

# Morphology of Myocardial Bridges In Human Hearts- A Cadaveric Study From Rajasthan.

Mrs. NEHA SAINI<sup>(1)</sup>, Dr. VASANTA LEELA<sup>(2)</sup>, Dr. DHIRAJ SAXENA<sup>(3)</sup>

<sup>(1)</sup>Ph. D. Scholar (Anatomy), SMS Medical College, RUHS.

<sup>(2)</sup> Professor, Anatomy, Narayana Medical College, Chintareddy Palem, Nellore, Andhra Pradesh

<sup>(3)</sup> Professor, Anatomy, SMS Medical College, Jaipur, Rajasthan.

## ABSTRACT:

**Introduction:** Myocardial bridging can be defined as a congenital coronary anomaly in which a segment of coronary artery is tunneled in the myocardial wall. In several studies, it has been proved that myocardial bridges are associated with Ventricular arrhythmia, myocardial ischemia and infarction.

**Materials & Methods:** The present study was undertaken in the Department of Anatomy, SMS Medical College included 100 cadaveric human hearts. After simple dissecting procedure morphological aspects of myocardial bridges and tunneled arteries were noted.

**Results-** Out of 100 examined cadaveric human hearts, myocardial bridges were found in 40 hearts. Myocardial bridges were more observed on left coronary artery than the right coronary artery. Posterior interventricular branch in both coronary arteries had maximum number of myocardial bridges. The maximum and minimum lengths of myocardial bridge – 57.01 mm 5 mm were observed respectively.

**Conclusion:** The precise knowledge of myocardial bridges is required for the angiographers and cardiothoracic surgeons for an efficient management of coronary disease and other cardiac ailments.

**Key words:** Myocardial bridge (MB), left anterior descending artery, posterior interventricular artery

**Introduction-** Coronary artery disease has become one of the major causes of death in developed as well as developing countries.

Much progress has been made in the last few decades than in all foregoing medical history in the management of cardio-vascular diseases. Due to introduction of newer surgical techniques, in-correctable lesions have been controlled. This work was aimed for studying the morphology of 'Myocardial Bridges', which are one of the causes of sudden cardiac arrest. Myocardial bridging can be defined as a congenital coronary anomaly in which a segment of coronary artery is tunneled in the myocardial wall. Also myocardial bridges have been reported in association with sudden death during exercise. Therefore, knowledge of number, length and depth of myocardial bridges can help in identifying the people at risk. Myocardial bridges can be diagnosed by two methods- Non-invasive and Invasive technique. In non-invasive method, they can be identified by Multiple-slice computed tomography (MSCT); stress single photon emission computed tomography (SPECT) and stress echocardiography. In invasive method, nitroglycerin injection is inserted coronary arteries which will produce vasodilating effect on adjacent non-bridged coronary segments.

It is also said by many cardiologists that MB is a main cause of sudden death among young basketball and football players. Since in them due to physical exertion during systole MB compresses the LAD segment beneath it and causes a life threatening condition even if no coronary atherosclerosis is found. The underlying cause of this condition is that when BP of such individuals with MB is high, physical exertion further increases BP in segment proximal to MB than in the aorta. MI or infarction can occur because of MB and also via coronary artery spasm at the LAD segment beneath it. This may or may not be accompanied by atherosclerosis. Although numerous data on the variations of the coronary arteries have been reported, further exploration in this field would still enrich the knowledge on them and it is also essential in view of their great clinical significance.

**Material and method-** The study was conducted in the department of Anatomy, SMS Medical College, Jaipur. This was done on cadaveric human hearts which were dissected to trace the myocardial bridges. Ethical clearance for the study was obtained from the Institutional ethical committee. Total 100 human hearts of different age groups and of either sex were studied. The hearts were dissected out from the cadavers after giving two longitudinal incisions in the right and left parasternal region extending up to sternoclavicular joints and joining them with two transverse incisions above and below the suprasternal notch and xiphisternum respectively. The pericardium and the vessels attached to the heart were carefully preserved in 10% formalin for dissection. Both the coronary arteries and their branches were exposed and highlighted using red fabric color and the required dimensions of myocardial bridges were examined with the help of digital vernier caliper, then the data was recorded.

**Observation and Results-** Out of 100 examined cadaveric human hearts, myocardial bridges were found in 40 numbers of hearts. Myocardial bridges were more observed on left coronary artery (74% cases) than the right coronary artery (66% cases). In case of left coronary artery most of the bridges were observed on LAD and in case of right coronary artery they were more present on Posterior interventricular branch. The maximum length of myocardial bridge was 57.01mm and minimum 5mm in case of LCA. When we observe the diameter of LAD it was found that the mean value of its diameter (D1) proximal to MB is 2.4 mm, diameter (D2) under the MB is 2.4 mm and diameter (D3) distal to MB is 2.4 mm

**TABLE- 1- SHOWING LENGTH OF MYOCARDIAL BRIDGES IN DIFFERENT CORONARY ARTERIES.**

LENGTH (mm)	LCA	RCA
MAXIMUM	57.01	27.14
MINIMUM	5	1.42
MEAN	20.84	10.21
S.D.	11.78	5.87

The maximum and minimum lengths of bridges on LCA and RCA along with their mean and standard deviation are shown in table 1.



