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Research Article

MORPHOLOGICAL STUDY OF VARIATION IN BRANCHING PATTERN OF BRACHIAL ARTERY

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ABSTRACT
The brachial artery is the major blood vessel of the arm. Variations are important for surgeons to prevent complications. It seems necessary to identify unusual arterial pattern of the upper limb. The following observations were done in brachial artery present or absent, number, origin, termination pattern and its branches with pattern. Length of brachial artery is 22.22 cm. Branch of brachial artery is 64 %.2 Superior ulnar collateral arteries is branch of brachial artery 81 %. Inferior ulnar collateral artery is branch of brachial artery 96 %. Radial artery is terminal branch of brachial artery in 94 % and branch of brachial artery in 6 %. Muscular branches are average 1 muscular branch to coracobrachialis while for 2 for both brachialis and biceps brachii muscles. Our study on the brachial artery shows variations.

Key Words: *Brachial Artery, Profunda Brachii Artery, Superior Ulnar Collateral Artery, Inferior Ulnar Collateral Artery, Ulnar Artery, Radial Artery*

INTRODUCTION
The brachial artery is the major blood vessel of the arm. It continues down the ventral surface of the arm until it reaches the cubital fossa at the elbow. It then divides into the radial and ulnar arteries which run down the forearm. The pulsations are on medial aspect of tendon of the biceps. Variations are important for surgeons to prevent complications. It seems necessary to identify unusual arterial pattern of the upper limb. Variations in arterial pattern of upper limb are observed frequently. The presence of the arterial variations in the upper limb may be due to chemical factors, hemodynamic forces, and foetal position in the uterus, genetic predisposition, and developmental changes (Rodriguez *et al.*, 2001).

MATERIALS AND METHODS
The present study was conducted on 100 upper limbs of 50 cadavers embalmed with an embalming fluid belonging to the Department of Anatomy, Government Medical Colleges, Surat and Gujarat over the period of 4 years. The following observations were made and noted.
Brachial artery: 1.Present or absent 2.Number 3.Origin 4.Termination pattern 5.Length is measured by 2 points (a) the midpoint of the width of the artery where it begins (b) point of termination
Branches
1. Profunda brachii artery: Branch of brachial artery and its pattern, Common trunk with superior ulnar collateral artery, relation with teres major, Branching pattern in relation with axillary artery; posterior circumflex humeral art; subscapular; both circumflex humeral artery or absent. 2. Superior ulnar collateral artery**:** Branch of brachial artery and its pattern with profunda brachii or Branch of brachial artery 3. Inferior ulnar collateral artery: Branch of brachial artery or Absent 4. Nutrient artery: Branch of brachial artery and pattern. 5. Ulnar artery: Terminal branch or branch of brachial artery /axillary artery 6. Radial artery: Terminal branch or branch of brachial artery /axillary artery 7. Muscular branches

Observations
Brachial artery is present in all cases.
The average length of brachial artery is 22.22 cm from lower border of teres major to intercondylar line and from intercondylar line to the bifurcation the average length is 2.34 cm. Total length of brachial artery is 24.56cm. Length of brachial artery from lower border of teres major to intercondylar line

Table 1: Profunda brachii artery

	Our study
Branch of brachial artery	64 %
Two separate branch from brachial	1 %
Three separate branch from brachial	Nil
Common trunk with superior ulnar collateral artery (figure 1)	19 %
Arising at lower border of teres major	10 %
Branch of 3rd part of axillary artery	4 %
Common trunk with posterior circumflex humeral artery	2 %
Absent	Nil

