

**Correlative Study of Length of Upper Limb with Position of Bifurcation of Brachial Artery in Males of North Karnataka Population**Gazala Shaireen<sup>1</sup>, Humaira Zainab<sup>2</sup>, Mohd. Ibrahim Pasha<sup>3</sup><sup>1</sup>Assistant Professor, Department of Anatomy, Faculty of Medical Sciences, Khaja Banda Nawaz University, Kalaburgi-585104, Karnataka<sup>2</sup>Associate Professor, Department of Anatomy, Faculty of Medical Sciences, Khaja Banda Nawaz University, Kalaburgi-585104, Karnataka<sup>3</sup>Assistant Professor, Department of Anatomy, Faculty of Medical Sciences, Khaja Banda Nawaz University, Kalaburgi-585104, Karnataka

Received: 25-09-2023 / Revised: 28-10-2023 / Accepted: 30-11-2023

Corresponding author: Dr. Humaira Zainab

Conflict of interest: Nil

**Abstract:****Background:** Variations of the brachial artery are often observed in autopsies, which are probably due to their complex embryonic development. Hence, knowledge of variations in the brachial artery is mandatory for clinicians, especially orthopedicians, during amputation.**Method:** 30 (thirty) male, non-pathological cadavers were dissected. Tailor's tape was used to measure the length of the upper limb (UL). (A)-UL was measured from the tip of the acromion process of the scapula to the tip of the middle finger. (B) The position of bifurcation of the brachial artery (BA) was measured from the epicondyle of the humerus to the bifurcation of the brachial artery, and variations were noted and correlated with the length of the respective upper limbs.**Results:** The mean value of the right upper limb was 71.66 ( $\pm$  5.14) and the mean value of the position of bifurcation of BA was 4.11 ( $\pm$  0.57) and the correlation coefficient was 0.77 and  $p < 0.001$ . The mean value of the length of the left UL was 71.54 ( $\pm$  5.13), the length of the position of the bifurcation BA was 4.10 ( $\pm$  0.59), and the correlation coefficient was 0.78 and  $p < 0.001$ .**Conclusion:** It is concluded that the present correlative study of the upper limb and position of bifurcation of BA has a great importance for appropriate invasive or surgical treatment of arm, forearm, and hand disorders.**Keywords:** Bifurcation, Tailors Tape, Brachial Artery, Variations.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

**Introduction**

Variation of the brachial artery is often encountered in routine autopsies during daily clinical practice. Individual descriptions of such variations have been reported since the 19th century [1]. It is reported that variations in branching patterns of the brachial artery range from 9.6% to 25%, as studied by previous authors [2]. The brachial artery (BA) could also follow a superficial course, coursing in front rather than behind the median nerve.

This superficial BA has high incidence variation patterns, about 3.6 to 9.6%. It is also observed that BA presents deviations from its normal anatomy pattern in 20% of the cases in various racial groups.

As various interventional surgical and radiological procedures are performed in the upper extremity, knowledge of the arterial variations of the region is of great importance for clinicians in order to avoid injuries and fatal results for the patients. Inappropriate knowledge in cases of aberrant locations of the arteries of the upper limb [4] may

result in thrombosis, gangrene, or, in extreme cases, even limb loss.

Cannulation of BA in clinical practice is performed for the diagnostic and therapeutic management of many pathological entities, like coronary artery disease, aortic and peripheral vascular disease, and chronic renal failure. Hence, an attempt is made to evaluate the variations in the pattern of BA and correlate them with the length of the respective upper limb.

**Material and Method**

30 cadavers present in the anatomy departments of KBN Medical College and MRMC Medical College Kalaburgi (585102), Karnataka, were studied.

**Inclusive Criteria:** Male, non-pathological, well-preserved cadavers were selected.

**Exclusion Criteria:** Pathological, amputated cadavers were excluded from the study.

**Method:** Each dissected cadaver was put in anatomical position, and the length of the upper limb (UL) was measured with tailors tape. Upper limb was measured from the tip of the acromion process of the scapula to the tip of the middle finger (B), and the position of the brachial artery (BA) was measured from the epicondyle of the humerus to the bifurcation of the brachial artery.