**Fig- 1. Showing myocardial bridge on Left anterior descending artery**

**TABLE- 2-INCIDENCE OF SINGLE AND DOUBLE MB ON LAD & PIV-**

NAME OF VESSEL	SINGLE MB	DOUBLE MB	TOTAL
LAD	21	4	25
PIV	17	01	18

On

LAD

myocardial bridges were observed in 25 (62.5%) hearts and on PIV 18 (45%) hearts possessed myocardial bridges. Out of 40 hearts, single bridge was observed on LAD in 21 hearts (84%) and on PIV in 17 hearts (94%). In 4 (16%) hearts two bridges were found on LAD and on PIV only one (5.55%) heart has double bridges.

**TABLE- 3- COMPARISON OF INCIDENCE OF MYOCARDIAL BRIDGE OVER LEFT CORONARY ARTERY AND RIGHT CORONARY ARTERY.**

DISTRIBUTION OF MB ON CORONARY ARTERY	LCA	RCA	BOTH
No. of hearts showing MB	31	28	19
(%) of hearts showing MB	73.80	66.66	45.23

Out of 40 hearts bridges were found on LCA in 31 (73.8%) hearts and in 28 (66%) hearts on RCA. When analysis of position of myocardial bridge was done it was found that majority of them were found on middle segment of the LAD, with a minor incidence on upper and lower segment of the artery.



**Fig- 2. Showing incisions on myocardial bridge to assess different diameters of bridged segment.**

**TABLE -4- TOTAL INCIDENCE OF MYOCARDIAL BRIDGES ON DIFFERENT ARTERIES**

MYOCARDIAL BRIDGES	LEFT CORONARY BRANCHES				RIGHT CORONARY BRANCHES		
	LAD*	LT. DIAGONAL	LT. MARGINAL	LT. CIRCUMFLEX	TRUNK	PIV*	RT. MARGINAL
NUMBER	25	04	04	04	06	18	05
PERCENTAGE	59.52	9.52	9.52	9.52	14.28	42.85	11.90

LAD= LEFT ANTERIOR DESCENDING ARTERY

PIV= POSTERIOR INTERVENTRICULAR ARTERY

Table 4 is showing the incidence of myocardial bridges on different branches of coronary arteries. It is observed that most of the bridges are found on LAD in case of Left coronary artery and in Right coronary artery they are prominent on PIV.

**TABLE- 5- SHOWING DIFFERENT PARAMETERS OF DIAMETER OF LAD ARTERY WITH MB-**

PARAMETERS	DIAMETER OF ARTERY PROXIMAL TO MB (D1)	DIAMETER OF ARTERY UNDER THE MB (D2)	DIAMETER OF ARTERY DISTAL TO MB (D3)
MEAN	2.4	1.6	1.3
S.D.	0.91	0.63	0.57
MIN. VALUE	1.11	0.69	0.35
MAX. VALUE	4.15	2.98	2.23



**Fig- 3. Showing coronary artery just distal to the Myocardial Bridge.**

When diameter of the arterial segment having bridge is analyzed, it was found that the diameter of the arterial segment just underneath the bridge becomes very narrow due to compression by myocardial bridge. As the mean values are showing that the diameter of artery proximal to the bridge (D1) is 2.4 mm, this diameter becomes just half under the bridge (D2) 1.6mm.

**Discussion-** Most of the course of coronary arteries is subepicardial. At their termination they dip into the myocardium. But sometimes, their branches run underneath the myocardium for a short distance. Myocardial bridges play a crucial role in cardiac diseases. Myocardial bridges in a living person can be identified by CT-Scan and MRI. These can be detected because of their ‘milking effect’ on coronary arteries on which they are present.

**Conclusion-**The observations in the present study on cadaveric human hearts in Rajasthan reveals that-

- 1) Myocardial bridges are mainly found on middle segment of LAD.
- 2) Maximum length of the bridge is 57.01mm
- 3) The diameter of the coronary artery under the bridge abruptly decreases due to its compression by myocardial bridge which may decrease the blood flow in living person leading to coronary artery diseases.

This analysis of myocardial bridge may support the surgeons in their surgical procedures related to decompression of the coronary artery under the myocardial bridge (Myotomy).

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