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Research Article

A STUDY ON THE ANATOMICAL VARIATIONS OF THE ORIGIN, COURSE AND BRANCHES OF THE RADIAL ARTERY

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ABSTRACT

To describe the radial artery and its variants in origin, branching pattern, mode of termination, and measurements of its length and external diameter. Radial artery variations are of importance for clinicians, whether in angiographic examinations or surgical approaches. The high origin of radial artery is the most frequent arterialvariation observed in the upper limb, showing an incidence of 14.27% in dissection material and 9.75% in angiographic examination. The present study was carried out in50 upper limb specimens andwe have correlated thepresent findingsthe findingsof earlierstudies.

INTRODUCTION

The radial artery (RA) is the smaller terminal branch of the brachial artery. It begins 1 cm distal to the elbow joint, at the level of neck of radius. It runs medial to and under the cover of the brachioradialis throughout its course in the forearm. Just above the wrist, it is palpable between the flexor carpi radialis medially and anterior border of radius laterally. It then turns posterolaterally round the wrist superficial to the lateral ligament of the wrist and deep to the abductor pollicis longus and extensor pollicis brevis muscles. It crosses the scaphoid and trapezium bones and just before it passes between the two heads of the first dorsal interosseous, it is crossed by the tendon of the extensor pollicis longus muscle. Between the extensor muscles of the thumb, it is crossed by the cephalic vein and digital branches of the radial nerve which supply the thumb and index finger. It passes between the two heads of the first dorsal interosseous muscle and enters the palm [1].

The main branches are the radial recurrent artery in the cubital fossa, superficial palmar branch in the forearm and palmar carpal branches at the wrist, dorsal carpal branch on the dorsum of hand and first dorsal metacarpal artery, princeps pollicis and radialis indicis in the palm. The common mode of termination of the radial artery is by forming the deep palmar arch.

Although variations in the origin of the RA are common, with an incidence of 77% [2], variations in the course are rare, with an incidence of only 0.9 % [3].Variations in the origin, course, termination, branching pattern and its relations to adjacent structures in the distal part of the forearm and wrist is of great importance especially for angiographic examinations and surgical approaches [4]. Also the superficial course of the artery in the forearm for about 20 centimetres, minimal number of large branches, diameter greater than that of internal thoracic artery and similarity in structure to the coronary artery makes radial artery an ideal graft in coronary bypass techniques. The main purpose of our present study is to note the variation in the level of origin, course, branching pattern and termination of the radial artery.

Aim of the study:

Even though the branches of radial artery are very few, the variations in its origin, course and branching pattern are not uncommon. So a thorough knowledge about the radial artery, its branches and its variations are very much important for the vascular surgeons, nephrologists, plastic surgeons and cardio – thoracic surgeons; according to which they can modify the surgical procedures in a most satisfactory way. So the present study of radial artery was undertaken by us to study the origin, course and branching pattern and termination.

Material and methods:

The study material consists of 50 upper limb specimens from 25 adult cadavers (19 males and 6 females). The specimens were selected from 25 cadavers

allotted to the I MBBS students at the Department of Anatomy, Government Theni Medical College. Dissections were made on anatomical planes, on the whole length of the upper limbs including the axillary region to clarify the origin, course, branches and termination of the radial artery.

Discussion:

In all the 50 limbs the radial artery appears to be the continuation of the parent trunk, the brachial artery [1]. In 43 specimens (86 %) the radial artery was seen arising at the level of neck of radius [5]. High level of origin of radial artery was the common variation noted in earlier studies [2].In 3 specimens (6%) The origin of the artery was at the level of the intercondylar line "figure-1". In 4 specimens (8%) the starting of the artery was above the intercondylar line "figure-2".In 22 specimens (44%) the radial artery was the smaller of the two divisions of the brachial artery [1]. In 12 specimens (24 %) the radial artery appears to be larger than the ulnar artery and in 16 specimens (32 %) the size is equal to that of the ulnar artery [6].

Rodriguez –Michael Sachs in1987reported cases with superficial course of radial artery in the anatomical snuffbox, where the radial artery after giving the superficial palmar branch, passed on to the dorsal aspect of the hand, by winding round the lateral aspect of the wrist superficial to the tendons forming the boundaries of anatomical snuff box and reached the first interosseous space. Ultimately it passed between the two heads of the first dorsal interosseous muscle to enter the palm.A similar case was reported by Nied enfuhr et al in 2003. In our present study in 48 specimens (96 %) the radial artery was seen descending along the lateral side of the forearm from the medial side of neck of radius to the wrist [1]. In two specimens (4 %) the radial artery was superficial in its course in the distal part of the forearm were the artery was covered by skin, superficial fascia and traverses over the tendons abductor pollicis longus and extensor pollicis brevis in the anatomical snuff box instead of going deep to them [7].

