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Research Communication

A Study of Arterial Dominance in Human Hearts by Perfusion Method

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Abstract: *A study was conducted in 15 postmortem human hearts in anatomy department of S.N.Medical College, Agra. Methyviolet dye and Neutral red dye was injected in left coronary and right coronary arteries respectively to delineate the areas perfused by them. The areas appeared by diffusion of dye from respective arteries is then plotted on graph paper and minimum and maximum areas were measured. The mean surface area perfused by right coronary artery was 12442.4 sq.mm and left coronary artery was 11127.13 sq.mm. Thus, our study showed right coronary artery dominance.*

Keywords: *Right Coronary Artery, Left Coronary Artery, Coronary Artery Dominance*

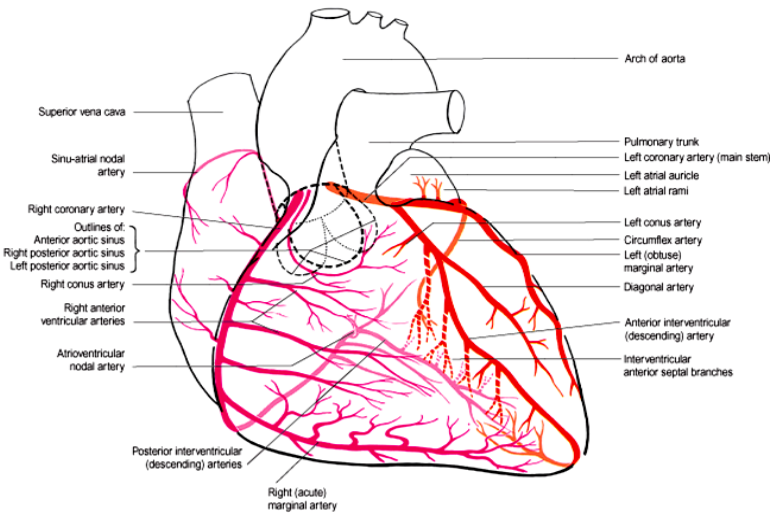
Introduction

The term '**dominant**' is used to refer to coronary artery which gives posterior interventricular branch, supplying posterior part of interventricular septum.

According to Mill et al,2003;- in 85% to 90% of hearts, right coronary artery crosses the crux*, where it makes a characteristic U-turn before bifurcating into posterior descending interventricular and right postero-lateral artery.

* Crux – *Point where the coronary sulcus meets the interarterial and interventricular sulci in the heart.*

Right and Left Coronary Arteries Showing Commonest Arrangement of Branching Pattern (Gray's Anatomy, 38th Ed.)



According to Gray's Anatomy, (38th ed.pp.1505-1510), in 70% of people, this is the left coronary artery, which is also invariably the larger of two vessels, supplying posterior part of ventricular septum and often part of the postero-lateral wall of the left ventricle.

In remaining cases, posterior inter ventricular branch is bilateral, arising from both the right coronary artery and left circumflex artery, and or absent and replaced by a network of smaller vessels from both right and left coronary arteries.

This post mortem study was carried out to find out as well as measure the area perfused by coronary arteries separately and to determine the coronary dominance according to comparatively larger area of heart supplied/ perfused by the right or the left coronary artery in the local population.

Aims and Objectives

To study the area of the heart and myocardium supplied by Right and Left coronary arteries respectively and to assess coronary predominance in the postmortem study.

Material and Method

The 15 specimens of hearts for this study were obtained from anatomy museum and cadavers, as well as from forensic department of, S.N. Medical College, Agra.

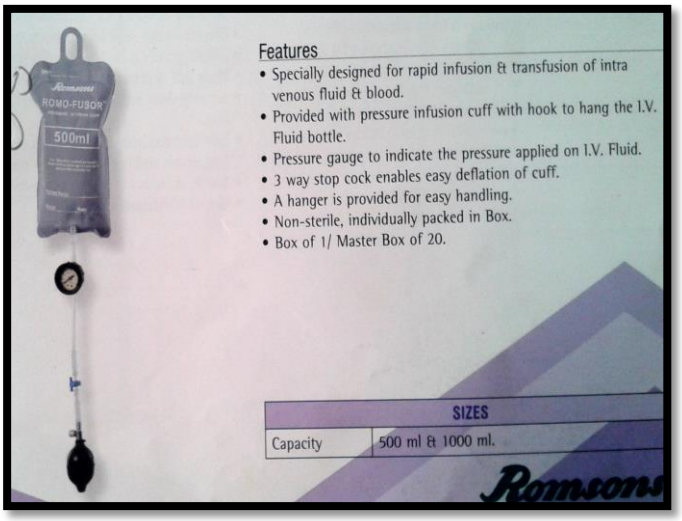
The specimens were collected of normal human adult heart of either sex (unclaimed) irrespective of their socio-economic status, sex or religion.

15 hearts were collected and kept in 1% formal saline. 10 ml of **methyl violet** (1%) and **neutral red** (1%) was injected respectively in left and right coronary arteries to delineate the areas perfused by respective coronary arteries.

Procedure

The two coronary arteries were cannulated through respective ostia and individually flushed with water and hydrogen peroxide to wash out any remaining blood and clots in the arteries.

The 10 ml of dye (**methyl violet** 1% for LCA and **Neutral red** 1% for RCA) filled in glass syringe and injected slowly with pressure head of 20 mmHg achieved by manual compression of a syringe connected to a cannula into the respective coronary arteries.



