

High bifurcation of the radial and ulnar artery from the brachial artery: case report

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ABSTRACT: Brachial artery anatomically divides into radial and ulnar artery dividing at the level of neck of the radius. We present a cadaveric case study with a variation in the bifurcation of the radial artery and ulnar artery at the mid shaft level of humerus near the insertion of coracobrachialis muscle. The detailed course of the brachial artery along with its terminal branches is studied. The article discusses the embryological background and its clinical implications.

SUMMARY: A 55 year old male cadaver from Kerala, south India was dissected during routine undergraduate teaching which had unilateral high bifurcation of the radial and ulnar artery from the brachial artery at the level of mid shaft of the humerus. The arteries were traced in the forearm, wrist

and in the hand for its course. The terminal branches of the brachial artery were given at a higher level in the mid shaft of humerus near the insertion of coracobrachialis.

Course in the arm: Brachial artery branch of axillary artery terminally bifurcated into the radial and ulnar artery at the level of the insertion of coracobrachialis. There was thin profunda brachii artery, and thin muscular branches proximal to the terminal bifurcation of the brachial artery. There was no recurrent radial collateral and ulnar collateral artery branches from the brachial artery directly. The bifurcated terminal radial and ulnar arteries were equal in size. Radial artery as was superficial and ulnar artery is the continuation of the brachial artery embryological significance. The course in the forearm, wrist and hand was as usual.

Key Words: High bifurcation, Radial artery, Ulnar artery

INTRODUCTION

The Brachial Artery arises from the axillary artery at the distal border of the teres major muscle with its course medial to the humerus. Radial artery was superficial which can be exposed to trauma, vulnerable site for bleeding, accidental puncture of the artery instead of vein. It can be a common site for thrombosis when the wrist is exposed to dislocation or fracture. Brachial artery which is very commonly used for catheterization procedures requires arterial study.

CASE REPORT

During the routine dissection and teaching for the medical undergraduate students at our institute, we observed high bifurcation of radial and ulnar artery from the brachial artery at the mid shaft of the humerus near the insertion of coracobrachialis unilaterally on the right side in a 55 year old male cadaver. The left sided course of the artery appeared normal. The right sided radial and ulnar arteries were equal in size (3 mm) circumference. There was thin profunda brachii artery with muscular branches given directly from brachial artery proximal to the bifurcation of the terminal arteries. There were no radial and ulnar recurrent branches given. Because of the higher bifurcation of the radial and ulnar artery (4 mm circumference) above the elbow joint. Anterior and posterior interosseous artery was given from ulnar artery in the forearm.

The course of the radial artery was superficial; the artery in from of the distal end of radius enters the wrist and crosses the anatomical snuff box leaving the dorsal surface, anastomoses with the ulnar artery to form the deep palmar arch. The branches given from the radial artery was thin. The radial recurrent branch was absent and a thin interosseous branch given in the mid forearm level. Course in the wrist and hand was as usual. The course of the ulnar artery was anatomical with medially placed ulnar nerve. The course in the wrist and hand was also anatomically normal. There was no relevant medical or surgical history of the cadaver.

DISCUSSION

The brachial artery was a branch from axillary artery. The branches of brachial artery observed in the cadaver was profunda brachii and muscular branches from brachial artery were thin and absence of radial and anterior and

posterior ulnar recurrent arteries. The anterior and posterior interosseous arteries given from the ulnar artery. The course of the radial and ulnar artery in the forearm, wrist and hand was as usual. The high bifurcation of the brachial artery has clinical relevance for the vascular surgeons, plastic surgeon, and orthopedicians. The vascular variations in the upper limb have been studied by various authors (Table 1).

The axis artery is derived from the lateral horn of the seventh intersegmental artery which is the subclavian artery. The limbs are supplied by axis artery derived from the intersegmental arteries. The axillary artery, brachial artery, anterior interosseous artery, and deeper palmar arch develop from the main trunk of the axis artery. Radial artery and ulnar artery develop as lateral sprouts of the axis artery close to the bend of the elbow (1-5).

The radial artery may also arise at slightly at a higher level or proximally when compared to the ulnar artery during its development (6).

S. No.	Name of the author	Year of publishing	% of cases with SBA
1	Quain	1844	0.2
2	Gruber	1848	0.4
3	Muller	1903	1
4	Adachi	1928	3.1
5	Miller	1939	3
6	Mc Cormack et al.	1953	0.12
7	Skopakoff	1959	19.7
8	Fuss et al.	1985	17
9	Rao and Chaudry	2001	4.9
10	Rodriguez-Niendenfur et al.	2001	4.9
11	Patnaik et al.	2002	6
12	Kachik et al.	2010	5

Table 1) Incidence of high origin of radial artery that is brachioradial artery, reported by authors (5)

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Initially the developing radial artery is superficial branch remains predominant while deep part undergoes regression. Superficial radial artery is due to the hemodynamics predominance and deep part undergoes regression with persisting superficial part (7).

According to Arey and Jurjus there are 6 different reasons for the variations observed (8,9).

- The choice of unusual paths in the primitive vascular plexus.
- The persistence of vessels which are normally obliterated.
- The disappearance of vessels which are normally retained.
- An incompetent development.
- The fusion and absorption of parts which are normally distinct.
- A combination of factors leading to an atypical pattern normally encountered.

According to Singer the developing brachial artery has different patterns. The vasculature of the aorta and cardinal veins and form endogenous mesodermal cells. The early vasculature is a central artery draining into a peripheral marginal sinus and then into a peripheral venous channels. Blood vessels do not form beneath the ectoderm or in the central artery is from the seventh intersegmental arteries and cardinal veins from the angioblasts (endothelial cell precursors) mesh of capillaries and then collects into a marginal sinus beneath the AER which carries it away from the limb bud (10-15). The development of the entire brachial artery occurs in stages 5 different stages according Singer.

Hylaric acid which is secreted by the ectoderm is the inhibitory product with the establishment of the digital rays apical position of the marginal sinus persists in adulthood as basilic and the cephalic veins of the arm (10).

Clinical implication

The high bifurcation of brachial artery presented in the case report has surgical relevance and the arterial pattern to be studied carefully before operating. The variation is a useful fact for radiologist for studying the vessels in the arm. Fracture of humerus may induce vascular damage causing tissue necrosis. The knowledge of basic vascular patterns and their variations are necessary for surgical purposes. Vascular grafting done by plastic and vascular surgeons also requires the common variations observed in brachial artery. High bifurcation deserves significance in cardiac catheterization, in angioplasty, pedicle flaps or arterial grafting. The arterial pattern to be studied before the surgeries.

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