Regarding its branches the radial artery usually gives off two large branches in the forearm, the radial recurrent artery and the superficial palmar artery. The radial recurrent artery arises just below the origin of radial artery and the superficial palmar branch usually arises in the distal part of the forearm and it then passes over or through the muscles forming the eminence of thumb to enter the palm [8]. In 44 specimens (88%) the radial recurrent artery, was arising close to the origin of radial artery "figure4". In three specimens (6%) it was arising beyond the origin of the radial artery "figure 5" and in two specimens (4%) the artery was arising from the lateral side of the brachial artery. Finally in one specimen (2%)"figure-6",it was arising at the level of bifurcation of bifurcation of the brachial artery (2%) [9]. Usuallythe superficial palmar branch of the radial artery completes the superficial palmar arch [10]. In 48 specimens (96%), the superficial palmar branch was arising from the radial artery in the distal part of the forearm and completed the superficial palmar arch in the palm. In 2 specimens (4%) the superficial palmar branch of radial artery was completely absent andthe superficial palmar arch in one (2%) was incomplete and in the other (2%)the arch was completed by the median artery [12], were the median artery was arisingfrom the radial artery in the distal part of the forearm.Normally the radial artery after entering the palm, gives off the princeps pollicis artery which divides into two to supply the medial and lateral sides of the thumb.Then the radial artery gives off the radialis indicis artery to the lateral side of the index finger. After this, the radial artery curves medially and continues as deep palmar arch which is completed on the medial side by the deep branch of the ulnar artery [12].The princeps pollicis and radialis indicis arteries frequently arises by a common trunk or may be derived from the superficial arch , from an enlarged median artery or from the superficial palmar branch.In our present study in 45 specimens the princeps pollicis artery wasseen arising from the radial artery in the palm (90%). In 2 specimens (4%) the artery was arising from the radial artery on the dorsum"figure-7". In one specimen (2%) it was arising from the superficial palmar branch of the radial artery and in other 2 specimens (4%) princepspollicis was seen arising from superficial palmar arch.In 47 specimens (94%) the radialis indicis was arising from radial artery in the palm. In 2 specimens(4%) it was arising from the superficial palmar arch and in one specimen(2%) it was arising from the superficial palmar branch of the radial artery.Regarding its termination, the radial artery usually ends by anastomosing with deep branch of ulnar to form deep palmar arch [13]. In 46specimens (92%) radial artery terminated by forming deep palmar arch. In two specimens (4 %) the radial artery ends by supplying adductor pollicis in its distal part. In two specimens (4 %), the radial artery after giving arteria princeps pollicis and radialis indicis travelled deep to the oblique head of adductor pollicis muscle and the deep palmar arch was incomplete. A slender dorsal carpal branch arising from the radial artery deep to extensor pollicis tendons was noted in all the 50 specimens. A thin first dorsal metacarpal artery was also noted in all 50 specimens.

I. Figures and Tables

1. Brachial artery 2. Radial Artery 3. Radial Recurrent Artery

Figure-1: Origin of radial artery at the intercondylar line

1.Brachial artery 2.Radial artery 3.Ulnar artery

Figure-2: Origin of radial artery above the condylar line

Figure-3: High origin of radial artery

1. Brachial artery 2. Radial Artery 3. Radial Recurrent Artery

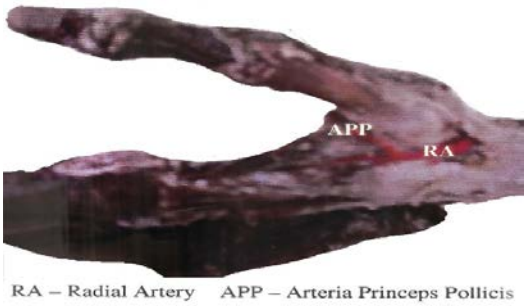
Figure-4: Radial recurrent branch arising from radial artery close to its origin

1.Brachial artery 2. Radial artery 3.Radial recurrent branch

Figure-5: Radial recurrent branch arising from

1.Brachial Artery 2.Ulnar Artery
3.Radial Artery 4. Radial Recurrent Artery

Figure-6: Radial recurrent branch arising at level of bifurcation of brachial artery



RA – Radial Artery APP – Arteria Princeps Pollicis

Figure-7: Princeps pollicis & Radialis indicis arising from the radial artery on the dorsum of hand.

CONCLUSION:

Knowledge of the description of radial artery and its variants has great importance in different clinical fields and basic medical studies. The knowledge of this variation of the radial artery is important while performing intravenous cannulations and plastic surgeries. It is also important to cardiothoracic surgeons as the radial artery is increasingly being used for the coronary bypass graft in place of the great saphenous vein [14], and also occlusion of the radial artery is very common following direct penetrating or blunt trauma or from transarterial catheters for arterial pressure monitoring or blood gas analysis [15]. Patients with an incomplete palmar arch are at an increased risk of developing chronic hand ischaemia due to injury of the radial or ulnar artery. In our present study, although the variations in course and branching pattern are much similar to the earlier studies, it will definitely give a better background knowledge about the artery for the anatomists and surgeons.

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