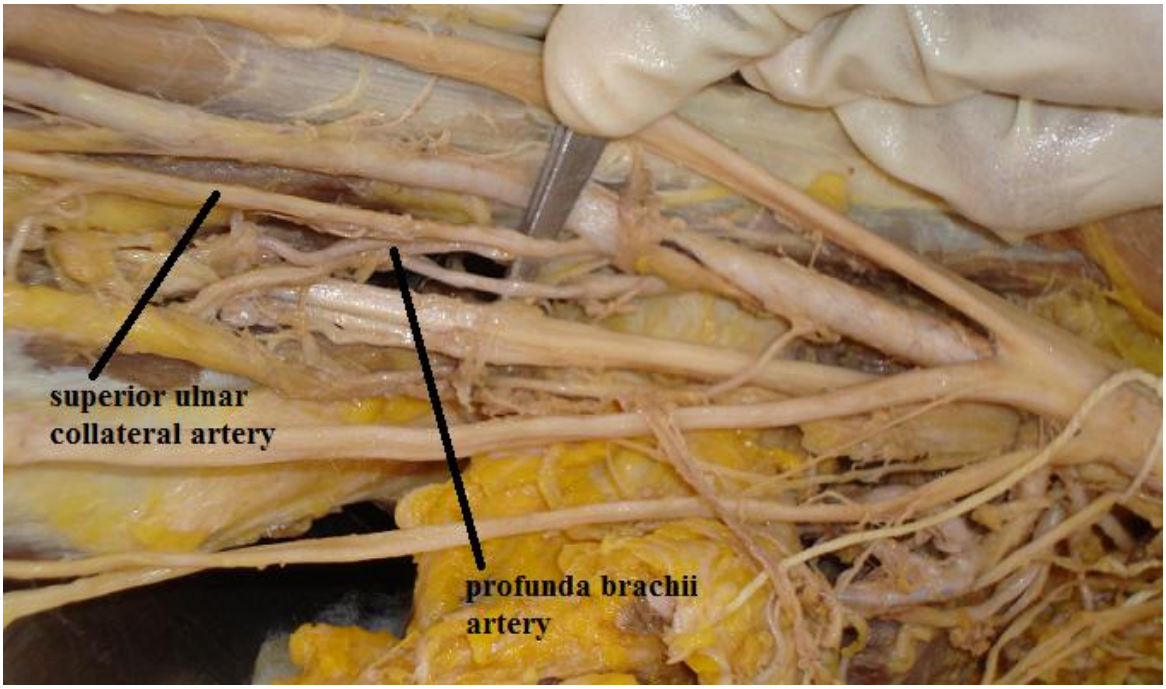

Figure 1: Common stem for superior ulnar artery and profunda brachii artery

Table 2: Superior ulnar collateral artery

	Our study
Branch of brachial artery	81 %
Arise as common trunk with profunda brachii artery (figure 1)	18 %
Common trunk with inferior ulnar collateral artery (figure 2)	1%

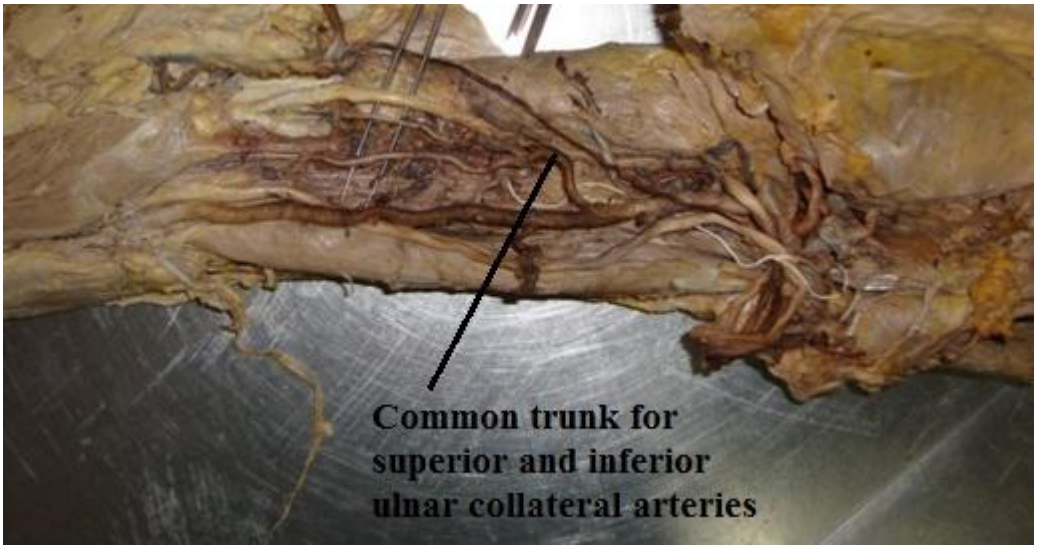

Figure 2: Common trunk for superior ulnar collateral artery and inferior ulnar collateral artery

