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ORIGINAL RESEARCH

To determine the anatomical Variations and Clinical Importance of radial artery (Brachioradial Artery)

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ABSTRACT

Aim: To determine the anatomical Variations and Clinical Importance of radial artery (Brachioradial Artery)

Methods: This investigation employed 60 previously dissected upper limb specimens. The specimens were preserved in a 10% neutral buffered formalin solution. By clearing the connective tissue surrounding the radial artery, it was revealed and tracked from its beginning to its end. The course, branches, and variations of the radial artery were studied, and measurements were collected in specimens displaying an abnormal course of the radial artery using verniercallipers. The styloid process of the radius was used as a marker to measure the early division of the radial artery into palmar and dorsal branches.

Results: The radial artery emerged 5.6 cms proximal to the radius neck in 3.33 percent of the cases. The radial artery separated into palmar and dorsal branches anterior to the styloid point of radius in the distal part of the forearm in 8 specimens (13.33 percent) 3.33 percent of the specimens had the origin of the palmar branch 12.3 cms proximal to the radial styloid process, which continued superficial to the flexor retinaculum and thenar muscles in the palm to form part of the incomplete superficial palmar arch and supplied the lateral two and half fingers. In 3.33 percent of the cases, the radial artery split into palmar and dorsal branches 4.8 cms proximal to the radial styloid process, and the palmar branch split into superficial and deep branches. The bigger dorsal branch from the radial artery had a superficial path across the tendons of the abductor pollicislongus, extensor pollicisbrevis, and extensor pollicislongus, which constituted the limits of the anatomical snuff box in 5% of the specimens.

Conclusion: The superficial radial artery, which runs through the top of the anatomical snuff box, may be confused with the cephalic vein, and unintentional medication injection into the artery can lead to secondary issues. The aberrant course of the radial artery might explain the lack of a pulse at the wrist on the radial side. Such an unusual path might be useful for diagnostic, interventional, and surgical treatments.

Keywords: anatomical Variations, Clinical Importance,radial artery, Brachioradial Artery

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Introduction

The upper arm arteriole supply, particularly the brachial artery, is often subject to a large lot of fluctuation. In around 15-20% of cases[1], the arteriole supply displays the bifurcation of the brachial artery at a higher place than typical. When the subclavian artery reaches the lateral boundary of the first rib, it gives birth to the axillary artery. When the axillary artery penetrates the lower border of the teres major muscle, it immediately transforms into the brachial artery. [2] What is not well known is angiogenesis and its clinical significance, particularly in the terminal region of the brachial artery, as well as how this variety of bifurcation occurs.

The high bifurcation of the brachial arteries is the result of thoughts that can only be postulated or theorised. According to Rodriguez-Neidenfuhr, the vascular system in the upper limb is built on a network of capillaries coming from the dorsal aorta. [2-4] According to certain hypotheses, forearm arterial variations are caused by growth failure in the routes of the arterial plexus limb buds as a result of uneven patterns of blood flow during embryological development.[5]This abnormality might be caused by any variety of developmental abnormalities or incomplete embryonic fusions. [6,7]The arteries' origin will be determined by the path that the superficial brachial arteries trunk branching will travel. 8 Either it is an early trunk of origin or it is not. In healthy people, the artery starts at the distal border of the teres major muscle and ends at the level of the radius's neck. [5] It runs parallel to the median nerve as it descends into the medial intermuscular septum. [4,9,10] The median nerve travels lateral to the artery proximally and medially to the nerve distally. The median nerve is the sole structure that crosses the brachial artery's route. The brachial artery branches into the profundabrachii artery, superior ulnar collateral artery, inferior ulnar collateral artery, nutritive artery, and muscle branches. [2] The brachial artery runs from the cubital fossa medially to the biceps brachii tendon, laterally to the median nerve, and deep to the bicipitalaponeurosis. In most people, the artery divides into the ulnar and radial arteries near the cubital fossa. However, there is diversity in the brachial artery division in 25% of people. According to examining publications from 2017, there are six known varieties of this artery, with the superficial brachial artery being the most prevalent. [4] The brachial artery is often used for blood pressure measures, dialysis, and arteriography, all of which might be jeopardised by arterial changes.[5,10] The study of these differences may help healthcare experts make more accurate and precise diagnoses. [10] When the femoral artery is blocked, the brachial artery may be utilised instead. It may also be used to treat persistent renal failure after an arteriovenous fistula. [1,4]Radiologists and vascular surgeons must evaluate information regarding the variation patterns in this artery in order to limit the danger of iatrogenic consequences. [5,6]Gangrene, thrombosis, and, in extreme situations, limb loss may occur if the variety of vasculature is not mapped out before to performing an upper-limb operation. [6]

Methods and materials

This investigation employed 60 previously dissected upper limb specimens. The specimens were preserved in a 10% neutral buffered formalin solution. By clearing the connective tissue surrounding the radial artery, it was revealed and tracked from its beginning to its end. The course, branches, and variations of the radial artery were studied, and measurements were collected in specimens displaying an abnormal course of the radial artery using verniercallipers. The styloid process of the radius was used as a marker to measure the early division of the radial artery into palmar and dorsal branches.

