e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2023; 15(5); 1703-1708

Original Research Article

A Morphometric Study of Brachial Artery and its Branches at SMS Hospital Jaipur

Rakesh Swami[1], Chandrakala Agarwal[2], Seema Gupta[3]

[1]3rd Year Resident, Department of Anatomy, SMS Medical College, Jaipur
[2]Senior Professor Department of Anatomy SMS Medical College, Jaipur
[3]Senior Professor & HOD, Department of Anatomy, SMS Medical College, Jaipur

Received: 17-03-2023 / Revised: 18-04-2023 / Accepted: 20-05-2023
Corresponding author: Dr. Rakesh Swami
Conflict of interest: Nil

Abstract

Background: To study MORPHOMETRIC of brachial artery & it's branching pattern and length of brachial artery.

Methods: The present study was conducted on 40 upper limbs of 20 embalmed cadavers (both male & female) in the Department of Anatomy, S.M.S. Medical College, Jaipur. These were labeled from 1-20 with letters R or L corresponding to right or left limbs respectively. The Brachial artery was dissected & traced proximally to the continuity with the axillary artery at the level of the lower border of teres major.

Results: In the present study 20% of specimens showed variation in morphological and morphometric pattern of BA. The brachial artery showed trifurcation in 5% of specimens., 5% of specimens trifurcated into radial, ulnar and common interosseous arteries.

Conclusion: The Brachial artery and its branching pattern have been of great interest to anatomists and surgeons, interventionists and radiologists, due to wide clinical and radiological implications. Brachial artery is used in diagnostic angiography, cardiac catheterizationfor angioplasty, carotid stenting, transbronchial access for endovascular renal artery intervention and embolectomy through arteriotomy on brachial artery. Better anatomical knowledge about the branches of brachial artery and their variations are essential in avoiding iatrogenic injuries by surgeons and also during interpretations ofangiograms by radiologists.

Keywords: Brachial artery, Variation, Radiologist.

Introduction

The word "Brachial" is derived from the Greek word Brakhion meaning "Shorter"; brachium also means "arm". The vascular anatomy of the human upper limb which is man's important earning tool is a complex and challenging area. The arterial supply of the upper limbis mainly maintained by the brachial artery through its branches. The brachial artery is the major artery of the upper limb. It begins as a continuation of the axillary artery at the distal (inferior) border of the tendon of teres major muscle and ends at the level of the neck of the radius by dividing into radial and ulnar arteries. [1]

The artery is superficial in its course in the arm, lying immediately deep to the deep fascia of the anteromedial aspect of the arm. The brachial artery is the continuation of the axillary artery beyond the lower border of the teres major muscle, opposite the neck

of the radius in the anterior cubital region it divides into the radial and ulnar arteries. [2-4]

Variations in upper limb arteries have been frequently observed a majority of these variations occur in the radial artery followed by the ulnar artery however brachial artery variations are less common. Accurate knowledge of muscular and neurovascular variations is important for both surgeons and radiologists, which may prevent diagnostic errors. [5-6]

Material and methods

Place of study: Department of Anatomy, S.M.S. Medical College and Hospital, Jaipur Rajasthan.

Study universe: Cadavers available in the Department of Anatomy during academic year 2020-21, 2021-22.

Study Duration: From approval for institutional ethics committee to completion of work.

Study Design: Cross sectional Descriptive Conventional dissection method.

Study type: Descriptive observational study.

Sample size: Sample size is calculated at 95 % confidence level assuming standard deviation of 1.416 cm for length of brachial artery as found in seed article 5.

At the precision of 0.5 cm for length of brachial artery, minimum 31 limbs required as sample size which is enhanced & rounded off to 40 limbs as final sample size for present study.

Inclusion criteria:

Properly embalmed cadavers were available during the study in the Department of Anatomy.

Exclusion criteria:

Cadavers with any pathological lesion, traumatic lesion, or surgical procedure in the neck, axillary region, and upper arm.

