

ORIGINAL RESEARCH

Clinical, angiographic profile and follow-up of patients with myocardial bridges at a tertiary hospital**Neha Mukesh Goel¹, Pranav Shamraj², Amit Bhalerao³, Sagar Subhash Nanaware⁴**

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ABSTRACT

Background: Myocardial bridging can occasionally generate clinically important complications, despite usually being a benign condition. Myocardial bridging can be associated with stable and unstable angina, myocardial infarction, myocardial stunning, atrioventricular nodal block, ventricular tachycardia and sudden death. Present study was aimed to study clinical, angiographic profile and follow-up of patients with myocardial bridges at a tertiary hospital.

Material and Methods: Present study was single-center, prospective, observational study, conducted in patients, >18 years, of both sexes, who underwent diagnostic conventional coronary angiography. Myocardial bridge (MB) was identified based on narrowing of coronary artery in systolic phase resulting in at least 50% reduction of luminal diameter in comparison with the diastolic phase.

Results: During study period, out of 1962 diagnostic conventional coronary angiography procedures satisfying study criteria, myocardial bridge (MB) was noticed in 81 cases, incidence was 4.13 %. Common indications for diagnostic conventional coronary angiography among patients of myocardial bridge (MB) were unstable angina (USA) (19.75 %), STEIAMI (18.52 %), chronic stable angina (CSA) (16.05 %), STEAWMI (13.58 %), atypical chest pain (9.88 %), Others (8.64 %), pre-surgery (8.64 %) & NSTEMI (4.94 %). In patients of myocardial bridge (MB) on follow up symptoms noted were atypical chest pain (38.27 %), dyspnoea on exertion (27.16 %) & chest pain (23.46 %). On follow up, myocardial bridge (MB) was associated with 2 cases of acute myocardial infarction, no major adverse cardiac events, myocardial ischemia or cardiovascular death noted.

Conclusion: Clinical suspicion of Myocardial bridges should be considered in young patients with acute coronary syndrome with typical or atypical chest pain, though casual association needs further studies with larger sample size & longer follow up.

Keywords: Myocardial bridges, acute coronary syndrome, chest pain, angiography

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INTRODUCTION

The major coronary arteries, which normally are distributed over the epicardial surface of the heart, occasionally have a segmental intramyocardial course. During systole, this segment of the vessel is compressed, a condition referred to as milking or systolic “myocardial bridging”.¹ The reported rates of myocardial bridges (MB) with angiographic documented systolic compression varies between 0.5 and 12% and the middle part of left anterior descending (LAD) coronary artery is most commonly involved.

The incidence of MB ranges between 15–85% in autopsy studies, and 0.5–16% in angiographic series. Myocardial bridging can occasionally generate clinically important complications, despite usually being a benign condition. Myocardial bridging can be associated with stable and unstable angina, myocardial infarction, myocardial stunning, atrioventricular nodal block, ventricular tachycardia and sudden death.³

New imaging techniques have led to improved identification and functional quantitation of myocardial bridging in vivo, which is crucial for establishing a link between systolic compression and the clinical presentation, and hence for commencing appropriate therapy. Present study was aimed to study clinical, angiographic profile and follow-up of patients with myocardial bridges at a tertiary hospital.

MATERIAL AND METHODS

Present study was single-center, prospective, observational study, conducted in department of cardiology, at XXX medical college & hospital, XXX, India. Study duration was of 3 years (July 2018 to June 2021). Study approval was obtained from institutional ethical committee.

Inclusion criteria

- Patients, >18 years, of both sexes, who underwent diagnostic conventional coronary angiography, willing to participate in present study

Exclusion criteria

- Patients with total occlusion bypass surgery and artifacts were excluded from the study.

Study was explained to patients in local language & written consent was taken for participation & study. Demographic data, clinical examination findings were noted in proforma.

