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Original Article

Size of distal radial and distal ulnar arteries in adults of southern Rajasthan and their implications for percutaneous coronary interventions

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ABSTRACT

Aims and objectives: Transradial interventions are gaining popularity in recent years. However the radial artery being small, there is a limitation in using interventional devices through this route. We have measured radial and ulnar arteries size in adult patients at our tertiary care cardiology center in southern Rajasthan.

Method: Adult patients >30 years, who came for Echocardiography at a tertiary care center were included. Radial and ulnar arteries inner diameters were measured 2–3 cm above the Styloid process in both forearms with the Ultrasonography. Patient information about weight, height, diabetes and hypertension were collected. Body mass index and Body surface area were calculated.

Results: We studied 204 patients, which includes 60.8% males. Mean diameter was 2.325 ± 0.4 mm mm for radial arteries and 2.358 ± 0.39 mm for ulnar arteries ($p = 0.24$). Hypertensive and male patients had larger mean radial artery diameter than non hypertensive (2.383 mm v/s 2.272 mm, $p = 0.006$) and female patients (2.37 mm v/s 2.26 mm, $p = 0.008$) respectively. Diabetic patients (2.305 mm) had nonsignificantly smaller radial arteries diameters than nondiabetics (2.329 mm, $p = 0.6$). We calculated correlations between radial arteries diameters and Body surface area, Body mass index, height and weight of patients, none of these correlations were statistically significant ($r = 0.30$, $r = 0.28$, $r = 0.07$, $r = 0.031$ respectively).

Conclusion: Mean radial artery diameter (2.325 ± 0.4 mm) in the study was slightly smaller than ulnar artery (2.358 ± 0.39 mm). Males and hypertensives had a larger mean radial artery diameter than females and non hypertensives. Radial artery inner diameter measurement by Ultrasonography may be more helpful than Allen's test for ideal selection of cases.

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1. Introduction

Radial artery is being increasingly used by cardiologists for diagnostic and interventional purpose since last two decades after the work of Campeau[1] and Kiemeneij.[2] It is a safe alternative to the femoral route, however, transradial access is limited by a significantly higher rate of procedural failure because of small size of radial artery.[3] Devices and catheters used for femoral route may not work through radial approach.

There is not much literature on predictors of radial artery size in an individual. Hypertension, non diabetics and male sex have been found to be associated with larger radial artery diameter.[4–6] In these studies there was no correlation of radial artery diameters with Body mass index or Body surface area. The mean internal diameter of radial artery has been reported to be 3.67 ± 0.8 mm in the western population[7] compared to 2.63 ± 0.35 mm in Asian population.[8] Radial Artery is also being increasingly used in India for diagnostic and interventional purposes. There are not much reported data on size of radial arteries in the Indian population.

Ulnar artery is also being used by some investigators for coronary angiography and the procedure is found to be safe.[9,10] There is no consensus regarding the size of distal ulnar artery in comparision to distal radial artery. Some investigators found ulnar artery larger than radial artery,[6,11,12] while others contradicted this finding.[4,13]

The aims of this study were to measure radial and ulnar arteries diameter in the adult population by Ultrasound and evaluate the factors which can predict the size of radial or ulnar artery, so that one can know the appropriate size of devices and catheters suitable for radial or ulnar cardiac interventions.

2. Patients and methods

This cross sectional observational study was conducted in Hindustan Zinc Limited Cardiology Center, Department of Cardiology, Rabindra Nath Tagore Medical College, Udaipur, India, in June and July 2011.

Patients more than 30 years of age, who came to echocardiography laboratory for echocardiography, were included in the study. Internal diameters of right and left radial, and right and left ulnar were measured with the Doppler vascular probe of 5–11 MHz of GE vivid 7 dimension machine. 204 patients were included in the study. Age, gender, history of hypertension, history of diabetes, weight and height of the patient were collected at the time of radial and ulnar artery measurement. Body surface area (Mosteller formula)[14] and Body mass index were derived from height and weight.

Radial and ulnar arteries diameters were measured 2–3 cm above the tip of Styloid Process. The smallest internal diameters of radial and ulnar arteries were recorded after comparing the size in both; longitudinal and transverse sections.

Continuous variables were expressed as mean ± SD. Independent *t* test was used to analyze data in between groups. A *p* value <0.05 was considered statistically significant.

Pearson's correlation coefficient was used to show relations between body parameters and radial and ulnar arteries diameters.

3. Results

We studied 204 patients which includes 60.8% males. 48.0% of patients were hypertensive and 15.2% were diabetic. Average age of patients in the study was 56.87 years.

Total 404 radial arteries of both the forearms (2 patients have undergone CABG with use of radial conduit and in other 2, radial arteries were not palpable or aberrant) were studied. The mean internal diameters of right and left radial arteries were 2.329 ± 0.4 mm and 2.322 ± 0.4 mm respectively (*p* value 0.86). The mean diameter of all the radial arteries was 2.325 ± 0.4 mm. Total 402 ulnar arteries of both the forearms (6 were not palpable or aberrant) were studied. The mean internal diameters of right and left ulnar arteries were 2.339 ± 0.37 mm and 2.376 ± 0.4 mm respectively (*p* value 0.34). The mean diameter of all the ulnar arteries was 2.358 ± 0.39 mm. Fig. 1 shows that difference between mean radial and ulnar arteries internal diameters at wrist was non significant (*p* value 0.24).

Table 1 shows radial and ulnar arteries inner diameters with variables like sex, hypertension and diabetes. The mean diameter of radial arteries in males was 2.369 ± 0.41 mm in comparison to females 2.259 ± 0.39 mm (*p* value <0.01). Similar result was found for ulnar arteries of males in comparison to females, 2.408 ± 0.4 mm and 2.282 ± 0.36 mm respectively (*p* value <0.01). Hypertensive patients had larger radial arteries (2.383 ± 0.4 mm) in comparison to non hypertensive patients (2.272 ± 0.41 mm, *p* value < 0.01). Diabetic patients (2.305 ± 0.40 mm) had smaller mean radial artery diameter than non diabetics (2.329 ± 0.41 mm), but this difference was not significant (*p* value 0.06). There were no significant correlations of radial arteries inner diameters, with Body surface

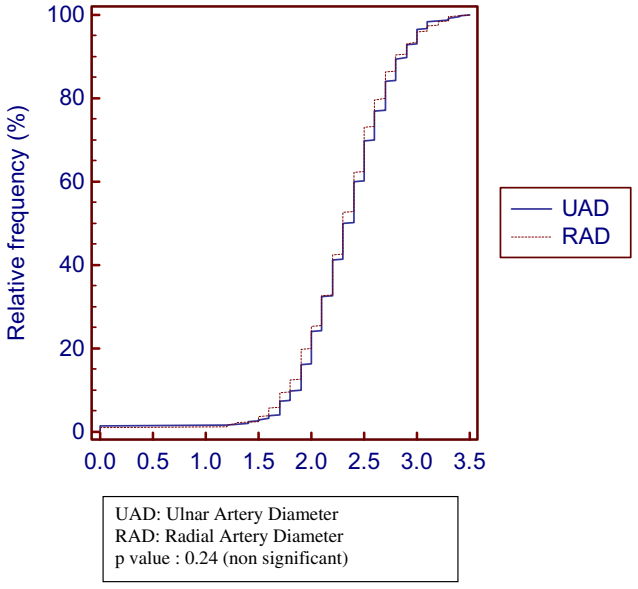

Fig. 1 – Comparision of radial and ulnar artery diameter frequency distribution curve.