

THE ANGULATIONS OF RIGHT CONUS ARTERY AND ITS ANATOMICAL IMPORTANCE

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ABSTRACT**BACKGROUND**

The Right Conus Artery is the first branch of Right Coronary Artery. Sometimes it can arise directly from Aorta, then it is called as Third Coronary Artery. Knowing the angulations of Right Conus Artery will be very helpful to the surgeons during aortic root replacement surgery and re-insertion. The Conus Artery angle changes as a result of growth and morphological changes to the myocardium.

AIM

To find the Angulations of Right Conus Artery.

MATERIALS AND METHODS

150 cadaveric hearts of both male and female with unknown age fixed in 10% formalin were used to study the angulations of Right Conus Artery with manual goniometer.

STATISTICAL ANALYSIS

Students unpaired t test was analysed by SPSS software.

RESULTS AND DISCUSSION

In this study, the P value obtained for angulations of right conus artery with respect to aorta and Right Coronary Artery was less than 0.0001 which shows that there is a significant difference in the angulations of Right Conus Artery depending on whether it is arising from Aorta (Obtuse) or Right Coronary Artery (Acute). The P value obtained for angulations of right conus artery in common origin and when arising from Right Coronary Artery was greater than 0.0001 which shows that there is no significant difference in the angulations of Right Conus Artery depending on whether it is arising from Right Coronary Artery or having a common origin mostly acute. Similar study of angulations has been done by Ivan Stankovic. He reported that the angle between the Third Coronary Artery (TCA) and Aorta is $73.4^{\circ} \pm 35.2^{\circ}$ (Insignificant) and angle between Right Coronary Artery and Right Conus artery is $82.3^{\circ} \pm 39.8^{\circ}$ (insignificant) which differs from our present study.

CONCLUSION

Angulations of Right Conus Artery with Aortic origin was obtuse and with Right Coronary Artery and common origin was acute. This obtuse angulations of Right Conus Artery with Aortic origin that irrigates myocardium is a boon to heart.

KEYWORDS

Right Conus Artery, Angulations, Third Coronary Artery, Aorta, Right Coronary Artery.

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INTRODUCTION: The Right Conus Artery is the first branch of Right Coronary Artery.⁽¹⁾ Sometimes it can arise directly from Aorta, then it is called as Third Coronary Artery.^(2,3) Right Conus Artery supplies the infundibulum of Pulmonary trunk.⁽⁴⁾ Right conus artery usually anastomoses

with left conus artery to form the Vieussen's arterial ring.^(2,5,6)

According to many authors, this anastomosis acts as a collateral pathway between right and left coronary arteries. A haemodynamic change of Coronary arteries is based on the branching pattern and vascular angulations of coronary vasculature.⁽⁷⁾ An idealistic Anatomy is necessary to know the angulations of arteries which will influence on haemodynamics. The angle of divisions of Coronary artery depends on their dimension during embryogenesis, but the angle changes as a result of growth and morphological changes to the myocardium.⁽⁸⁾ Knowing the angulations of

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Right Conus Artery will be very helpful to the surgeons during Aortic root replacement surgery and reinsertion.

The surgeons should rule out the Third Coronary Artery which arises as a direct branch of Aorta near Right Coronary Artery during surgical procedures.

OBJECTIVES: To measure angulations of Right Conus Artery.

MATERIALS AND METHODS: 150 cadaveric hearts of both male and female with unknown age fixed in 10% formalin which was collected over 5 years period of time (2011-2015) in Department of Anatomy of Vinayaka Missions University (Vinayaka missions Medical College, Karaikal, Kirupananda Variyar Medical College, Salem and Aarupadai Veedu Medical college, Puducherry). Ethical clearance obtained from University and these hearts were used to study angulations of Right Conus Artery. First the cadaveric hearts were dissected using dissection forceps, (Pointed, Tooth, Blunt) scalpel and scissors. During dissection epicardium, subepicardial adipose tissue was removed to reveal the Right Conus Artery, Aorta and Right Coronary Artery. The angulations of Right Conus Artery with Aorta and Right Coronary Artery is measured at its root using manual goniometer consisting of two arms, a fixed and movable arm with a protractor.

Angulations with respect to Aorta: Central axis of goniometer was placed at the junction of Aorta and origin of Right Conus Artery. Fixed arm of goniometer was placed along the axis of Ascending Aorta and the movable arm was placed along the axis of Right Conus Artery and the angulations was measured (Figure 1)



Fig. 1: Angulation of Right Conus Artery with Respect to Aorta

Angulations with Respect to Right Coronary Artery: Central axis of goniometer was placed at the junction of Right Coronary and Right Conus Artery. Fixed arm of goniometer was placed along the axis of Right Coronary

Artery and the movable arm was placed along the Right Conus Artery and the Angulations was measured (Figure 2).

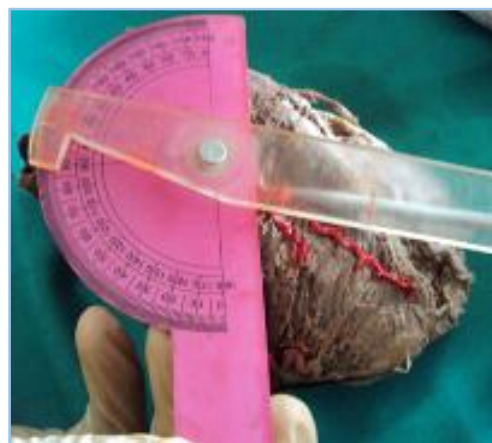


Fig. 2: Angulations of Right Conus Artery with respect to Right Coronary Artery

Data was recorded, tabulated and analysed using computer software statistical package of social sciences (SPSS).

