

# Study of Prevalence, Risk Factors and Angiographic Profile of Patients with Myocardial Bridges in a Tertiary Care Hospital, Dhaka, Bangladesh

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**Abstract:** Background: Band of Myocardial tissue overlying a segment of an epicardial coronary artery is termed myocardial bridge (MB). The aim of this study was to identify the prevalence, risk factors and angiographic profile of patients with myocardial bridge in a tertiary care hospital, Dhaka, Bangladesh. Materials and Methods: This retrospective observational study included a total of 1480 patients with suspected coronary artery disease admitted to Enam Medical College and Hospital, Savar, Dhaka, Bangladesh for coronary angiography between April 2016 to June 2019 of them 43 cases were found to have myocardial bridge. Coronary compression was defined as a maximum systolic luminal compression  $\geq 50\%$ . In this population, 43 patients had systolic luminal compression  $\geq 50\%$ , and all 43 patients were selected for the study to determine the prevalence and risk factors of MB and recorded coronary angiogram was reviewed to see the angiographic location of MB, length of MB and number of vessels involved. Results: In this study incidence of MB was 2.9%. The risk factors associated with MB hypertension were 33 (76.74%), diabetes mellitus 28 (65.11%), hyperlipidaemia 18 (41.86%), family history of CAD 15 (34.88%), smoking history 22 (51.16%). Located of MB in LAD were 34 (79.06%), LCX 07 (16.27%) and RCA 02 (4.65%). The MB were in single vessel 38 (88.37%) and double vessels 05 (11.62%). MBs with atherosclerotic stenosis in LAD were 18 (41.86%), LCX 02 (4.65%), RCA 01 (2.32%) and severity of MB stenosis were in LAD 50-70% were 27 (62.79%), >70% were 07 (16.27%), LCX 50-70% were 06 (13.95%) and >70% was 01 (2.32%) and RCA 50-70% was 02 (4.65%). The length of MBs segment <10 mm were 06 (13.95%), 10-20 mm were 25 (58.19%) and >20 mm were 12 (27.90%). Conclusion: In this study the prevalence of MB was 2.91%, commonly presented with chronic stable angina. The most risk factors of myocardial bridges were hypertension, diabetes mellitus, hyperlipidaemia, family history and smoking history. In coronary angiography most of the patient of MB was present in association of acute coronary syndrome with documented coronary artery disease and was mainly located in LAD mid segment and the length of MB was mostly 10-20 mm. Further large numbers of case are needed to validate the result of the study.

**Keywords:** Coronary Angiogram, Chronic Stable Angina, Coronary Artery Disease

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## 1. Introduction

Myocardial bridge (MB) is an anatomical entity in which a segment of an epicardial coronary artery becomes overlying by myocardial fibers. This term is also an angiographic entity that means any degree of systolic narrowing of an epicardial

coronary artery observed in at least one angiographic projection. Muscle overlying the intra-myocardial segment of an epicardial coronary artery, first mentioned in 1737 and described angiographically in 1960 is termed a myocardial bridge (MB) [1]. This situation is characterized by the decrease in the coronary blood flow during systole due to the

compression of the myocardial fibrils surrounding the epicardial coronary artery in a certain segment. Myocardial bridging most commonly involves the left anterior descending coronary artery (LAD). It has been shown in recent studies that the clinical manifestations of myocardial bridges is due to the result of an reduction in myocardial blood flow not only during systole but persisting throughout portions of diastole leading to ischaemia. It was first mentioned by Reyman in 1737 [2] and first described by Crainicianu in the early 1920. [3] Portmann and Iwig first reported the radiological appearance of transient stenosis in a segment of the left anterior descending coronary artery during systole in 1960. Myocardial bridging is generally thought as a harmless anatomical variant of the coronary arteries. [4, 5]. But myocardial bridging may be associated with myocardial ischemia and infarction due to coronary artery spasm [6, 7] conduction abnormalities [8], ventricular arrhythmias [9] and sudden death [10] In pathological series, the prevalence has varied from 5% to 86% [11, 12] and in angiographic series; the prevalence has been shown as being between 0.5% and 33% [13, 14]. Variation at angiography may in part be attributable to small and thin bridges causing little compression. In studies of pediatric patients with HCM, the presence of myocardial bridging has been associated with the severity of disease, including nuclear perfusion abnormalities, chest pain, ventricular tachycardia, and increased risk of sudden cardiac death (SCD) [15, 16]. Much national data regarding myocardial bridges is not available. So, we designed a retrospective observational study. The aim of this study was to detect the prevalence and risk factors of myocardial bridging and to determine the angiographic profile to follow up of myocardial bridging of coronary arteries of the selected patients referred for diagnostic coronary angiography.

