A STUDY OF BRACHIAL ARTERY, ITS VARIATIONS AND THE CLINICAL ORIENTATION
ANTHONY AMMAL S
Department of Anatomy, KARPAGA VINAYAGA INSTITUTE OF MEDICAL SCIENCES AND RESEARCH CENTRE

Abstract: Knowledge about the variations of brachial artery is of considerable practical importance during surgical procedures in the arm, forearm and hand, however, brachial artery and its terminal branches variations are very common. The study was designed to evaluate the anatomical variations of the brachial artery and its morphology, embryogenesis and clinical implications. 50 upper limbs from twenty five embalmed cadavers are used for this study. Trifurcation of brachial artery is seen in 4 percent, superficial brachioradial artery in 2 percent and superficial brachioulnar artery in 4 percent of the specimens studied. An awareness of such a presence of variations are valuable for the surgeons and radiologists in evaluation of angiographic images, vascular and re-constructive surgery.

Keyword: brachial artery, superficial brachioulnar artery, superficial brachioradial artery and trifurcation.

INTRODUCTION:
The brachial artery is the continuation of the third part of axillary artery from the inferior border of Teres major tendon. It passes beneath the coracobrachialis muscle and gives branches like Profunda brachii, nutrient artery to humerus, ascending branch or deltoid branch, superior and inferior ulnar collateral artery [1]. In the cubital fossa, close to radial tuberosity, usually it bifurcates into radial and ulnar artery [2]. Variations of vascular pattern in the upper extremities have been reported by many authors. The earliest studies on variations in the arterial system have been given by Senior [3] and Singer [4]. Remodeling of early network of capillary plexus, results in the formation of definitive arterial pattern. The development of the upper limb arteries is a complex process. Variations in the formation of stages of the capillary plexus forming into definitive blood vessels gives rise to variations of the arterial pattern of the upper limb [5]. There are multiple variations in the division pattern of brachial artery and between the right and the left upper limbs of the cadaver. The brachial artery is an important arterial unit from the clinical point of view and the brachial artery is indispensable to anatomists, vascular surgeons, cardiothoracic surgeons, radiologists and plastic surgeons. Anything related to brachial artery, the above said persons should be aware of the normal anatomy and variations of the brachial artery. An abnormal superficial tortuous brachial artery may be mistaken for basilic vein on inspection [6]. The present study is conducted to study the variations in the origin, course, and termination of brachial arteries in cadavers.

AIMS AND OBJECTIVES:
1. To study the origin, course and termination of brachial artery.
2. To observe the level of branching of radial and ulnar artery.
3. To emphasize the importance of brachioradial artery and brachioulnar artery in clinical procedures.
4. To observe the origin of common interosseous artery.

MATERIALS AND METHODS:
- Fifty upper limbs were taken from twenty five embalmed human cadavers of both sexes.
- Measuring tape
- Dissection set

METHOD OF STUDY:
Conventional Dissection method:
An incision was made on the front of the arm from tip of acromion process of the scapula up to the cubital fossa in the midline to expose the brachial artery. Then the incision was extended in the antebrachial region. Fasciae have been dissected and reflected. Flexor muscles of the arm are identified after dissecting the axilla and arm. Branches of the brachial plexus are identified. Relations of the median nerve to the brachial artery at various levels in the brachium were observed. The branching pattern of the brachial artery is observed. The variations in the branching pattern of brachial artery are looked for.

SPECIMEN COLLECTION:
Fifty upper limbs from twenty five embalmed human cadavers from our institution were collected for the present study.

OBSERVATION:
The following observations were made in the study.

<table>
<thead>
<tr>
<th>Table 1: Brachial Artery Variations Observed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
</tr>
<tr>
<td>85</td>
</tr>
</tbody>
</table>

In the present study from 50 upper limbs, 5 limbs had the variations. It comes to around 10%.

An Initiative of The Tamil Nadu Dr. M.G.R. Medical University
University Journal of Pre and Para Clinical Sciences
In the present study, brachial artery at the neck of radius, divides into three branches namely radial, ulnar and common interosseous artery in 2 specimens (4%) (Figure 1, Table No. 2).

