

A Morphological Study on Variations in the Level of Bifurcation of Brachial Artery

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Abstract

Background: The Brachial artery is a continuation of the axillary artery, begins at the distal border of the tendon of the teres major and about a centimeter distal to the elbow joint i.e. at the level of the neck of the radius it is dividing into radial and ulnar arteries. There are so many variations in the bifurcation of brachial artery like higher level, low level bifurcation etc. Variations in bifurcation are clinically significant while during arterial cannulation to the clinicians.

Materials & Methods: During routine dissection of adult cadavers of 30-60 years age at department of Anatomy in Rangaraya Medical College, Kakinada & Government Medical College, Ananthapuram. While performing dissection of upper limb, level of bifurcation of brachial artery is observed in 40 upper limb specimens [20 cadavers].

Results: Among 40 upper limb specimens, in 2 right upper limb specimens [out of 20] higher level bifurcation of brachial artery is observed. Out of 20 left upper limb specimens, 2 left upper limb specimens show bifurcation at higher level. In 36 specimens, bifurcation is at normal level. Low level bifurcation is not seen in any specimen.

Conclusion: Knowledge about the morphological variations of the brachial artery and its course, branching of artery and anastomoses is crucial while analyzing the angiograph, planning orthopedic reconstructive and vascular procedures in damaged upper limbs. This information is crucial to Anaesthesia doctors, Emergency physicians, General surgeons.

Keywords: Brachial artery, Bifurcation of artery, Normal level, High level, Low level.

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Introduction

The Brachial artery is a continuation of the axillary artery, which begins at the distal (inferior) border of tendon of the teres major muscle and about a centimeter distal to the elbow joint i.e. at the level of the neck of the radius, it is dividing into radial and ulnar arteries (16). There are wide variations in the branching pattern of brachial artery between persons & persons and in between the right and the left upper limbs of the same person (12). The brachial artery develops from proximal part of main trunk of axillary artery of upper limb along with axillary artery, which is derived from 7th cervical intersegmental artery [1]. Whereas radial, ulnar arteries develop as sprouts from axillary artery of upper limb. The brachial artery is an important arterial conduit from the clinical point of view and the brachial artery is very crucial artery to anatomists, general surgeons, Radiologists, plastic surgeons and even

cardiovascular thoracic surgeons (9). Any physician or surgeon having anything to do with the brachial artery "ought" to know the normal anatomy and variation of the brachial artery. During routine dissection, a lot of variation in the arterial pattern of the upper limb were encountered which ignited our curiosity to study the normal anatomy and variation of brachial artery. In coronary artery bypass graft (CABG) surgery, anatomy of artery should be timely confirmed to reduce the incidence of iatrogenic injuries. An abnormal superficial tortuous brachial artery may be mistaken for basilic vein during cannulation.

Materials & Methods

The present study was conducted in 40 upper limbs of 20 embalmed cadavers from the department of Anatomy, Rangaraya Medical College, Kakinada and Government Medical

College, Ananthapuram. The variation in the branching pattern of brachial artery was studied with meticulous dissection and observation. In each cadaver the upper limb was kept in abducted and laterally rotated position. An incision was made on the front of the arm from the tip of acromion process of the scapula upto the cubital fossa in the midline to expose the brachial artery and its venae comitantes. Then the incision was extended in the antebrachial region from the medial border of the biceps tendon and further extended along the middle of the forearm. Skin and superficial fascia were reflected from the deep fascia by blunt dissection. The deep fascia including bicipital aponeurosis were incised vertically. The brachial artery was dissected and traced proximally to the continuity with axillary artery at the level of lower border of teres major. Distally in the cubital fossa the bicipital aponeurosis was divided upto its bifurcation. In all upper limb specimens, we

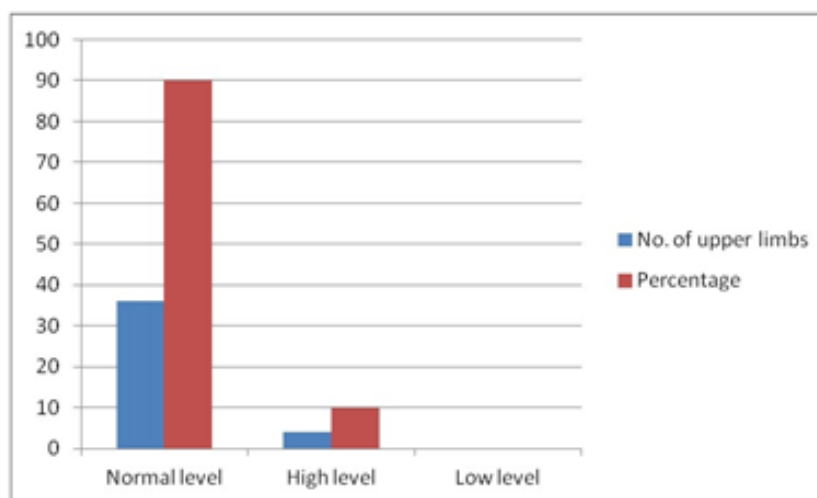
observe the level of bifurcation of brachial artery i.e. at the normal level of neck of radius / above to the normal level [high level] / below to the normal level [low level].