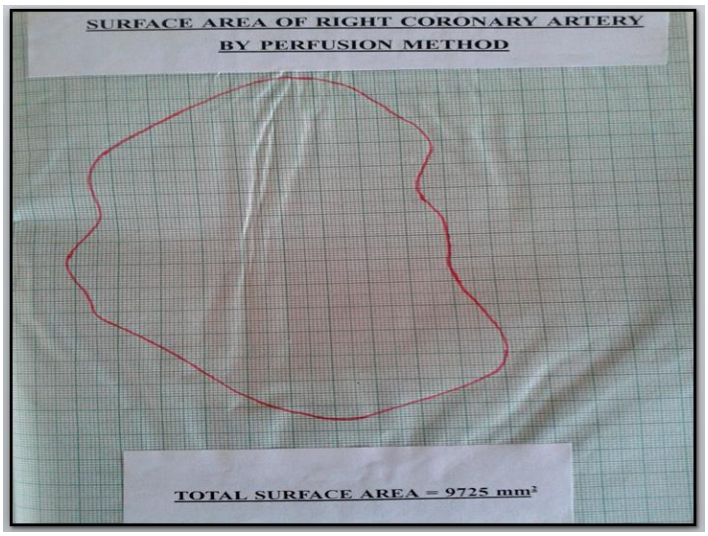
After infusion of dye, 15 to 30 minutes time is allowed for dye to percolate in myocardium. The perfused heart then was wrapped in transparent polythene bag and the perfused area was then outlined by help of butter paper and marker and was then plotted on graph paper and measurements were taken, noted and analysed . The heart was then fixed in 10% formalin and photographs were taken.

OBSERVATIONS

In present study, when the dye was injected (1% methyl violet in Left Coronary Artery and 1% neutral red in Right Coronary Artery) the areas appeared by diffusion of the dye from respective artery . This area was marked and then plotted on graph paper for necessary measurement.

Photograph Showing Area Perfused By Left Coronary Artery When Mehylviolet (1%) Injected In Artery

Photograph showing area perfused by neutral red (1%) & methylviolet(1%) injected in rca &lca respectively



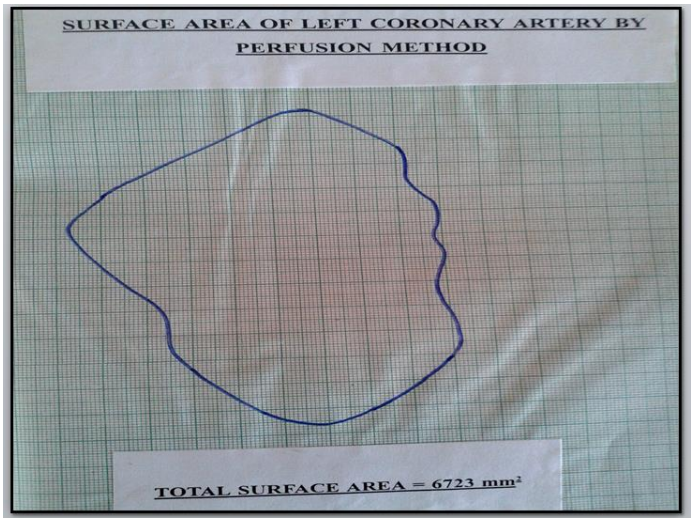


Table Showing Range of Surface Area of Right and Left Coronary Arteries

	RIGHT CORONARY ARTERY	**LEFT CORONARY ARTERY**
MINIMUM AREA (IN SQ.MM)	8523	
MAXIMUM AREA (IN SQ.MM)	16725	17875

Table Showing Surface Areas (In Sq.Mm) Perfused By Right & Left Coronary Arteries

S.NO.	**RIGHT CORONARY ARTERY**	**LEFT CORONARY ARTERY**
1.	* 8523	14232
2.	9232	13821
3.	10387	* 17875
4.	9725	* 6723
5.	14735	7543
6.	12435	8435
7.	11835	10535
8.	14525	9373
9.	12723	10843

10.	14526	11576
11.	* 16725	10253
12.	13514	11112
13.	8523	14517
14.	15414	10212
15.	13814	9857
MEAN=TOTAL/15	186636/15=12442.4	166907/15=11127.13

The mean surface area perfused by RCA was 12442.4 sq.mm and LCA was 11127.13 sq.mm. The area which is largely perfused by either coronary artery is taken as dominant area.

The dominance of right coronary artery by perfusion study was 73.33% and left coronary artery was 26.67% as 11 hearts showed the dominance of RCA while only 4 hearts of total 15 hearts studied showed dominance of left coronary artery.

Discussion

James (1961) had noted Posterior Interventricular Artery (PIVA) as a terminal branch of RCA in 80% of cases. In our study by perfusion method, the area perfused was 73.33% from RCA and 26.67% from LCA.

The inverse relationship between RCA and LCA is most simply expressed as right or left dominance, depending on which artery gives rise to the PIVA (James, 1961).

The origin of posterior interventricular artery from right coronary artery is the commonest in man, and reffered to as RIGHT DOMINANCE, which occurred in 73.33% of hearts in our study and LEFT DOMINANCE, was observed in 26.67%.

Table Showing Comparison of Dominant Circulation of Studies (In Percentage)

DOMINANT ARTERY (PIVA)	**CAVALCANTI (1995)**	**GRAY'S ANATOMY (38TH ed.)**	**MILL et al (2003)**	**PRESENT STUDY**
RIGHT CORONARY ARTERY	88.18	----	85-90	73.33
LEFT CORONARY ARTERY	11.82	70	-----	26.67

Cavalcanti (1995) and **Mill et al** (2003) stated the dominance of right coronary artery while **Gray's Anatomy** (38th ed.) stated the dominance of left coronary artery. Our study by perfusion method showed the dominance of right coronary artery.

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