual and this unusually short segment brachial artery may

bifurcate as usual or it may trifurcate into radial, ulnar and common interosseous arteries³. In some cases it is also seen that radial artery arises at higher level but follows usual courses in forearm^{4,5}. In some cases brachial artery may be absent in very rare cases³.

CASE REPORTS:

During routine dissection for undergraduate study in department of Anatomy of Calcutta National Medical College we dissected a 62 year old male cadaver and we came across high up division of brachial artery dividing into radial and ulnar arteries after a short course in the upper half of the right arm. (Fig :1) Photography was taken. Dissection of the left upper limb revealed no unusual observations. In this case study brachial artery began normally at inferior border of teres major, as a continuation of axillary artery in both right and left side. It had almost equal

caliber in both sides but in the right side the length of brachial artery is short and it bifurcated at the middle of right arm close to the insertion of coracobrachialis into radial and ulnar artery. (Fig :1)

DISCUSSION:

Anomalies of the forelimb arterial tree are fairly common. This is mainly because of their multiple and plexiform sources, the temporal succession of emergence of principal arteries, anastomoses and periarticular networks and functional dominance followed by regression of some paths³.

High origin of radial and ulnar artery forms the highest percentage of variations of brachial artery. High origin of radial artery occurrence is 3-15% as reported by different authors^{6,7,8,9}. The parent trunk being axillary artery in 12.5%, proximal 1/3 of brachial artery in 62.5% and middle 1/3 of brachial artery in 25%⁹.

According to Arey (1957)¹⁰ anomalous blood vessels may be due to :

- Unusual pathway chosen by primitive vascular plexus
- Vessels which normally persists may disappear
- Vessels which normally disappear may persist
- Incomplete development
- Fusion and absorption of the parts usually distinct

High origin of radial artery from brachial artery was noted by Keen in 1961.¹¹ He explained this variant on the basis of Arey's observations regarding anomalous blood vessels¹⁰. Keen highlighted that there was persistence of the upper portion of the radial artery arising from the brachial artery proximal to the origin of ulnar artery followed by failure of development of

the new connection of the radial artery with the brachial artery at the level of origin of ulnar artery.¹¹

The unusually short segment brachial artery with its high up division into radial and ulnar arteries as observed in the present study can be explained in the light of embryological development. Every variation in the peripheral vascular anatomy is due to obliteration or persistence of any segment of axis artery.¹²

The artery to the developing upper limbs is derived from the 7th cervical intersegmental artery. This artery gradually gives rise to other branches to supply upper limb. Distal to the level of teres major it continues as the brachial artery and in the cubital fossa it continues as the interosseous artery.

The ectodermal-mesenchymal interaction and extracellular matrix components also control blood vessels formation.¹³ The radial and ulnar arteries are developed late in the forearm from axis artery, subsequently interosseous artery reduces in size and becomes a branch of ulnar artery.

In the present case, early division of brachial artery occurred in mid arm; as a result it became very short. The normal vascular development including the patterning of the blood vessels is influenced greatly by local hemodynamic factors. Altered hemodynamic environment may give rise to variant patterning of blood vessels. In early stage of development there is a capillary plexus which gradually differentiate to form definite blood vessels.

Variations in the formation of stages of this capillary plexus may also be responsible for the present case¹⁴.

CONCLUSIONS:

The vessels of the upper limb have much more importance in different kinds of diagnostic, analytical, and therapeutic studies. In congenital, inflammatory, metabolic and regenerative disease,

the study of basic anatomy is important for understanding circulation of the blood flow to improve the operative outcome. In orthopedic surgeries around elbow accidental crush injuries leading to hemorrhage requires its special mention. Variations in the arterial tree may be encountered in brachial catheterization and skin flap elevations from the arm or forearm. Computer highlighted diagnostic, interventional and surgical significance of such a

variation. Diagnostically this type of variations may disturb the evaluation of angiographic images. Further knowledge of such variations has got clinical importance especially in field of orthopedic, plastic and vascular surgeries¹⁵. Last but not the least, knowledge of this variation is important for the clinicians in day to day practice for measurement of blood pressure using sphygmomanometer cuff in the arm.

