

ASSESSMENT OF THE PROTECTIVE ROLE OF MYOCARDIAL BRIDGING AGAINST ATHEROSCLEROSIS IN THE CORONARY SYSTEM

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Abstract: *The retrospective study was based on data collected from tertiary care hospitals from May 2022 to November 2022 to evaluate the association between myocardial bridge and obstructive atherosclerosis, which requires treatment with coronary artery bypass grafting (CABG) or percutaneous coronary intervention (PCI), in coronary system. Patients diagnosed with or likely to have coronary artery disease, coronary angiography of whom was performed, were included in the study. Of 1000 patients who underwent angiography, 80 (50 males and 30 females) had MB located in the left anterior descending artery (n=72), left circumflex (4), and right coronary artery(4). The occurrence of myocardial bridging in the SOCAD and SOCAD groups was significantly different and significantly lower in SOCAD compared to non-SOCAD groups (P< .0001). There was a significant negative linear correlation between MB and SOCAD (P <.0001). Log OR of MB was -2.135, suggesting the protecting effect of MB against SOCAD. It is concluded that myocardial bridging protects against atherosclerosis in the coronary system.*

Keywords: Myocardial Bridge, Obstructive Atherosclerosis, Coronary Artery Disease

Introduction

Myocardial bridge (MB) is muscle superimposed upon the intramyocardial segment of the epicardial coronary artery. Studies have shown that MB impacts atherosclerosis in LAD (Murtaza et al., 2020). Location, thickness, and length are interlinked, and thicker or longer MBs are proximally located in LAD (Rovera et al., 2023). The gold standard for diagnosing MB is a systolic milking effect, which occurs due to systolic compression of the intramyocardial segment (Pargaonkar et al., 2021).

Myocardial bridging is a hereditary anomaly, and its occurrence ranges from about 5% to 23% (ultrasound) to 55.7% (autopsy) (Matta et al., 2022a; Mihail and Ilia, 2021). This variation is because thin and short bridges that cause minor systolic compression may be ignored (Happach et al., 2022). MB may be associated with different complications like angina, arrhythmias, acute myocardial infarction, and sudden death (Matta et al., 2022b). Angina is generally caused by muscular compression, which reduces coronary artery flow. Previous studies show that vessels in intramyocardial segments are protected from atherosclerosis. However, the effect of myocardial bridging against atherosclerosis in the coronary artery system is unknown. This study aims to evaluate the association between the myocardial bridge and obstructive atherosclerosis, which requires treatment with coronary artery bypass grafting (CABG) or percutaneous coronary intervention (PCI) in the coronary system.

Methodology

The retrospective study was based on data collected from Tertiary Care Hospital from May 2022 to November 2022.

Patients diagnosed with or suspected of CAD who underwent coronary angiographies were included in the study after signed consent. The hospital board approved the study design.

Patients' data, including age, sex, coronary risk factors (hypertension, hyperlipidemia, diabetes mellitus (DM), impaired glucose tolerance (IGT), ischemic cerebrovascular disease (ICVD), and chronic kidney disease (CKD)), invasive treatments and findings of coronary angiography was collected. MB was diagnosed by angiography, showing a transient reduction of lumen size in an epicardial coronary artery during systole. Severe obstructive coronary artery disease (SOCAD) is defined as more than 75% stenosis in a major coronary artery. Patients with SOCAD were treated with CABG or PCI and were included in the SOCAD group; others were included in the non-SOCAD group.

SPSS version 23 was used for data analysis. Mean (standard deviation) and frequency (percentage) were used to present study variables. The variance assessed discrepancy between groups and Fisher's test for non-continuous and continuous variables. Logistic regression analysis was done to evaluate the association between MB and SOCAD. A probability value of less than 0.05 was significant.

Results

A total of 1000 patients underwent angiography, among which 80 (50 males and 30 females) had MB located in the left anterior descending artery (n=72), left circumflex (4), and right coronary artery (4).

The occurrence of myocardial bridging in the SOCAD and the non-SOCAD group was significantly different and

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significantly lower in the SOCAD compared to the non-SOCAD group ($P < .0001$). Table I compares the incidence of risk factors between both groups.