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Results

The current study's observations and measurements are reported in the form of tables numbered 1 through 3. The radial artery emerged 5.6 cms proximal to the radius neck in 3.33 percent of the cases. [Table-1]. The radial artery separated into palmar and dorsal branches anterior to the styloid point of radius in the distal part of the forearm in 8 specimens (13.33 percent) [Table -2]. 3.33 percent of the specimens had the origin of the palmar branch 12.3 cms proximal to the radial styloid process, which continued superficial to the flexor retinaculum and thenar muscles in the palm to form part of the incomplete superficial palmar arch and supplied the lateral two and half fingers. In 3.33 percent of the cases, the radial artery split into palmar and dorsal branches 4.8 cms proximal to the radial styloid process, and the palmar branch split into superficial and deep branches. The superficial branch of the radial artery continued into the palm as the superficial palmar branch of the radial artery, forming a full superficial palmar arch that fed the radial side of the index finger and both sides of the thumb. The deep branch passed through the anatomical snuff box before ending at the dorsal carpal arch. The bigger dorsal branch from the radial artery had a superficial path across the tendons of the abductor pollicislongus, extensor pollicisbrevis, and extensor pollicislongus, which constituted the limits of the anatomical snuff box in 5% of the specimens. The dorsal branch of the radial artery eventually entered the palm through the first interdigital cleft [Table 3]. In 3.33 percent of the specimens, the dorsal branch of the radial artery gave rise to the first dorsal metacarpal artery and arteriaprincepspollicis, which fed the neighbouring sides of the thumb and lateral side of the index finger. The dorsal branch of the radial artery continued into the palm to produce the deep palmar arch.

Table 1: **Origin of radial artery inrelation to Interepicondylar line of Humerus**

Radial artery	**Number of specimen**	**%**
Origin distal to Interepicondylar line of humerus (IEL)	58	96.67
Origin proximal to Interepicondylar line of humerus (IEL)	2	3.33

Table 2: Division of radial artery into palmar and dorsal branches in the forearm.

Range	**Right**	**%**	**Left**	**%**
At styloid process	24	40	28	46.67
< 3cm (In the forearm)	2	3.33	2	3.33
>3 cm (In the forearm)	4	6.67	0	-

Table 3: Course of radial artery near the anatomical snuff box

Relations	**Right**	**%**	**Left**	**%**
Within the anatomical snuff box	27	45	30	50
Superficial to anatomical snuff box	3	5	0	

Discussion

Anatomists often concentrate on uncommon anatomical differences, but vascular changes that occur frequently have a larger clinical value since they are more likely to be encountered. The radial artery is most often utilised in surgical treatments such as elevating a radial forearm flap, as a graft for coronary bypass, and as an intransradial route during coronary surgeries. Because it lowers site problems, the trans radial method is more frequently approved for cardiac procedures than the trans femoral and/or trans brachial approaches.

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Superficial radial artery is a rare variation characterised as a radial artery of normal origin at the neck of the radius that crosses superficial to tendons creating the limits of the snuff box11 with an incidence of 0.52 percent to 1%. According to research, this artery variation is frequently unilateral. [12] A superficial radial artery, if present, generally arises from the distal third of the forearm[12-14], less often from the proximal third of the forearm15,16, and in one instance it originated above the elbow level.[12] In the current investigation, three specimens had superficial radial arteries (5 percent). The superficial radial artery is generally bigger than the deep branch, which runs through the anatomical snuff box normally. [14,16,17]The presence of a superficial radial artery that runs superficially along the length of the cephalic vein suggests the lack of a radial pulse at the wrist, which is the most typical location for doctors to feel the peripheral pulse. Because of its closeness to the cephalic vein, this superificial course of the radial artery above the snuff box may provide complications with intravenous cannulation during operation monitoring or hospitalization18 and represent a risk for unintentional intra-arterial medication administration.[19]

To minimise vascular deterioration caused by repeated usage, accidental cannulation or injection of the superficial radial artery necessitates prompt surgical surgery.[20]For coronary artery bypass grafting, the radial artery is usually employed. Cardiovascular surgeons should check for the course of the radial artery before harvesting it to prevent future difficulties. Anatomical variances of blood arteries are often caused by defects during embryonic development. The radial artery divides into two branches in primates: a volar branch, which is represented by a radiopalmar branch in humans, and a dorsal branch, which is represented by the normal radial artery, which further divides into superficial and deep branches in relation to the tendons in the anatomical snuff box. [21] The radial artery, which terminates in a deep palmar arch, is important in tendon transplantation. If orthopaedic surgeons overlook the superficial course of the radial artery in the dorsum of the hand during tendon transplantation, bleeding and other problems may occur. [22]

Conclusion

Physicians should feel the pulse of the radial artery against the lower end of the radius since it is one of the most frequent places to detect peripheral arterial pulse. The radial artery is also one of the most often harvested arteries for coronary bypass graft surgery. Anomalous artery courses are widespread, with some having higher clinical relevance than others. The superficial radial artery, which runs through the top of the anatomical snuff box, may be confused with the cephalic vein, and unintentional medication injection into the artery can lead to secondary issues. The aberrant course of the radial artery might explain the lack of a pulse at the wrist on the radial side. Such an unusual path might be useful for diagnostic, interventional, and surgical treatments. Even while diagnostic arterial investigations such as an arteriogram or MRA may assist identify any vascular abnormalities prior to surgery, it is critical for a healthcare professional to use a basic and affordable method of feeling for the existence of a radial pulse before cannulation.

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