Method of Data Collection:

The present study will be conducted on 40 upper limbs of 20 embalmed cadavers (both male & female) in the Department of Anatomy, S.M.S. Medical College, Jaipur. These were labeled from 1-20 with letters R or L corresponding to right or left limbs respectively. The Brachial artery was dissected & traced proximally to the continuity with the axillary artery at the level of the lower border of teres major. Distally in the cubital fossa, the bicipital aponeurosis will be divided and the brachial artery will be traced up to its bifurcation. The following observation will be taken:-

1. **Branches of brachial artery:** The site of origin of all branches will be noted and the distance between proximal point main trunk (lower border of teres major) and the origin of its branches.5
2. **Length of brachial artery:** following 2 points were taken for measuring its length.

a) The midpoint of the width of the artery where it begins i.e., at lower border of teres major.
b) At the point of termination of artery.

Statistical analysis: Collected data will be entered in Microsoft Excel 2016 Software. Qualitative data will be expressed as proportions and percentages while quantitative data will be expressed as mean and standard deviation.

Appropriate statistical tests will be applied as per data yield. P-value <0.05 will be considered statistically significant

Study Materials

From 20 cadaver 40 adult upper limb.

Method of Study

Conventional dissection method.

Specimen Collection

Adult upper limb specimens were obtained from the embalmed cadavers allotted for routine academic dissection to the first year

MBBS students at the Institute of Anatomy SMS Medical College, Jaipur.

Conventional Dissection Method

A vertical incision was made in the anterior aspect of the arm and the skin, superficial fascia and deep fascia were reflected carefully up to the elbow. A transverse incision was made at the level of the elbow. Flaps were reflected to uncover the biceps brachii muscle, the muscle was reflected laterally. The neurovascular bundle present medial to the biceps was dissected carefully.

The structures present in the arm were followed up to the insertion of coracobrachialis. The brachial artery was identified and it continued from the Axillary artery at the distal border of teres major muscle. The BA was seen medial to the humerus but gradually curls anterior to it until it lies midway between the two humeral epicondyles. The median nerve was traced from the brachial plexus. Its relation to brachial artery was studied. Then the artery was traced distally up to the cubital fossa. In the cubital fossa, the Brachial artery was dissected lateral to the median nerve and deep to the bicipital aponeurosis.

The length of the Brachial artery was measured from its origin to the intercondylar line and intercondylar line to level of termination (neck of the radius).

The branches of Brachial artery were noted at various levels. The profunda brachii artery arose from the posteromedial aspect of the brachial artery distal to the teres major muscle. It runs closely with the radial nerve between the long and medial heads of triceps up to the radial groove.

The nutrient artery to the humerus was dissected from its origin at the midlevel of the arm and observed to enter the nutrient foramen near the attachment of coracobrachialis.

Superior ulnar collateral artery was identified a little distal to the midlevel of the arm. Along with ulnar nerve it pierced the medial inter muscular septum and was found between the medial epicondyle and olecranon.

Inferior ulnar collateral artery was dissected 5 cm proximal to the elbow joint. It was traced between the median nerve and brachialis muscle where it pierce the medial inter muscular septum.

From the transverse incision at the elbow, another vertical incision was made from the cubital fossa to the wrist and the BA was traced up to the termination where it divides into radial and ulnar arteries at the level of neck of radius. The Origin and course of radial and ulnar artery was noted.

Result

Table 1 : Type of brachial artery variation

Variation Type	Count of variation type
Abnormal Na from Pba	1
High Level Termination	5
Trifurcation	2

Out of forty specimens, twenty-two specimens (80%) showed normal pattern of brachial artery and eighteen specimens (20%) showed variations either in its course or in branches, High level termination, indicating that variations of brachial artery were commonrather than an exception.

