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Unilateral High Division of Brachial Artery

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Abstract: ***Background: Accurate knowledge of variation pattern of the major arteries of upper limb is of considerable practical importance in the conduct of surgery in the arm, forearm and hand however brachial artery and its terminal branches variations are less common. Introduction: The brachial artery, a continuation of the axillary artery, begins at the distal border of the tendon of teres major and ends about a centimeter distal to the elbow joint by dividing into the radial and ulnar arteries. Aim: Present study is to evaluate the anatomical variations of brachial artery and its morphology, embryology and clinical importance. Study material: During routine dissection of upper limbs in Kakatiya medical college, Warangal, noticed variations in branching pattern in brachial artery. Result: The brachial artery is terminated into radial and ulnar arteries in upper 1/3rd of the arm. Conclusion: Detailed knowledge of anatomy and variations of brachial artery is necessary for radiologists, vascular surgeons for performing angiography prior to surgical interventions and clinicians in day-to-day practice for measurement of blood pressure using sphygmomanometer cuff in the arm.***

Keywords: brachial artery, variation, ulnar artery, radial artery

1. Introduction

a) The brachial artery, a continuation of the axillary artery, begins at the distal border of the tendon of teres major and ends about a centimeter distal to the elbow joint by dividing into the radial and ulnar arteries[1].
b) The artery is crossed superficially by the median nerve from lateral to medial side[2].
c) The brachial artery gives origin to profunda brachii, nutrient, superior and inferior ulnar collateral, muscular, radial, and ulnar arteries[1, 2]
d) The profunda brachii artery, a large branch from the brachial artery, distal to the teres major, follows the radial nerve closely between the long and medial head of the triceps and then in the radial groove. It gives origin to radial collateral and middle collateral arteries.
e) The knowledge of arterial anatomy of the upper limbs and its common variations is very essential to all medical practitioners.

Case Study

2. Materials and Methods

In the present study, 16 cadavers (32 upper limbs) were dissected. The variation was observed in a male cadaver aged about 50 year right upper limb during a routine dissection class for undergraduates.

The brachial artery was carefully traced for its origin, course, and termination.
a) The finding was noted after thorough dissection of the upper limbs of both sides (axilla, arm, cubital fossa, forearm and palm) in the Department of Anatomy, Kakatiya medical college, Warangal.
b) No other variation was found particularly in relation to the cords of the brachial plexus and their branches.
c) Dissection of the left upper limb revealed no unusual observations.

1) In Arm:
a) The brachial artery is terminated into radial and ulnar arteries, approx. about 1.5 cm distal to the lower border of teres major, in the upper 1/3rd of arm.
b) Median nerve is superficial to radial artery and is crossing from lateral to medial side at middle of the arm.
c) Radial artery is towards medial and superficial to ulnar artery.
d) The radial and ulnar arteries descended parallel to each other in the arm.
e) Before termination, 1 inch above brachial artery gave rise to its branches, profunda brachii artery in its proximal part, muscular branches to surrounding muscles. These branches arising as common trunk.
f) Superior ulnar collateral artery and inferior ulnar collateral artery are arising from ulnar artery. No branches arising from radial artery.
g) Both radial and ulnar arteries passed superficial to muscles in the arm.
h) Remaining is same that of normal pattern.

2) In Cubital Fossa
The radial artery passed through the apex of the fossa, lying lateral to median nerve. While the ulnar artery passed deep to the deep head of the pronator teres muscle which is usual.

3) In Forearm
The branching of the radial and ulnar arteries was normal in forearm.

4) In Hand
The branching of the radial and ulnar arteries was normal in hand

3. Discussion

- Arterial variation in the upper limb was noted for the first time by von Haller in 1813[3].
- It is not uncommon to find variation in the branching pattern of arteries of the upper limb.

- 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.
- During the development, 7th cervical intersegmental artery would lead to the axis artery[1, 4].
- Axis artery is the major artery from which all other branches of the upper limb arteries arise.
- The early limb bud receives blood via inter segmental arteries, which contribute to a primitive capillary plexus. At the tip of the limb bud there is a terminal plexus that is constantly renewed in a distal direction as the limb grows. Later one main vessel supplies the limb and the terminal plexus; it is termed the axis artery.
- The aforesaid terminal plexus at the tip of the limb bud is separated from the outer ectodermal sleeve of the limb by an avascular zone of mesenchyme.
- The ectodermal-mesenchymal interactions and extracellular matrix components are controlling the initial patterning of blood vessels within the limb[5].
- 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 variability pattern of blood vessels.
- Major variations in division of brachial artery are seen in 25% subjects.
- High origin of radial and ulnar artery was seen as highest % of variations of brachial artery.
- A Detailed description of upper limb vascular variability has been described, estimated to be between 9% to 18.5%.[4]
- In the present study, high bifurcation of brachial artery was found in 1 cadaver i.e., 1 right upper limb which is equivalent to 3.12% out of 32 dissected upper limbs.

4. Conclusion

Thus any of the factors affecting during development of limb vessels will lead to variations in the level of division of major arteries.

Diagnostically this type of variation may disturb the evaluation of angiographic images. Further knowledge of such variation has got clinical importance especially in the field of orthopedic, plastic and vascular surgeries. 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.

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(1)RT Upper Limb (2) (3)

(4) (5) (6)

(7) (8) (9)

BA-BRACHIAL ARTERY;TM-TERES MINOR;LD-LATTISMUS DORSI;MCN-MUSCULOCUTANEOUS NERVE;MN-MEDIAN NERVE;UN-ULNAR NERVE;UA-ULNAR ARTERY;RA-RADIAL ARTERY;MC-MEDIAL CONDYLE;PBA-PROFUNDA BRACHIAL ARTERY;SUCA-SUPERIOR ULNAR COLLATERAL ARTERY;IUCA-INFERIOR ULNAR COLLATERAL ARTERY, MUSCULAR BRANCHES along with PBA in FIGURE 4 named 1)2)3)4)