The duration of the study was from November 2022 to November 2023.

**Statistical analysis:** The mean value of the upper limb and the length of the bifurcation were

compared with a t test and correlated with coefficients and regression values. Statistical analysis was carried out in SPSS software.

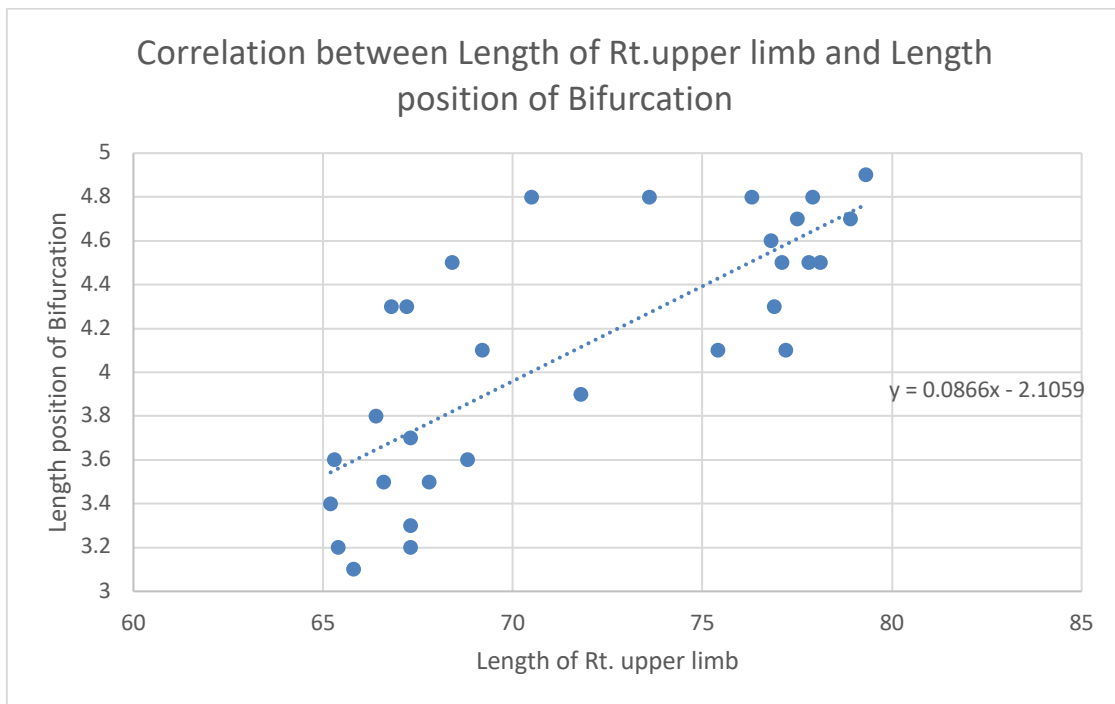
**Observation and Results**

**Table 1:** The mean values of the right upper limb were 71.66 (± 5.14) and the mean value of the length position of BA was 4.11 (± 0.57); the p value was p<0.001; and the correlation coefficient was 0.77.

**Table 2:** The mean value of the length of the left upper limb was 71.54 (± 5.13), the length of the bifurcation of BA was 4.10 (± 0.59), the correlation coefficient was 0.78, and the p value was highly significant (p<0.001).

**Table 1: Correlation between Length of Right upper limb with position of bifurcation of brachial artery from epicondyle of humerus**

No of Cadaver	Length of Rt. Upper limb	Length position of Bifurcation	Correlation Coefficient	P value
30	71.66 (± 5.14)	4.10 (± 0.57)	0.77	P<0.01