Table 2: Mean length of BA and its branch from lower border of TM

Artery	Artery Mean Length from Lower Border of TM in CM
Right BA	26.71
Left BA	26.8
Right PBA	2.9005
Left PBA	2.948
Right NA	5.6625
Left NA	5.6945
Right SUCA	10.436
Left SUCA	9.904
Right IUCA	16.7945
Left IUCA	17.078
Right Limb BA Termination from Intercondylar Line	1.015
Left Limb BA Termination from Intercondylar Line	1.05

Table 3: Mean brachial artery length in male and female

Sex	Number	Mean Right BA in CM	Mean Left BA in CM
Male	34	27.0764	26.7411
Female	6	26.71	26.8

Table 4: Types of termination of brachial artery

Termination	No.	Percentage
Bifurcation	38	95%
Trifurcation	02	5%
Total	40	100

Table 5: Level of termination of brachial artery

Level	No.	Percentage
Above the intercondylar line	5	12.5%
Below the intercondylar line	35	87.5%
Total	40	100

brachial artery and two specimens (5%) showed trifurcation and specimen trifurcated into radial, ulnar and common interosseous arteries.

Discussion

The arterial supply of upper limb is mainly maintained by brachial artery through its branches. The brachial artery has various important anastomoses with proximal parts of radial and ulnar arteries, which ensures circulation in case of disturbed blood flow.

The brachial artery is preferred site for arterial blood sampling and recording blood pressure. The precise knowledge of the frequency of anatomical variations in the branchingpattern of brachial artery is essential for vascular surgery. The present workis an attempt to bridge the knowledge gap regarding the origin, course, relations and branching pattern of brachial artery in human cadavers.

In the present study 40 upper limbs were dissected, observed the origin, courseand branching pattern of brachial artery and compared with the earlier studies by various workers.

In the present study, 20% of specimens showed variations of brachial arteryeither in its course or in branches (Table-3).This showed slightly higher incidence when

compared to observations of previous workers, Mc. Cormack[3] (18.53%), Patnaik[6] (18%) but lower incidence of variations seen when study compared to study of Bergmann[6] (25%) and Rodriguez[44] (23%).

In the present study the mean length of Right Brachial artery from lower border of teres major is 26.71 cm and the mean length of Leftt Brachial artery from lower border of teres major is 26.8 cm.

The mean length of Right Brachial artery in male upper limb specimen from lower border of teres major is 27.0764 cm and the mean length of Right Brachial artery in female cadaver from lower border of teres major is 24.633 cm. The mean length of Left Brachial artery in male specimen from lower border of teres major is 27.212 cm and the mean length of left Brachial artery in female specimens from lower border of teres major is 24.467 cm.

Deepa T. K et al.(2016) [7] in their study found that the mean length of brachial artery was 26.29cm which is lower than our mean length of brachial artery.

Suresh Bidarkotimath [8] found that mean length of the brachial artery varied between 23 ± 8.64 cm which is similar to our results.

In the present study, the mean length of right PBA is 2.9005 cm and the mean length of left PBA is 2.948. In the present study, the mean length of right NA is 5.6625 cm and the mean length of left NA is 5.6945.

Sushma et al.[9] in their study found that the values of the point of origin of the profunda brachii artery varied between 1.66cm (±1.04) in right limbs and 1.44cm (±0.86) in left limbs.

In our study, the mean length of right SUCA is 10.436 cm and the mean length of left SUCA is 9.904cm

Conclusion

The Brachial artery and its branching pattern have been of great interest to anatomists and surgeons, interventionists and radiologists, due to wide clinical and radiological implications. Brachial artery is used in diagnostic angiography, cardiac catheterization for angioplasty, carotid stenting, transbrachial access for endovascular renal artery intervention and embolectomy through arteriotomy on brachial artery. Better anatomical knowledge about the branches of brachial artery and their variations are essential in avoiding iatrogenic injuries by surgeons and also during interpretations of angiograms by radiologists.

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