A morphological study of variations in the branching pattern and termination of the radial artery

**INTRODUCTION**

Coronary artery bypass grafting is an established means of treating advanced coronary artery disease. Accurate knowledge of the branching pattern of this artery and its relation to surrounding structures is of great importance in the care of surgical patients.

**METHODS**

This study was conducted on 75 formalin-fixed upper limbs in order to note the variations in the branching pattern and termination of the radial artery.

**RESULTS**

The radial artery divided into three branches in 2.7% of cases and into two branches in 52.0% of cases. The radial recurrent artery originated from the brachial artery instead of the radial artery in 12.0% of cases. The radial recurrent artery, palmar carpal artery, first dorsal metacarpal artery and superficial palmar artery were absent in 1.3%, 26.7%, 9.3% and 5.3% of cases, respectively. 6.7% of cases had a high origin of the superficial palmar artery.

**CONCLUSION**

The rich photographic documentation of the variation of branching pattern and termination of radial artery is not only of academic interest but also useful to surgeons and radiologists working in the same area.

**Keywords:** branching pattern, coronary artery bypass grafting, radial artery, termination

or undergoing arteriography. For both surgical and routine patient care, precise knowledge of the course of the RA and its relation to adjacent structures is of great importance. Therefore, the current study was undertaken to document and provide a database of both the normal and variant anatomies of the RA in adult human cadavers in the South Indian population.

**METHODS**

In this study, 75 formalin-fixed upper limbs were dissected. Out of these, 17 limbs were from male cadavers, nine were from female cadavers and 49 were isolated upper limbs. Upper limb specimens with damaged RAs were excluded from the study. An incision was made in the upper limb from the axilla up to the wrist, and the skin and deep fascia of the forearm from the axilla to the proximal margin of the flexor retinaculum were exposed in layers. A transverse incision was then made just proximal to the flexor retinaculum, and the flaps of fascia were reflected. The brachioradialis, tendons of the abductor pollicis longus and extensor pollicis brevis were retracted without any injury to the surrounding structures. In the groove between these muscles, the RA was identified and cleaned from its origin to its termination, and its branching pattern as well as any other variations were noted and recorded.

**RESULTS**

In nine out of the 75 cases (12.0%), the radial recurrent artery originated from the brachial artery instead of the RA (Fig. 1), and was absent in one case (1.3%) (Fig. 2). The palmar carpal artery was absent in 20 cases (26.7%) (Figs. 2 & 3), and the first dorsal metacarpal artery in seven (9.3%) (Figs. 2 & 4). In five out of the 75 cases (6.7%), the superficial palmar artery had a high origin of the radial (Fig. 3), while in four cases (5.3%), it was absent (Fig. 2). The princeps pollicis artery emerged from other arteries instead of from the RA in three cases (4.0%), from the median artery in one case (1.3%),
and from the superficial palmar branch of the RA in two cases (2.7%). In two cases (2.7%), the arteria radialis indicis emerged from the superficial palmar branch, and was absent in four cases (5.3%).

In two out of 75 cases (2.7%), the RA divided into three branches. The first branch gave off the princeps pollicis and radialis indices arteries from the web of the thumb, while the second branch was the dorsal metacarpal artery and the third was the deep branch of the RA. In 39 out of 75 cases (52.0%), two branches were observed; the first provided the princeps pollicis and radialis indices from the web of the thumb, and the second was the deep branch of the RA (Table I, Fig. 5).

**DISCUSSION**

Variations in the arterial pattern of the upper limb have frequently been observed both in routine dissections and clinical practice. To our knowledge, this is the first study reporting unique variations in the branching pattern of the RA. In our study, the radial recurrent artery originated from the brachial artery instead of the RA in 12.0% of the cases, while in one specimen, it was completely absent. The palmar carpal artery was absent in 20 cases (26.7%) and the first dorsal metacarpal artery, in seven cases (9.3%). Dhar and Lall noted a case of superficial palmar artery arising high above from the RA, which was also observed in five out of 75 cases (6.7%) in our study. However, in our study, the superficial palmar artery was absent in four cases (5.3%). Patnaik et al found that at the proximal end of the second intermetacarpal space, the RA gave off a second dorsal metacarpal branch that passed distally toward the second interdigital cleft, whereas this was not observed in the present study.

Furthermore, de Rezende et al found termination of the RA by division into three branches in 22 specimens (84.6%). However, division into three branches was noted in only 2.7% of our specimens, although the branches were similar (i.e. the princeps pollicis...
pollicis artery, first dorsal metacarpal artery and branch to the deep palmar arterial arch) (Fig. 5c). de Rezende et al also found termination of the RA by division into four branches, with the last branch running to the dorso-ulnar aspect of the thumb in 15.3% of specimens. Of note, division of the RA into two branches was found in 39 out of the 75 cases (52.0%) in our study.

In conclusion, this extensive dissection-based study presented some distinctive and important findings on the branching pattern and termination of the RA, along with comparisons with previous reports. Such knowledge would be of immense help to surgeons and radiologists who are working on the RA as an entry route during coronary angiography and percutaneous coronary interventions.

REFERENCES