

SHORT SEGMENT OF BRACHIAL ARTERY WITH ITS EMBRYOLOGICAL AND CLINICAL SIGNIFICANCE

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ABSTRACT: Objectives: To estimate the site of bifurcation and significance, To indicate surgical implication, To correlate with embryological basis.

Material and methods: The case was observed after thorough and meticulous dissection of the upper limbs of both sides (axilla, cubital fossa, forearm and palm) of an 80 year old male cadaver in the department of fr.muller medical college, mangalore, india. photographic documentation of the variation was also made.

Results: An unusually short segment of brachial artery in the right arm which bifurcated 21.5cm above the neck of radius at the level of insertion of coracobrachialis which bifurcated into radial and ulnar arteries of same calibre with high origin of radial artery.no other variation was found in relation to the cords of brachial plexus and their branches.dissection of left upper limb revealed no unusual observation.

Conclusion: This could pose a challenging problem to vascular surgeons while performing reconstructive procedures.Itcan be evaluated by vascular mapping prior to an arteriovenous access creation.Altered hemodynamic environment may give rise to variant patterning of blood vessels.

Keywords:Arteries-upper limb-arm-variations-embryology-clinicals

INTRODUCTION

The brachial artery is the main arterial supply of the upper limb providing the blood supply to nearly all of its structure.It is a medium sized artery and is actually a continuation of the axillary artery from the region of axilla into the arm.Brachial artery is rather superficial in its course.Its overlapped from the lateral side by biceps brachi muscle.It lay upon the triceps and the coracobrachialis muscles.In the proximal region the artery lies medial to the humerus where it is palpable.In the lower part of its course the artery gain an anterior position relative to the humerus. The brachial artery accompanies the median nerve which crosses it from lateral to medial side in the middle of the arm. The earliest of the studies cited on morphology of the upper limb arterial variation pattern provide insufficient statistical data.There have been controversies regarding the terminology as some authors advised topographical names to the brachial and antebrachial arteries while others believed that the arterial variations should be individual entities.Variations have been observed in the arterial patterns of the upper limb where there is absence of brachial artery,radial artery,ulnar artery and their branches.Also there may be difference in the origin and course of their arteries which might interfere with therapeutic,diagnostic and surgical procedures. The rapid advance in the techniques of microvascular and reconstructive surgery of the upper limb arteries warrants a careful observation and record of all varieties of developmental variations of upper limb arteries. The arterial variations in the upper limb have been great interest of topic since eighteenth century {Von Haller, 1813}. The brachial artery usually begins as a continuation of axillary artery at the inferior border of the tendon of teres major and ends about a cm distal to the elbow joint,at the level of of neck of radius by dividing into radial and ulnar arteries.This study highlights an unilateral case of a high division of brachial artery with a slightly high course of radial artery and relatively deeper ulnar artery. Dimension of the brachial artery and flow mediated dilatation(FMD) are associated with severity of cardio vascular diseases.Radial artery in coronary artery bypass grafting,brachial and antebrachail arteries in chronic renal failure for dialysis and radial forearm flaps(Chinese flap) in cosmetic surgeries like burns,contractures of neck etc.So study on vascular pattern of upper limb and its variations assume great importance to prevent and avoid possible complications and achieve best results after operations as well as therapeutic and diagnostic interventions.So this case report presents a case from an anatomical perspective and also highlights the clinical and embryological development.

These types of variations can be explained on the basis of embryological development. According to Feinberg, ectodermal mesenchymal interactions and extracellular matrix components within the developing limb bud are controlling the initial patterning of blood vessels.(a).The present case of high division of brachial artery can also be noted down on the basis of observation done by Arey in 1957 where he mentions that there may be persistence of vessels which normally obliterate and disappearance or failure of development of vessels which normally persist(b).This reversal of the normal process of vascular embryological changes is largely due to altered local hemodynamic environment(c).