Compared to those without myocardial bridging, patients with MB had significantly lower rates of SOCAD ($P < .0001$) and risk factors, including DM ($P < .0001$), hypertension ($P < .0001$), chronic kidney disease ($P = .0006$) and ischemic cerebrovascular diseases ($P = 0.0026$).

The association between risk factors and SOCAD is shown in Table II. There was a significant negative linear correlation between MB and SOCAD ($P < .0001$). Negative association intensities (log-ORs) refer to the protective role against SOCAD and vice versa. For age, impaired glucose metabolism, and hypertension, Log ORs were positive. Log OR of MB was -2.135, suggesting the protecting effect of MB against SOCAD.

Table I: Comparison Of Incidence Of Risk Factors Between Both The Groups

Parameters	Without MB (n=920)	With MB (n=80)	P-value
Age	62.45 ± 10.25	64.01 ± 10.47	<0.001
Sex			
Male	470 (51.1%)	50 (62.5%)	<0.001
Female	450 (49.1%)	30 (37.5%)	
Hypertension	560 (60.8%)	40 (50%)	<0.001
Diabetes mellitus	220 (23.9%)	8 (10%)	<0.001
Impaired glucose tolerance	40 (4.3%)	2 (2.5%)	0.5441
Diabetes mellitus/impaired glucose tolerance	270 (29.4%)	11 (13.7%)	<0.001
Hyperlipidemia	80 (8.7%)	6 (7.4%)	0.934
Ischemic cerebrovascular disease	50 (5.43%)	2 (2.5%)	0.0026
CKD	20 (2.17%)	1 (1.25%)	0.006
SOCAD	520 (56.5%)	9 (11.25%)	<0.001

Table II: Association between risk factors and SOCAD

Parameter	Log-OR	Standard error	Z value	P value
Age	0.009	0.002	3.020	0.0026
Myocardial bridging	-2.135	0.140	-15.550	<0.001
Female gender	-3.140	0.380	-8.287	<0.001
CKD	0.257	0.148	1.738	0.0830
Hypertension	0.339	0.075	4.690	<.001
Hyperlipidemia	-0.207	0.105	-2.020	0.04400
Ischemic cerebrovascular disease	-0.028	0.138	0.185	0.8550
Impaired glucose metabolism	1.158	0.217	5.390	<0.001

Discussion

Many studies suggest that MB contributes to arrhythmia, myocardial infarction, angina, and myocardial ischemia (Aden et al., 2022; He et al., 2020). However, bridge segments are associated with lesser atherosclerotic lesions than bridged ones (Matta et al., 2022b). Previous studies show that atherosclerotic plaque can be formed proximally to the bridge but is absent at the intra-mural segment (Kabak et al., 2020). The incidence of myocardial bridging varies depending upon the variability of diagnostic modalities and instruments used. In the current study, the incidence of MB was 8%, and females had significantly higher morbidity than males ($P < .0001$). The incidence of MB was significantly higher in non-SOCAD compared to the SOCAD group, and in patients with MB, the incidence of SOCAD was significantly lower. This implied that MB has a potential protective role against SOCAD in the coronary system. The association between SOCAD and MB was adjusted for sex, age, hypertension, hyperlipidemia, chronic kidney disease, impaired glucose metabolism, and ischemic cerebrovascular disease. Results suggested that MB can have a potential positive effect on SOCAD. A previous study reported hyperlipidemia to be a major risk factor for coronary artery disease (Wu et al., 2021). However, in the current study, the SOCAD group had a significantly lower rate of hyperlipidemia compared to the non-SOCAD group.

It does not imply a negative association between hyperlipidemia and severe obstructive disease, as patients in the non-SOCAD group did not require lipid-lowering therapy.

Although MB is associated with various complication (Zerbo et al., 2020), it can be considered a benign anomaly of coronary arteries (Matta et al., 2021). Thus, its treatment is uncertain; clinically, beta-blockers are a first-line drug in symptomatic patients (Nemat et al., 2022). Other treatments include surgical intervention and coronary stents. A study on patients with isolated MB reported that they have a good prognosis, and angina, in most cases, is improved through treatment with beta-blockers. The limitations of this study are design and nonrandomization.

Conclusion

It is concluded that myocardial bridging protects against atherosclerosis in the coronary system.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned.

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Consent for publication

Approved

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Conflict of interest

The authors declared absence of conflict of interest.

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