Table 3: Inferior ulnar collateral artery

	Our study
Branch of brachial artery	96 %
Common with superior ulnar collateral artery (figure 2)	1%
Absent	3 %

Nutrient artery is branch of brachial artery in 94 % and of profunda brachii artery in 6 % .Ulnar artery is terminal branch of brachial artery in 98 % and branch of brachial artery in 2 % (figure 3).

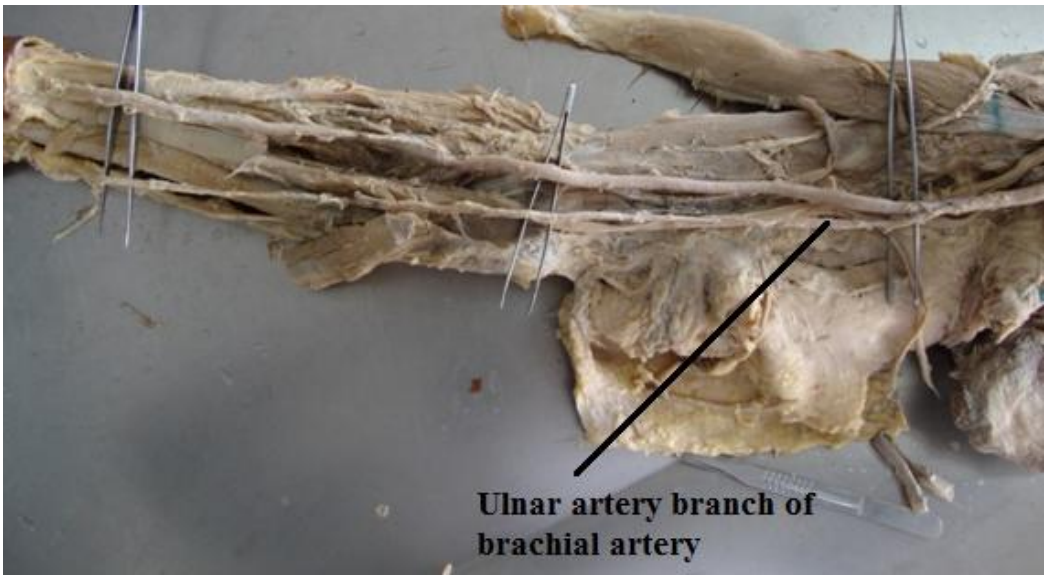

Figure 3 Ulnar artery branch of brachial artery

Radial artery is terminal branch of brachial artery in 94 % and branch of brachial artery in 6 %. Muscular branches are average 1 muscular branch to coracobrachialis while for 2 for both brachialis and biceps brachii muscles.

DISCUSSION

Brachial artery is present usually in every case but Ciervo *et al.,* (2001) has noted a case of absent brachial artery in one upper limb and the patient was operated for this anomaly and artificial arterial venous fistula and bypass grafting was done. Termination of brachial artery is generally by the bifurcation in all the cases in present study where as Huber (1930), Williams *et al.,* (1999), Patnaik *et al.,* (2001), Rodríguez *et al.,* (2001) found 1 cases of trifurcation. Profunda brachii artery is the direct branch of brachial artery in 64 % of cases which is comparable to Charles et al which has 54.7% of cases. Profunda Brachii artery is arises with the common trunk with superior ulnar collateral artery in 19 % of cases where as other study shows approximately 22 % of such cases.