In the present study, 25 cadavers were dissected and looked for variations of the brachial artery in both upper limbs. Of the three cadavers which showed variations of the brachial artery, two cadavers showed bilateral variation of brachial artery and one cadaver had unilateral variation. (Table No. 3)

In the present study, 47 specimens (94%) showed the division of the brachial artery into radial and ulnar artery at the cubital fossa level. In 3 specimens (6%), the divisions of the brachial artery were observed in the brachium, of which 2 specimens (4%) showed superficial brachio-ular artery and 1 specimen (2%) showed superficial brachioradial artery (Table No. 4).

Bilateral superficial Brachio-ular Artery:
It arises from the brachial artery at a point, 12 cm from the acromion process in the arm. It runs a superficial course in the arm and forearm, passes superficial to the flexor retinaculum and terminates by forming the superficial palmar arch along with the superficial palmar branch of radial artery. (Figure 2)

Unilateral Superficial Brachioradial artery:
It arises from the brachial artery at a point 10 cm from the acromion process in the right brachium. It runs anteriorly and laterally and passes superficial to median nerve. It terminates in forming the deep palmar arch (Figure 3).

Origin of Common Interosseous Artery:
In the present study, common interosseous artery arises from the ulnar artery in 46 specimens (92%) and in 4 specimens (8%), the common interosseous artery is the direct branch of brachial artery, of which in 2 specimens (4%), trifurcation of brachial artery was observed and in 2 other specimens (4%), superficial brachio-ular artery was present and hence common interosseous artery branched directly from the brachial artery, along with the radial artery in the cubital fossa.

DISCUSSION:
Variations in the vascular patterns are usually the result of developmental anomaly during the formation of blood vessels in any respective part of the body [7]. Singer postulated that, the arterial system seen in the adult develops from the axial artery, which arises from the 7th cervical intersegmental artery which gives subclavian artery to supply the upper limb. The subclavian continues as axillary artery and at the lower border of Teres major muscle, it becomes the brachial artery. The brachial artery continues as the interosseous artery in the forearm as the axis artery. The radial and ulnar artery arises late in the development and gets established subsequently. The interosseous artery reduces in size and becomes a branch of ulnar artery [4]. High origin of radial artery occurrence is 3 to 15 %, as reported by different authors [8]. In the present study, 2% of superficial brachioradial artery is observed. The
superficial brachial arterial tree is not very uncommon variation of the upper limbs. It originates at the brachium, descends along the brachial artery, and is placed more anteriorly and laterally. It may or may not be observed. Arey (1957) had opined that anomalous blood vessels may be due to the following reasons:

i. Choice of unusual paths in the primitive vascular plexuses.
ii. Persistence of vessels normally obliterated.
iii. Disappearance of vessels normally retained.
iv. Incomplete development.
v. Fusion and absorption of the parts usually distinct [12].

**EMBRYOLOGY:**

The development of the entire arterial tree of the upper limb occurs in stages. Singer has proposed stages of development of arterial tree. They are,

**Stage 1:** The lateral branch of seventh intersegmental artery, i.e., subclavian artery extends to the wrist and terminates by forming capillary plexus; its distal portion forms the anterior interosseous artery.

**Stage 2:** Median artery arises from the anterior interosseous artery grows along the median nerve to communicate with palmar capillary plexus. By this time the anterior interosseous artery undergoes regression.

**Stage 3:** The ulnar artery arises from brachial artery and unites distally with the existing median artery to form superficial palmar arch.

**Stage 4:** The superficial brachial artery develops in axillary region from the axillar trunk and runs on the medial surface of the arm, runs diagonally from medial to lateral side of the forearm to the posterior surface of the wrist to divide over the carpus into digital branches.

**Stage 5:** All these changes occur simultaneously. Rodriguez et al., (2001) postulated that the presence of arterial variations in the upper limb were due to chemical factors, haemodynamic forces and foetal position in the uterus, genetic predisposition and developmental changes [10].

**CONCLUSION:**

1. A good knowledge of the variations of the arterial pattern is must for a good treatment outcome especially in the fields like vascular surgery, Plastic surgery, arterial cannulation and to avoid surgical complications etc.

2. Presence of variations may lead to misinterpretation of angiographic images.

3. Accidental puncture of superficially placed arteries may occur while attempting to puncture the veins.

4. Anomalous origin of the radial artery may cause the failure of the arterial pattern of the coronary angiography [13].

5. The existence of such a variant is of particular clinical significance, as these arteries are more susceptible to trauma, and can be easily confused with superficial veins during medical and surgical procedures, potentially leading to iatrogenic distal limb ischaemia.

**REFERENCES:**