Results

Out of 40 upper limbs [20 right upper limbs, 20 left upper limbs] observed, 36 upper limb specimens shows normal level of bifurcation of brachial artery i.e at the level of neck of radius. Whereas in 4 upper limb specimens showed variation in the level of bifurcation of brachial artery. In the present study, high level of bifurcation of brachial artery was observed at the middle of arm in 2 right upper limbs out of 20 right upper limb specimens. High level of bifurcation of brachial artery is also observed in 2 left upper limb specimens out of 20 left upper limbs. low level bifurcation is not observed in any of the upper limb specimen out of 40 upper limb specimens.

Table 1: Showing frequency of variation in the level of bifurcation of brachial artery in Total upper limb specimens

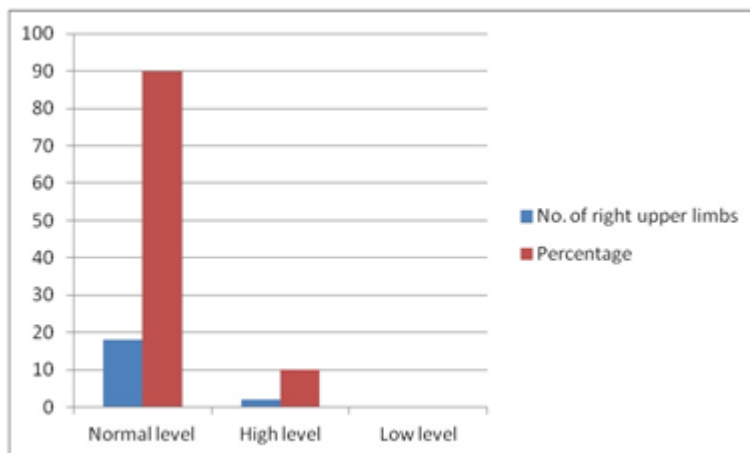
Level of division of brachial artery	No of upper limbs	Percentage
Normal level	36	90 %
High level	4	10%
Low level	0	0%



Pie chart 1: Showing frequency of variation in the level of bifurcation of brachial artery in total upper limb specimens

Table 2: Showing frequency of variation in the level of bifurcation of brachial artery in Right upper limb specimens

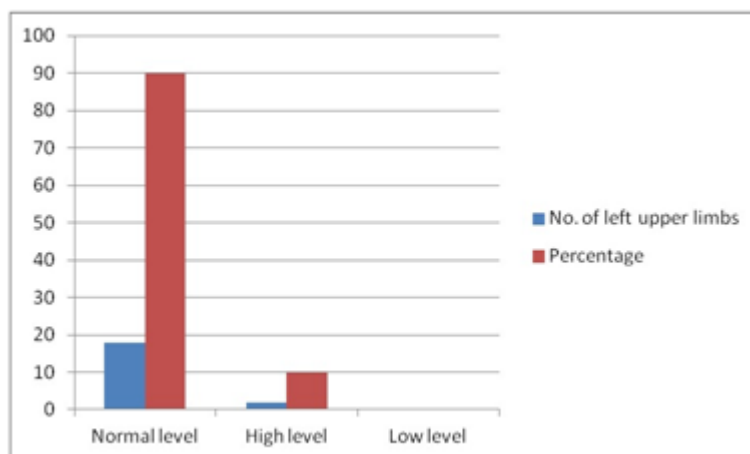
Level of division of brachial artery	No of right upper limbs	percentage
Normal level	18	90%
High level	2	10%
Low level	0	0%



Pie chart 2: Showing frequency of variation in the level of bifurcation of brachial artery in right upper limb specimens

Table 3: Showing frequency of variation in the level of bifurcation of brachial artery in Left upper limb specimens

Level of division of brachial artery	No of left upper limbs	Percentage
Normal level	18	90%
High level	2	10%
Low level	0	0%



Pie chart 3 : showing frequency of variation in the level of bifurcation of brachial artery in left upper limb specimens

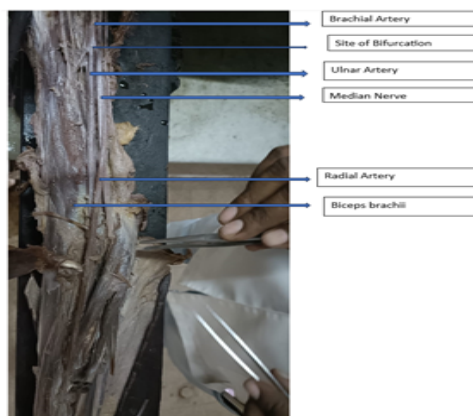


Figure 1: Showing higher level bifurcation of brachial artery in right upper limb specimen