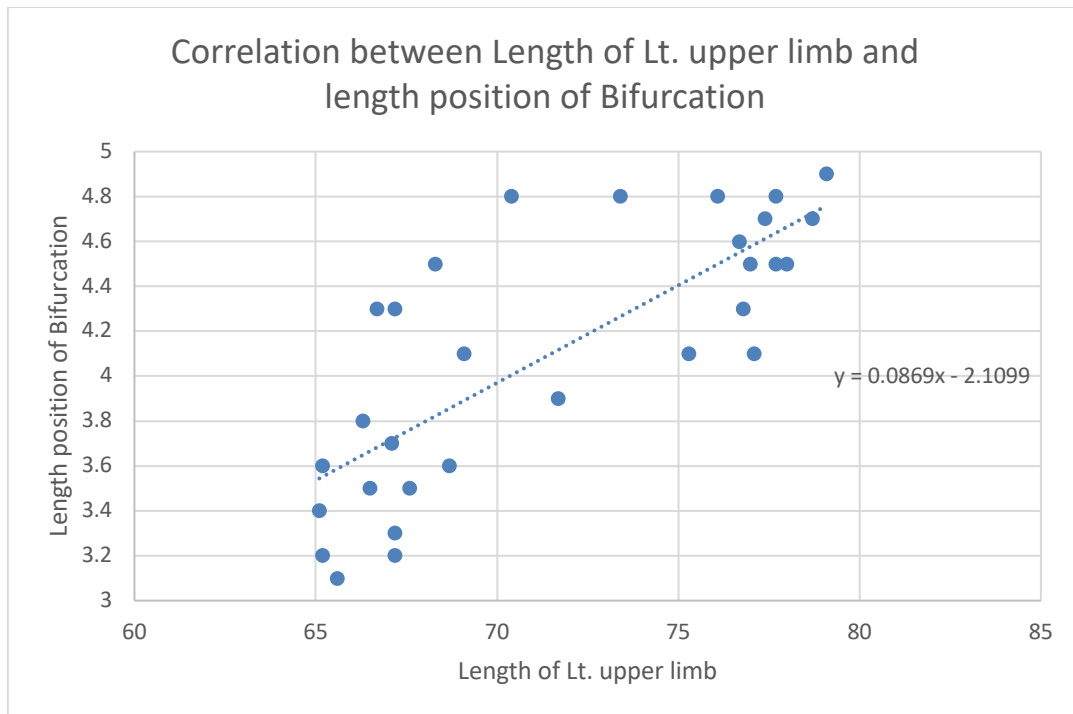


**Figure 1: Correlation between Length of Rt.upper limb and Length position of Bifurcation**

Statistically there is significant correlation observed between Length of Right upper limb and position of bifurcation of brachial artery from epicondyle of humerus (p<0.01). The regression equation of Length of position of Bifurcation(Y) on Length of Rt. Upper limb(X) on is as follows,  $Y = 0.0866 * X - 2.1059$

**Table 2: Correlation between Length of Left upper limb with position of bifurcation of brachial artery from epicondyle of humerus**

No of Cadaver	Length of Lt. Upper limb	Length position of Bifurcation	Correlation Coefficient	P value
30	71.54 (± 5.13)	4.10 (± 0.57)	0.78	P<0.01



**Figure 2: Correlation between Length of Lt. upper limb and length position of Bifurcation**

Statistically there is significant correlation observed between Length of left upper limb and position of bifurcation of brachial artery from epicondyle of humerus ( $p < 0.01$ ).

The regression equation of Length of position of Bifurcation (Y) on Length of Lt. Upper limb (X) on is as follows,  $Y = 0.0869 * X - 2.1099$

### Discussion

Present of correlative study of length of upper limb with position of BA in north Karnataka population. The mean value of length of rt. UL was  $71.66 (\pm 5.14)$  and mean values length of position of bifurcation of BA was  $4.11 (\pm 0.57)$  and correlation coefficient was 0.77 and  $p < 0.001$  (p value was highly significant) (Table 1) and mean value of length left U.L. of position of bifurcation of BA was  $4.11 (\pm 0.59)$ . To correlate these above said significant findings no literature is found in English Hence these significant Values can be justified by following factors. (a) In general arteries pursue the shortest and most direct course in order to reach their objective and that, this course is partly determined by mechanical convenience [6]. (b) The main arteries of the limbs run along flexor surfaces where they are less likely to be exposed to tension in movements of adjacent joints. (c) They avoid passing through actual muscular tissue which would compress them during active contraction where they penetrate muscle they pass rather through tendinous arches which protect them from pressure. (d) Arteries which are required to adapt themselves to varying positions in association with movements of the structures which they supply