CASE REPORT

The following variations in the arterial pattern of right upper limb was observed in a 80 year old male cadaver during the course of an undergraduate medical training programme at FATHER MULLER MEDICAL COLLEGE, MANGALORE, INDIA. During routine dissection of the upper limb the skin and fascia of both upper limbs were completely dissected and the neurovascular bundles of the axillae and the whole limbs were clearly explored. The course of the arteries and their branches were thoroughly traced and the observed anatomical variations were photographed and recorded. The axillary artery in both upper limbs had normal anatomical course and branching pattern of the brachial plexus and cords normally distributed around it. The brachial artery as usual was seen to be a continuation of axillary artery with 4cm from the level of teres major and 9.5cm from the level of surgical neck of humerus. It was found to divide 21.5 cm above the neck of radius at the level of insertion of coracobrachialis, into radial and ulnar arteries of same calibre with high origin of radial artery. The ulnar and radial arteries descended in the forearm under the deep fascia and further distribution of these arteries arose normally from the radial and ulnar arteries respectively. Profunda brachii and other branches of brachial artery arise from its prior to its bifurcation. No other variation was found in relation to the cords of brachial plexus and their branches and their relations with axillary and brachial arteries. Dissection of the left upper limb revealed no unusual observations.



A Figure Showing Short Segment of Brachial Artery (BA)

DISCUSSION

The classical studies in embryology are those of DeVriese{1902} and Muller(1903). But it is of Singer(1933), based on findings from adult corpses and developmental data collected and published in a congress proceedings(Senior 1926). Singer states that the adult pattern develops from a main trunk which extends from the axilla to the fingers and represents the brachial and interosseus artery. Anomalies of forelimb arterial tree are very common. The reason is believed mainly 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 paths(d). The unusually short segment of brachial artery with high division into radial and ulnar arteries as observed can be explained on the level of embryology.

DEVELOPMENT OF VASCULAR SYSTEM

Initially, the limb bud has only capillary networks. The subclavian –axillary –brachial axis arteries appear during stages 15 and 16. The brachial artery gives rise to the interosseous and median arteries. The median arteries become the main blood supply to the hand. The ulnar artery appears before the radial artery during stages 17 and 18 respectively. As per the development at the tip of the limb bud, a terminal plexus grows in the distal direction. Later one main vessel supplies the limb and the terminal plexus and it is named as the axis artery. The limb bud is separated from the outer ectodermal sleeve of the limb by an avascular zone of mesenchyme. This avascular region contains an extracellular matrix consisting largely of hyaluronic acid. Removal of this hyaluronic acid by hyaluronidase results in vascularisation of the tissue since partial degradation products are angiogenic. Thus ectodermal mesenchymal interactions and extracellular matrix components are controlling the initial pattern of blood vessels within the limb (e). In the upper limb bud the axis artery is derived from the lateral branch of the intersegmental artery i.e., subclavian.

CLINICAL IMPORTANCE

Numerous surgical interventions are there that can help the quality of life of patients. Recognition of high origin of brachial artery and radial artery in the arm as reported in the present case is crucial for clinicians. A case reported during hemodialysis presented with a pseudoaneurysm from the percutaneous coronary procedures has the adverse effect of reducing access site complications but is associated with specific technical challenges in comparison with transfemoral approach. Transradial procedure failures can sometimes be due to variation in radial artery anatomy. This implies the importance of imaging of radial artery before surgical procedures. Variation in branching pattern of brachial artery is of great significance in cardiac catheterization for angioplasty, pedicle flaps or arterial grafting. High bifurcation of brachial artery presenting with acute ischaemia secondary to an embolic event was reported by Cherukupalli et al (i). This anomaly was identified and ischaemia was resolved successfully with embolectomy.

CONCLUSION

It is very clear from the above facts that the normal vascular development including the patterning of the blood vessels is influenced greatly by local hemodynamic factors. Alteration in the hemodynamic environment may give rise to variant patterning in the blood vessels.

Finally any arterial variation can have both morphological and clinical significance. Cardiologists, radiologists, or vascular surgeons involved in the procedure should be attentive to these possibilities of anatomical alteration and require, in case of doubt, a color Doppler ultrasound of the limb. The case reported here may be of interest to angiologists and radiologists, as well as vascular surgeons. The existence of a superficial radial artery implies the absence of the normal radial pulse at wrist level. It can cause problems in cannulation for operation monitoring required surgical treatment. Awareness of variations like these are of immense importance during surgical procedures.

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