Table 4: Variation in origin of profunda brachii artery

	Our study	**Charles *et al.*, (1931)**	**Anson (1966)**	**Patnaik VVG (2002)**
branch of brachial artery	64 %	54.7%	55%	94%
two separate branch from brachial	1 %	0.7%	0.7%	2%
Three separate branch from brachial			0.3%	
Common trunk with superior ulnar collateral artery	19 %	22.3%	22%	2%
Arising at lower border of teres major	10 %	8%	-	-
Branch of 3rd part of axillary artery	4 %	8.7%	16.0%	2%
common trunk with posterior circumflex humeral artery	2 %	4%	7%	-
Absent	-	0.7%	-	-

Superior Ulnar Collateral artery is the branch of brachial artery in 81% of cases whare as in Patnaik *et al.,* (2002) study it shows in 96 % of cases, the other variations are compared with other studies in following table.

Table 5: Variation in origin of superior ulnar collateral artery

	Our Study	**Charles *et al.*, (1931)**	**Anson (1966)**	**Patnaik *et al.*, (2002)**
Branch of brachial artery	81 %	-	-	96%
Arise as common trunk with profunda brachii artery	18 %	22.3%	22%	2%
Branch of profunda brachii artery	-	-	-	2%
Common with inferior ulnar collateral artery	1 %	-	-	-

Inferior ulnar collateral artery is Branch of brachial artery in 96 % while absent in 3 % of cases which is absent in 4 % of cases in Patnaik *et al.,* (2002).

Ulnar artery is mainly one of the terminal branches of brachial artery but it is one of the branches of brachial artery in 2 % of cases. Mc Cormack *et al.,* (1953) shows brachial artery as one of the branch in 1.33 % of cases, Devansh (1996) shows such variation in as high as in 9.38 % of case.

Table 6: Variation in origin of ulnar artery

	Our Study	McCormac *et al.,* (1953)	Weathersby (1956)	Devansh (1996)	Karlsson (1982)	Uglieta (1989)
Terminal branch of brachial artery	98 %	-	-	-	-	-
Branch of brachial artery	2 %	1.33%	0.67%	9.38%	1.21%	-
Branch of axillary artery	-	0.93%	-	-	-	1%

Radial artery variation in branching pattern of the brachial artery shows that the radial artery arises as one of the branch of the brachial artery in 6 % of cases in our study. And in other study by Gonzales-Compta (1991) shows 14.27 %, Keller *et al.,* (1980) shows 9.47 % of cases. Remaining variations are given below.

Table 7: Variation in origin of radial artery

	Our study	Gonzales-Compta (1991)	Keller *et al.,*(1980)	Karlsson (1982)	Uglieta (1989)
Terminal branch of brachial artery	94 %	-	-	-	-
Branch of brachial artery	6%	14.27%	9.47%	8.53%	7%
Branch of axillary artery	-	-	2.13%	1.21%	1%

Muscular branches: In our study we found on an average 1 muscular branch for coracobrachialis and 2 branches for biceps and brachialis. Other muscular branches to deltoid, triceps and to pronater teres were found. But we were unable to find such data from other researchers.

Conclusion

Our study on the brachial artery shows variations. The variation showed is length of brachial artery is 24.56 cm. In 64 % main branch of brachial artery profunda brachii artery is the branch of brachial artery, in 19 % cases profunda brachii artery arises as common trunk with superior ulnar collateral artery. The superior ulnar collateral artery is the branch of brachial artery in 81% while it arises as common trunk with profunda brachii artery in 19% cases. The inferior ulnar collateral artery is the branch of brachial artery in 96% cases while it arises as common trunk with superior ulnar collateral artery in 1% case and was absent in 3% cases. Nutrient artery is the branch of brachial artery in 94 % of cases where as branch of profunda brachii artery in 6 % of cases. Ulnar artery is the terminal branch of brachial artery in 98 % of cases where as in 2 % of cases it is just a branch of brachial artery. Radial artery is terminal branch of brachial artery in 94 % of cases where as it's just a branch of brachial artery in 6 % of cases. There are average 1 muscular branch to coracobrachialis while for 2 for both brachialis and biceps brachii muscles.

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