During diagnostic conventional coronary angiography, myocardial bridge (MB) was identified based on narrowing of coronary artery in systolic phase resulting in at least 50% reduction of luminal diameter in comparison with the diastolic phase. The diameter of vessel was measured during in end-systolic and end-diastolic phases with an electronic caliper after magnification. All the measurements were recorded in the left anterior oblique position. These assessments were done without nitroglycerine (NTG) injection. Various coronary risk factors and clinical presentations in the patients were analyzed.

At time of follow up after 1 year of diagnosis, clinical details & findings were noted in proforma. Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Statistical analysis was done using descriptive statistics.

RESULTS

During study period, out of 1962 diagnostic conventional coronary angiography procedures satisfying study criteria, myocardial bridge (MB) was noticed in 81 cases, incidence was 4.13

%). Among patients with myocardial bridge (MB), majority were of 20-39 years (25.39 %) & 40-49 years (20.99 %), were male (61.73 %). High risk factors noted were hypertension (43.21 %), obesity (35.8 %), diabetes (28.4 %), tobacco chewing (23.46 %) & smoking (19.75 %).

Table 1: General characteristics

Characteristics	No. of patients	Percentage
Age groups (in years)		
>39	21	25.93%
40-49	17	20.99%
50-59	14	17.28%
60-69	11	13.58%
70-79	10	12.35%
>79	8	9.88%
Mean age (mean \pm SD)		53.6 \pm 11.2 years
Gender		
Male	50	61.73%
Female	31	38.27%
High risk factors		
Hypertension	35	43.21%
Obesity	29	35.80%
Diabetes	23	28.40%
Tobacco chewing	19	23.46%
Smoking	16	19.75%

Common indications for diagnostic conventional coronary angiography among patients of myocardial bridge (MB) were unstable angina (USA) (19.75 %), STEIWMI (18.52 %), chronic stable angina (CSA) (16.05 %), STEAWMI (13.58 %), atypical chest pain (9.88 %), Others (8.64 %), pre-surgery (8.64 %) & NSTEMI (4.94 %).

Table 2: Indication for coronary angiography among patients with Myocardial Bridge

Indications	No. of patients	Percentage
Unstable angina (USA)	16	19.75%
STEWMI	15	18.52%
chronic stable angina (CSA)	13	16.05%
STEAWMI	11	13.58%
Atypical chest pain	8	9.88%
Others	7	8.64%
Presurgery	7	8.64%
NSTEMI	4	4.94%

In patients of myocardial bridge (MB) on follow up symptoms noted were atypical chest pain (38.27 %), dyspnoea on exertion (27.16 %) & chest pain (23.46 %). On follow up, myocardial bridge (MB) was associated with 2 cases of acute myocardial infarction, no major adverse cardiac events, myocardial ischemia or cardiovascular death noted.

Table 3: Follow-up clinical characteristic of patients with myocardial bridge

Symptoms on follow-up visits	No. of patients	Percentage
Atypical chest pain	31	38.27%
Dyspnoea on exertion	22	27.16%
Chest pain	19	23.46%

DISCUSSION

The prevalence of coronary artery disease as well as acute myocardial infarction has progressively increased in India in the last three decades from 1.1% to 7.5% in the urban and 2.1% to 3.7% in the rural population.⁴ CAD among Indians occur at a younger age, with more extensive angiographic involvement contributed by genetic, metabolic, and conventional causes.⁵

Myocardial bridge has been considered a benign condition, but the following complications have been reported: ischemia and acute coronary syndrome, coronary spasm, ventricular septal rupture, arrhythmias, exercise induced atrioventricular conduction block, stunning, transient ventricular dysfunction, early death after cardiac transplantation and sudden death.⁶

The mechanism which causes clinically significant myocardial bridges are unknown but the most common proposed one are systolic compression of tunneled artery with sustained early diastolic diameter reduction. The diagnosis of Myocardial bridging becomes clinically important in patients who have angina and do not have the other risk factors and the evidence of ischemia.^{7,8}