RESULTS: Out of 150 cadaveric hearts used in the study 108 hearts showed that Right Conus artery arose from Right Coronary Artery. In 12 hearts, Right Conus Artery and Right Coronary Artery had a common origin. In remaining 30 hearts, Right Conus Artery arose directly from Aorta in which case it is known as Third Coronary Artery.

Origin	No. of Hearts	Percentage	Mean Angulations
Right Conus Artery from Right Coronary Artery	108	72	38.4°
Right conus Artery from Aorta	30	20	125.6°
Common origin	12	8	37.8°

Table 1: Angulations of Right Conus Artery

The angulations of Right Conus Artery at its origin is measured and it ranged from minimum 15° to maximum 150°. 108 (72%) hearts in which Right Conus Artery arising from Right Coronary Artery, the angle between ranges from 15° to 90° and the mean angulations found to be 38.4° (Table 1). Thirty (20%) hearts which had aortic origin the angle between Right Conus Artery and Ascending Aorta was measured. The angulations ranged from minimum of 90° and max of 150°. The mean angulations were 125.6° (Table 1).

All the 12 (8%) hearts which had common origin, the angle between Right Conus Artery and Right Coronary Artery showed acute angulations. Angle varied with minimum of

25° to maximum of 50° with mean angulations of 37.8° (Table 1).

Statistical Variants	With Respect to Aorta	With Respect to Right Coronary Artery	P value (By Applying Unpaired t test)
Mean	125.67 ^o	38.4 ^o	<0.0001 (Highly significant)
Standard Deviation (SD)	17.14	14.07	
Standard Error of Mean (SEM)	±3.18	±1.28	
Number	30	120	

Table 2: Statistical Analysis and Result for Angulations of Right Conus Artery with Respect to Aorta and Right Coronary Artery

The angulations measurements were studied by student unpaired t-test to show the significance (Table No-2). The P value obtained for angulations of Right Conus Artery with respect to Aorta and Right Coronary Artery was less than 0.0001 which was extremely statistically significant. This shows that there is a significant difference in the angulations of Right Conus Artery depending on whether it is arising from Aorta or Right Coronary Artery.

Statistical Variants	Common Origin	With Respect to Right Coronary Artery	P Value (By Applying Unpaired t test)
Mean	37.83 ^o	38.4 ^o	0.8838 (Insignificant)
Standard Deviation (SD)	7.41	14.65	
Standard Error Of Mean (SEM)	±2.14	±1.41	
Number	12	108	

Table 3: Statistical Analysis and Result for Angulations of Right Conus Artery when Arising from Right Coronary Artery and Common Origin

The angulations measurements were studied by student unpaired t-test to show the significance (Table no- 3). The P value obtained for angulations of Right Conus Artery in common origin and with respect to Right Coronary Artery was greater than 0.8838 which was statistically insignificant. This shows that there is no significant difference in the angulations of Right Conus Artery depending on whether it is arising from Right Coronary Artery or having a common origin.

DISCUSSION: There is very less literature available regarding angulations of Right Conus Artery. This study is

done to emphasise the importance of angulations of Right Conus Artery. In the present study, 150 cadaveric hearts were used to study the angulations with regard to its origin. In 108 hearts, Right Conus Artery arose from Right Coronary Artery and in 12 hearts the Right Conus Artery and Right Coronary Artery arose from a common origin. In 30 hearts, Right Conus Artery arose from Aorta which is named as Third coronary artery.⁽¹⁾ In hearts which had coronary origin, the angulations between Right Coronary Artery (RCA) and Right Conus Artery ranged between 15° to 90° with a mean angulations of 38.4° mostly acute.

In hearts with common origin, the angle between Right Conus Artery and Right Coronary Artery ranges from 25 to 50 with a mean angulation of 37.8° which is always acute. In hearts having aortic origin, the angle between Right Conus Artery and Aorta ranged between 90° to 150° mostly found to be obtuse. The knowledge of angulations would be useful for the surgeons while performing right Ventriculotomy, Aortic root replacement surgery to avoid damage to Right Conus Artery.

The angulations study suggests that the Right Conus Artery with Aortic origin was obtuse and with Right Coronary Artery and common origin was acute. It is obvious that in 80% of the population, the Right Conus Artery had acute angulations. More the acute, more the ischaemic changes. According to this study in 20% of the population, Right Conus Artery arose from the Aorta, and the angle was obtuse. So they were advantageous over the 80% of the population who were having Right Conus Artery arising from the Right Coronary Artery.

The P value obtained for angulations of Right Conus Artery with respect to Aorta and Right Coronary Artery was less than 0.0001 which shows that there is a significant difference in the angulations of Right Conus Artery depending on whether it is arising from Aorta (obtuse) or Right Coronary Artery (acute).

The P value obtained for angulations of Right Conus Artery in common origin and when arising from Right Coronary Artery was greater than 0.0001 which shows that there is no significant difference in the angulations of Right Conus Artery depending on whether it is arising from Right Coronary Artery or having a common origin mostly acute. Similar study of angulations has been done by Ivan Stankovic. He⁽⁹⁾ reported that the angle between the Third coronary artery (TCA) and Aorta is 73.4°±35.2° (Insignificant) and angle between Right Coronary Artery and Right Conus Artery is 82.3°±39.8° (Insignificant) which differs from our present study.

CONCLUSION: More detailed knowledge and awareness of anatomical variation in the structure of the human heart and its vessels may help to overcome the difficulties in cardio-surgical procedures. Angulations of Right Conus Artery with Aortic origin was obtuse and with Right Coronary Artery and common origin was acute.

This obtuse angulations of Right Conus Artery with Aortic origin that irrigates myocardium is a boon to heart.

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