usually. (e) The angle at which branches leave a main arterial stem certainly depends to considerable extent on hemodynamic factors [7]. (f) Embryologically axis artery of the UL is derived from the lateral branch of the seventh intersegment. (Sub-clavian) artery [8], but due to variation in the position of the fetus in intrauterine life, there may be variation in the position of bifurcation of the brachial artery. (g) The variations of bifurcation of the brachial artery have been reported since the 17th century [9]. It could be due to adaptation from quadrupeds to bipedalism to maintain the hemodynamic pressure against the gravitation of the ground. (h) Due to these variations in the bifurcation of the brachial artery, it may cause ischemia in UL, which was approximately 4% in previous studies [10,11].

The variation of bifurcation of BA can be explained supplied by axis artery that is aerated from inter sequential arteries. The axis artery of the upper limb is derived from the seventh cervical inter segmented or sub clavian artery. This artery grows distally along ventral axial line and terminates in a palmar capillary plexus in hand. Axillary artery brachial artery anterior inters seas artery and deep palmar are develop from main trunk of axis artery. Variation limb bud growth may lead to variation growth bifurcation to compensate the differential growth of developing upper limb.

### Summary and Conclusion

The findings of variations in bifurcations of the brachial artery have much more importance in different kinds of diagnostic, analytical, and

therapeutic studies and in congenital, inflammatory, metabolic, and regenerative diseases.

This study of variations in the position of the brachial artery correlated to the length of the respective UL is full of useful information for surgeons to avoid iatrogenic injuries and angiographic interpretation by radiologists, plastic surgeons, vascular surgeons, cardiologists, anaesthesiologists, and orthopedicians, but this study demands further histological, genetic, and embryological studies because the exact formation and duration of angioblastic cells are yet to be known.

**Limitation of study:** Owing to the tertiary location of the present hospital, the small number of cadavers, and the lack of the latest technologies, we have limited findings and results.

The present study was approved by the Ethical Committee of the Faculty of Medical Science, Khaja, Banda Nawaz University, Kalaburgi, and Karnataka-585104.

#### References

1. Williams, PL. Warwick, R. Dyson, and M. Banister, eds. *Grays Anatomy*, 37<sup>th</sup> Edition, 1989, 318–319, New York Churchill Livingstone
2. N. Sulluy, Tuncer I, Variant high origin radial artery by lateral cases surgical Radiological Anatomy 1998, 18, 63–88.
3. Kaho M. Pangilinan, AJ: Absence of brachial artery Report of a rare human variation and review of upper-extremity arterial anomalies J. Vasc. Surg. 2001, 33, 191–194.
4. Vatsala AR, Rajashekhar HV, Angadi, and Sangam: variation in the branching pattern of the brachial artery. A Morphological and Statistical Study, Int. J. Biol. Med. Res. 2013, 4 (1), 2920–2923.
5. Basmajian V-Grants Method of Anatomy, 8<sup>th</sup> Edition, Page 115, 1972 Scientific Book Agency Publication, Calcutta.
6. Gross Clark Lee: *The Tissues of the* 6<sup>th</sup> Edition, Oxford, 1971, Clarendon Press Publications.
7. D.W. Thompson: *Growth and Form*, Cambridge, 1975 CD. Murray: *The Physiological Principle of Minimum Work*, applied to the angle of branching of arteries. J. Gen. Physiol. 1925, 9.
8. Shewale SN, Sukre SB, and Diwan CV: bifurcation of the brachial artery at its commencement. Biomedical Research 2012, 23 (3), 453–456.
9. Yalcin B. Kocabiyik, N., Yazar F., Kirici Y. Ozon, H.—Arterial variation of the upper extremities. Anat. Sci. 2000, 81, 82–84.
10. Salvatore, Ociomo Jr., and Dellenca E. Kormitsky Arterio: arterial malformations between a high-origin radial artery and brachial artery within the cubital fossa. Its clinical and embryological significance is a case report. Cases Journal 2, 2009, 6836.
11. Singla RK, Sharma R: superficial brachial artery on to high division JAMA, vol. 52 (3), 2022.