Myocardial bridges are commonly seen on the left coronary artery (LCA) trunk and/or on one of its branches, especially on the anterior interventricular artery (AIA), which represents 12–63% of MB, its lateral branch (13%) and its circumflex artery (2.8–6.7%). Also, they are observed on the diagonal artery (DA), marginal arteries, posterior interventricular artery (PIA) and right coronary artery (RCA).⁹

Sarkar R et al.,¹⁰ studied patients without significant obstructive coronary artery disease (CAD) presenting like ACS. Among the consecutive 968 patients, 63 were found to have non-obstructive lesion in coronary angiography (CAG), of which 23.8% were with normal coronaries and 76.2% with minor/mild CAD. Except for hypertension, there was no significant

difference in prevalence of the conventional risk factors like smoking, dyslipidaemia, and diabetes mellitus between these two groups. Coronary vasospasm (9%), myocardial bridge (8%), spontaneous dissection and ectasia (3% each) and abnormal origin (2%) were the other findings.

Karna SK et al.,¹¹ studied 4,438 patients underwent coronary angiography for various indications, mean age of the study population was 53.6 ± 11.2 years. MB was found in 212 (4.77%) of patients, predominantly in males. Unstable angina was the most common presentation among males (28.7%), whereas chronic stable angina was being the most common presentation among females (22.6%). Majority of MBs were seen in left anterior descending artery in its mid part (61%). Mean diameter compression of the affected segment was $32.6\% \pm 11.8\%$, with no significant difference seen among males and females or between mid and distal left anterior descending artery.

Sanjeev Kumar S¹² studied 3800 patients, proportion of MB was 208 (5.50%), in which 74.51% were males and 25.49% were females. Dominance-wise, 72.11% were right dominant, 22.60% were left dominant and 5.29% had balanced circulation. The incidence of myocardial bridging was 3.95% in right dominant, 1.24% in left dominant and 0.28% in balanced dominant patients. Total 199 (95.67%) MB were located on the Left Anterior Descending Artery (LAD) of which mid LAD were in 186 (89.42%), distal LAD in 9 (4.45%), proximal LAD in 4 (1.95%) and on diagonal (D1) it was 9 (4.45%). Double bridge was observed in 6 (2.89%) cases in proximal and distal regions of LAD.

In study by Anthony M et al.,¹³ left anterior descending Myocardial Bridge (LADMB) had prevalence of 1.42%. The mean age was 66.5 years. Male gender was more common than female (70vs30%). The prevalence of significant atherosclerotic LAD disease was more than

two times higher in the non-LADMB group compared to the LADMB group. Statistical analysis revealed a significant negative association between LADMB and atherosclerosis ($p < 0.001$). A significant greater rate of myocardial infarction and non-obstructive coronary artery disease (MINOCA) cases was observed in acute coronary syndrome LADMB patients. Sourin H et al.,¹⁴ conducted a meta-analysis of 21 articles. MB was associated with major adverse cardiac events - OR = 1.52 (1.01–2.30), and myocardial ischemia OR = 3.00 (1.02–8.82) but not with acute myocardial infarction, cardiovascular death, ischemia identified using imaging techniques, or positive exercise stress testing. Overall, myocardial bridging may have significant cardiovascular consequences (MACE, myocardial ischemia).

The typical angiographic finding in myocardial bridge is systolic narrowing of an epicardial coronary artery. Tachycardia following exertion worsen the myocardial ischemia by decreasing diastolic coronary flow and increasing the systolic narrowing of the bridged coronary artery.¹⁵

Treatment of a tunneled artery with balloon angioplasty is not effective. MB leads to almost complete early arterial recoil. Both percutaneous stent therapy and bypass surgery appear to be safe and effective therapies for MB and should be considered in patients who fail medical therapy with aspirin, beta-blockers and/or calcium channel blockers.

CONCLUSION

Clinical suspicion of Myocardial bridges should be considered in young patients with acute coronary syndrome with typical or atypical chest pain, though casual association needs further studies with larger sample size & longer follow up.

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