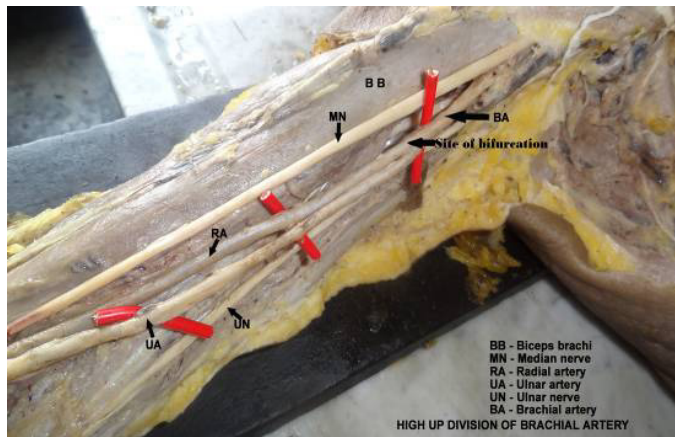


Fig 1: Right arm showing high up division of brachial artery into radial and ulnar artery.

REFERENCES

1. Johnson D, Ellis H, Collins P. upper Arm. in : Standring S, Ellis H, Healy JC, Johnson D, Williams A, Collins P, eds. Gray's Anatomy. 39th Ed. Philadelphia, Elsevier Churchill Livingstone. 2005; 856.
2. Yang HJ, Gril YC, Jung WS, Lee Hy. Variations of the superficial brachial artery in Korean Cadavers. J Korean Med Sci. 2008 OCT; 23(5):884-7.
3. Williams PL, Bannister LH, Berry MM, Collins P, Dyson M, Dussek JE, Ferguson MW, eds. Gray's Anatomy. 38th Ed. London, Churchill Livingstone. 1999 ; 319, 1539.
4. Okoro IO, Jiburum BC, Rare high origin of the radial artery: A bilateral symmetrical case. Nig J Surg Res 2003 ; 5:70 -2.
5. Singh H, Gupta N, Bargartha RN, Singh NP. Higher bifurcation of brachial artery with superficial course of radial artery in forearm. JK Science. 2010; 12:39-40.
6. Anson, B.J.; Morris. Human Anatomy in; the cardiovascular system – Arteries and veins. Thoms, M. Edr. Mc Grow Hill Book C. Newyork. 1966:708-24.
7. De Garis CF, Swartely WB. The axillary artery in white and Negro Stocks. Am J Anat. 1928: 41:353-97.
8. Muller E (1903) Beitrage Zur Morphologie des Gefaßsystems. I. Die Arterien des Menschen. Anatomische Hefte , 22, 377-575.
9. Karlssons, Niechajev IA (1982) Arterial anatomy of the upper extremity. Acta Radiologica 23, 115-21.
10. Arey LB. Developmental Anatomy. 6th Ed. Philadelphia, W.B. Saunders. 1957; 357-77.

11. Keen JA. A study of the arterial variations in the limbs, with special reference in symmetry of vascular pattern. *Am J Anat.* 1961; 108:245-61.
12. Rodriguez-Baeza A, Nebot J, Ferreira B, Reina F, Perez J, sanudo JR, Roig M. An anatomical study and ontogenic explanation of 23 cases with variations in the main pattern of the human brachio - antebrachial arteries. *J Anat.* 1995; 187:473-9.
13. Feinbery RN. Vascular development in the embryonic limb bud. In: Feinbery RN, Sherer GK, Auerbach R eds. *The Development of the vascular system.* Basel, Karger(Issue Biomed) 1991; 14: 136-48.
14. Larsen WJ. *Human Embiology.* New york, Churchill- Livingstone. 1953; 222-34.
15. Ganzalez – compta x. Origin of the radial artery from the axillary artery and associated hand vascular anomalies. *J Hand Surg Am.* 1991; 16: 293-6.