

A Correlative Study Between the Length of the Coronary Artery and Coronary Dominance with the Number of Septal Branches Using Luminal Cast



Medical Science.

KEYWORDS : Coronary arteries, Coronary dominance, Interventricular artery, septal branches.

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ABSTRACT

Introduction: An explicit knowledge of minute variations in the septal branches of coronary arteries is necessary for acute coronary interventions.

Objective: is to correlate the number of septal branches to the length of coronary artery and its dominance.

Methodology: 50 coronary arteries were injected with cast material and the variations were studied.

Result: The number of septal branches was maximum in case of Co-dominant type. The number of septal branches is directly proportional to length of the coronary artery and coronary dominance.

Conclusion: This creates an insight about the septal branches of coronary artery and coronary dominance which helps the interventional cardiologists during coronary interventions.

Introduction:

The cardiovascular diseases due to modern lifestyle like coronary artery diseases are rampant and account for 35% of deaths in India. Cardiac diseases kill one third of the female population globally.¹ On the other hand hypertrophic cardiomyopathy accounts for major cause of death in young competitive athletes and soldiers throughout the world. Coronary angiography is one of the commonest investigations for the patients approaching with the above diseases. Prime importance should be given to study the minute branches of the interventricular septum. Many text books don't even attempt to mention the names of the septal branches of Coronary arteries. Coronary circulation was described for the first time in a book named "DE MOTU CORDIS" in the year (1649).² It's a known fact that the first septal branch is used for Alcoholic septal ablation.³

Anatomy of these minute branches can be studied by various methods like dissection after fixing the specimens in 10% formalin, injecting radio opaque dyes and taking radiographs, Injecting resins or plastic like materials into the lumen of these vessels, allowing the material to settle and then corroding the specimens with acids.

Interventional cardiologists treat these diseases using alcoholic septal ablation by approaching the specific interventricular septal branches of the coronary arteries or by angioplasty. Coronary angioplasty can be indicated in patients having a single vessel disease it is minimum invasive having a very low mortality rate.⁴ This arterial study is also helpful for the conventional radiologists to study the coronary artery through multi slice CT angiograms.⁵

Objective:

The main purpose of this study is to correlate the number of septal branches to the length of coronary artery and its dominance.

Methodology:

50 human heart specimens were collected from a private medical college of south India. The selected specimens were of age group 15 to 60 years and the cause of death was non cardiac. The lumen of the coronary artery specimens (Both right coronary and the left coronary arteries) were injected with cast material, Butyl butyrate granules dissolved in acetone and suddenly brought down to room temperature which made a thick scaffoldings of the septals. Then the septals were traced by dissecting the specimens under water. The branches were painted with oil paint and the photographs were taken.

Results:

Table No. 1: Level of Termination of Left Anterior Descending Artery

	No of specimens	Septal branches	Percentage
At apex or before apex	22	(7-8)	44%
Lower 1/3 rd of PIV groove	28	(11-14)	56%

Table No. 2: Level of Termination of Right Coronary Artery

	No. of specimens	Percentage
At/before right border	8	16%
Before crux	12	24%
At crux or beyond crux	30	60%

Discussion:

The Human heart is supplied by both right and the left coronary arteries. LCA (left coronary artery) supplies the predominant part. The anatomical concept of coronary dominance states that dominant vessel is one which supplies the diaphragmatic portion of interventricular septum.⁶ Previous studies states that, in case of occlusion of the anterior interventricular artery, the posterior interventricular artery provides alternative route for coronary circulation.⁷ The incidence of right and left coronary dominance has been reported to be 80% to 85%, and 7% to 9%, respectively.^(8,9,10)

The first or the second interventricular septal branch from the left coronary artery is chosen for ablating the septum using ethanol.¹¹ In this study anterior interventricular (AIV) artery was a branch of left coronary artery arising about 5cm from the origin of the posterior aortic sinus in all specimens. The AIV artery traversed through the anterior interventricular groove which lies above the anterior interventricular septum, running downwards towards the apex of the heart. The mode of termination was variable. About 44% of AIV artery terminated at the apex or before reaching the apex and 56% crossed the apex and ended in the lower 1/3 of the posterior interventricular groove. In case of left coronary artery ending at or before the apex number of septal branches was (7-8) and in case LCA terminating beyond the apex number of septals were (11-14).

Table (1) shows the level of termination of anterior descending artery and the range of septal branches given by them.

The origin of RCA (Right coronary artery) was from the anterior aortic sinus. In the initial part the direction of RCA was towards the right margin of the heart running in the right anterior atrioventricular groove after reaching the right margin in the posterior atrioventricular groove then towards the crux of the heart. After reaching the crux of the heart RCA (right coronary artery) terminated.

Following observations were noted at the level of termination. RCA terminated at or before right border, before crux, at crux or beyond crux. The percentage of termination of RCA was tabulated in table no. (2)

The anterior and posterior septal branches assume a horizontal or oblique course parallel to antero-posterior plane of the interventricular septum.¹² The artery continuing beyond the crux of the heart in the posterior interventricular groove is termed as posterior descending artery [PDA]. The origin of the posterior descending artery depends on coronary dominance. The artery which gives a branch to the PDA is termed as the dominant artery.¹³ However it is a misnomer and well known fact.

Hence in the present study the interpretation of result becomes complicated. In case of left dominance (where PDA was branch of LCA) septals from PDA are 3-7. In case of right dominance (where PDA was branch of RCA) septals from PDA were 6-10 and In case of co-dominance (where PDA was branch of LCA & RCA) septals from PDA were 7-12.

Thus from this study it implies that septum is perfused with maximum number of septal branches in case of co-dominance. This study also shows that the number of septals to the IVS is directly proportion to the length of the coronary artery and also the coronary dominance.

Conclusion:

This correlative study of septal branches creates an insight about the septal branches of coronary artery and coronary dominance which helps the interventional cardiologists and the cardio thoracic surgeons during coronary interventions.



Fig1: Septal branches of AIV



**Fig 2: Septal branches of PIV
(AIV -anterior interventricular artery, PIV Posterior interventricular artery)**

Fig 1&2 showing the septal branches arising perpendicularly from the anterior and posterior interventricular arteries.

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