Higher Bifurcation of Brachial Artery with Superficial Course of Radial Artery in Forearm

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Abstract
An unusual case of bilaterally symmetrical higher bifurcation of brachial artery into radial and ulnar arteries with superficial course of radial artery in right forearm is reported. Accurate information regarding these variations is important during vascular and re-constructive surgery and also in evaluation of angiographic images.

Key Words
Higher Bifurcation, Brachial Artery, Superficial Radial Artery

Introduction
Variations in arterial patterns of upper limb in adult human body have been frequently observed either in routine dissections or in clinical practice (1). In 2-3% Korean cadavers, a superficial brachial artery arising from axillary artery and continuing in the forearm as radial artery has been reported (2). Few cases of higher origin of radial artery in arm with normal course in forearm have been published (3,4). In the present case, a rare anomaly of brachial artery dividing into radial and ulnar arteries in middle third of arm with superficial course of radial artery in right forearm is presented. The case is more significant as the higher bifurcation of brachial artery has been found to be bilateral.

Case Report
Bilateral variations in the level of bifurcation of brachial artery were observed during routine dissection of an adult male cadaver in the dissection hall of anatomy department. In this case it was observed that in right upper limb, brachial artery which normally divides into radial and ulnar arteries in cubital fossa got divided 7.5 cms above the line joining two humeral epicondyles (Fig.1A,B). Part of the brachial artery proximal to this bifurcation gave origin to profunda brachii artery and branches to flanking muscles as it normally does. The designate radial artery in arm gave only small branches to biceps and brachialis muscles. It coursed distally along with the designate ulnar artery on medial aspect of biceps and brachialis muscles upto elbow joint. From here onwards radial artery adapted a superficial oblique course covered only by the brachial and antebrachial fascia. In upper part of forearm, it ran along medial margin of brachioradialis muscle in the superficial plane lying on the tendon of biceps, supinator and flexor digitorum superficialis muscles (Fig.1C). In lower part of forearm and beyond that it had the same course as is normally seen. In the arm and proximal part of forearm it gave branches only to adjoining muscles. The designate ulnar artery had the same course as normal brachial artery in the arm and cubital fossa beyond which it continued as normal ulnar artery. On left side, bifurcation of brachial artery into radial and ulnar arteries was observed relatively at higher level i.e. 10.5 cms above the line joining humeral epicondyles (Fig.2A.B). Course of these vessels in forearm remains normal.

Discussion
Variations in upper limb arteries are fairly common and have been reported by several authors. Majority of these variations occur in radial artery followed by ulnar artery. In upper part of forearm, it ran along medial margin of brachioradialis muscle in the superficial plane lying on the tendon of biceps, supinator and flexor digitorum superficialis muscles (Fig.1C). In lower part of forearm and beyond that it had the same course as is normally seen. In the arm and proximal part of forearm it gave branches only to adjoining muscles. The designate ulnar artery had the same course as normal brachial artery in the arm and cubital fossa beyond which it continued as normal ulnar artery. On left side, bifurcation of brachial artery into radial and ulnar arteries was observed relatively at higher level i.e. 10.5 cms above the line joining humeral epicondyles (Fig.2A.B). Course of these vessels in forearm remains normal.

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Fig 1. Dissection of Front of Right Arm & Forearm. (A) Designate Radial Artery (B) Designate Ulnar artery (C) Superficial Radial Artery.

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The presence of superficial radial artery which makes it more vulnerable to trauma and thus bleeding. The superficial artery also makes it accessible for cannulation and also for taking radial artery graft which is widely used nowadays for coronary artery bypass graft surgery (CABGS). Being superficial, the radial artery may be mistaken for a vein and accidental injection of certain drugs in this artery may cause reflex vascular occlusion resulting in disastrous gangrene of hand.

**Embryological Explanation:** Every anomaly in the peripheral vascular anatomy can be related to genesis, regression or persistence of one or other segment of the embryologic axial artery (1,9). The type of anomaly presented in this case is due to persistence of radial artery in the arm and failure of formation of communication between radial and axial arteries in cubital fossa (Fig. 5). The superficial course of radial artery in upper part of forearm can be explained on the basis of haemodynamic mechanism between deep and superficial arteries in the forearm. Normally due to deep haemodynamic predominance, superficial terminal branches of radial artery undergo developmental arrest and deep part persists as normal radial artery. The superficial radial artery in right upper limb as seen in this case appears to be due to chance variations in haemodynamic factors which leads to regression of deeper vessels and persistence of one of the superficial terminal branches of radial artery (1,10).

**Clinical Implication**

The presence of superficial radial artery which makes it more vulnerable to trauma and thus bleeding. The superficial artery also makes it accessible for cannulation and also for taking radial artery graft which is widely used nowadays for coronary artery bypass graft surgery (CABGS). Being superficial, the radial artery may be mistaken for a vein and accidental injection of certain drugs in this artery may cause reflex vascular occlusion resulting in disastrous gangrene of hand.

**References**