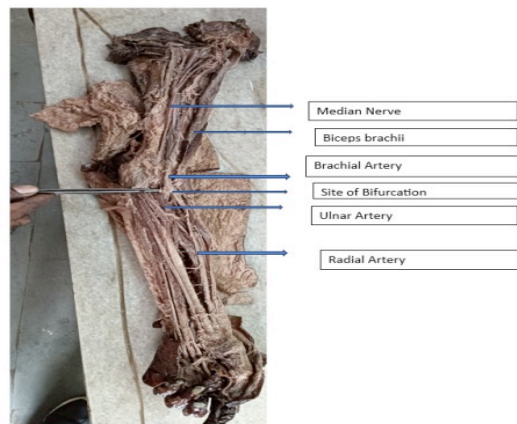


Figure 2: Showing higher level bifurcation of brachial artery in left upper limb specimen

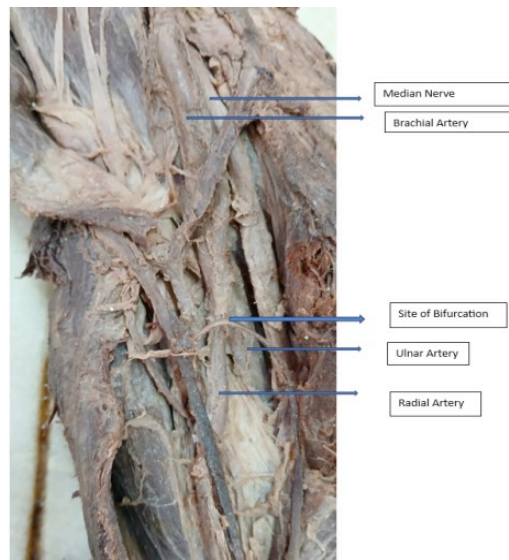


Figure 3: Showing Normal level bifurcation of brachial artery in right upper limb specimen

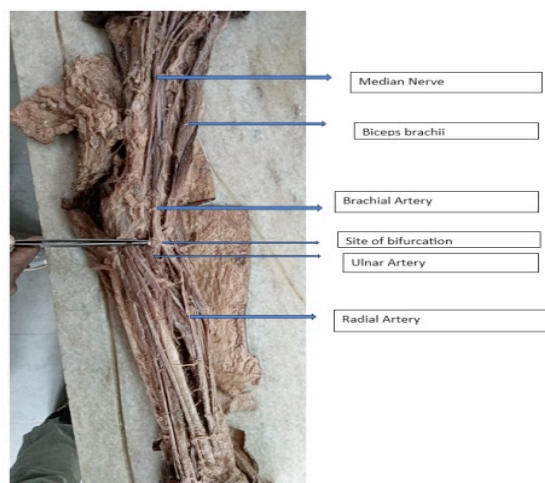


Figure 4: Showing Normal level bifurcation of brachial artery in left upper limb specimen

Discussion

In most of the upper limb specimens, brachial artery is bifurcated usually at the normal level of neck of radius. But only in few cases, it shows bifurcation at higher level i.e. at the middle of arm, lower level i.e. in the middle of forearm. Aughsteen AA, et al described the bilateral variation in the branching pattern of the brachial artery and reported that the bifurcation of the brachial artery at a higher level is on out of eight or ten individuals [2]. Bergmann RA et al reported variations in bifurcation of brachial artery are seen in 25% of subjects [3]. High bifurcation of the brachial artery was found in only 0.5% in 202 cadavers in a study by Bertolazzo et al [4]. H H Celik et al observed a rare case of bifurcation of brachial artery at the level of insertion of coracobrachialis muscle [6]. Giacomo et al reported a case of high division of brachial artery in the proximal portion of the middle of the arm into radial and ulnar arteries of which ulnar artery gave rise to common interosseous artery [7]. Namani Sathyanarayana et al documented a case of an early division of the brachial artery in the middle of right side arm into the radial and ulnar artery both of same calibre [8]. Bilateral high division of brachial artery is observed in a study by Pushpalatha M et al [10]. Quarrat UI ain et al study shows high level bifurcation of brachial artery in 2 upper limb specimens out of 88 specimens [11]. In a study by the Rossy junior WC et al, brachial artery is bifurcated in the axilla on both right, left upper limbs in a one cadaver out of 56 specimens [13]. Bifurcation of brachial artery is present at its commencement is observed in a study by shewale SN et al [14]. Higher bifurcation of brachial artery is observed along with superficial course of radial artery in entire forearm is observed in a study by Singh H et al [15]. Vishal Kumar found that the brachial artery bifurcate into lateral and medial branches at 9.5 cm distal to the lower border of teres major (17). Arterial variation in the upper limb was noted for the first time by Von Haller [18].

In present study, high level bifurcation of brachial artery was found in, 2 right upper limbs and 2 left upper limbs which is equivalent to 4% out of 40 dissected upper limbs. Whereas lower level bifurcation is not observed in any of the upper limb specimens and 36 upper limbs shows usual level of bifurcation at the level of neck of radius.

Conclusion:

Knowledge about the morphological variations of the brachial artery, its course, branching and anastomoses is crucial while analyzing the angiograph, planning orthopedic reconstructive and vascular procedures. Abnormal arterial patterns of the upper limb could disturb the evaluation of

angiographic images during diagnosis and is more vulnerable to iatrogenic injury during different surgical procedures. A familiarity with the variation in the level of bifurcation of brachial artery is also important both anatomically and clinically when understanding certain conditions such as neuropathy.

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