## 2. Materials and Methods

This was a retrospective observational study. A total of 1480 patients with suspected coronary artery disease (CAD) was admitted to Enam Medical College and Hospital, Savar, Dhaka, Bangladesh for coronary angiography between April 2016 to June 20019 of them 43 cases were found to have myocardial bridge. Coronary compression was defined as a maximum systolic luminal compression  $\geq 50\%$ . In this population, 43 patients had systolic luminal compression  $\geq 50\%$ , and all 43 patients were selected for the study to determine the prevalence of MB and risk factors for MB are studied from the patients' recorded demography and coronary angiogram was reviewed to see the angiographic location, length of MB and number of vessels involved.

The procedures followed with the permission of the Ethical Committee of the hospital. All the clinical and angiographic findings were taken from recorded documents and coronary angiogram CD of the hospital. Then the data were analyze using simple statistical data analyze tools to perform the results of this study.

## 3. Results

There were 1480 patients were admitted for coronary angiography with suspected coronary artery disease out of them 43 patients were enrolled in this study. The incidence of MB was 2.9% in this study. The ages of the patients were  $50 \pm 15$  (Mean $\pm$ SD) years. Out of them 28 (65.11%) were male and 15 (34.88%) were female. Body Mass Index of the patients were  $25 \pm 6$  (Mean $\pm$ SD). The studies of cardiovascular risk factors of the patients with MB were hypertension 33 (76.74%) and it was the peak in position and the other followed diabetes mellitus 28 (65.11%), hyperlipidaemia 18 (41.86%), family history of CAD 15 (34.88%), smoking history 22 (51.16%). The clinical presentations of the patients were chronic stable angina 28 (65.11%), unstable angina 07 (16.27%), NSTEMI 05 (11.62%) and AMI 03 (6.97%). The study of left ventricular ejection fractions on Echocardiography  $> 55\%$  were 28 (65.11%), 45%-55% were 10 (23.25%) and 35%-45% were 05 (11.62%). In coronary angiography location of MB was in LAD were 34 (79.06%) of them 08 were proximal segment, mid were 22, distal were 04, in LCX followed 07 (16.27%), of them proximal were 02, mid were 04, and distal were 01 and in RCA were 02 (4.65%), of them only in mid segment. Among the MB were in single vessel 38 (88.37%), double vessels were 05 (11.62%). The MBs with atherosclerotic stenosis of coronary artery in LAD were 18 (41.86%), LCX were 02 (4.65%), and RCA was 01 (2.32%). The severities of luminal narrowing of MB segment were in LAD 50 -70% were 27 (62.79%),  $>70\%$  were 07 (16.27%), in LCX 50-70% were 06 (13.95%) and  $>70\%$  was 01 (2.32%) and in RCA 50-70% was 02 (4.65%). The length of segment of MB  $<10$  mm were 06 (13.95%), 10-20 mm were 25 (58.19%) and  $>20$  mm were 12 (27.90%).

**Table 1.** Demographic characteristics of the studied patients. (n=43).

| Variable                  | (n=43)      | n (%) |
|---------------------------|-------------|-------|
| Age (Mean $\pm$ SD) years | 50 $\pm$ 15 |       |
| BMI (Mean $\pm$ SD)       | 25 $\pm$ 6  |       |
| Sex                       |             |       |
| Male                      | 28          | 65.11 |
| Female                    | 15          | 34.88 |

Age of the population was  $50 \pm 15$  (Mean $\pm$ SD) years. Out of them 28 (65.11%) were male and 15 (34.88%) were female. Body Mass Index of the patients were  $25 \pm 6$  (Mean $\pm$ SD).

**Table 2.** Risk factors with MB of studied patients (n=43).

| Variable              | (n=43) | n (%) |
|-----------------------|--------|-------|
| Hypertension          | 33     | 76.74 |
| Diabetes Mellitus     | 28     | 65.11 |
| Hyperlipidaemia       | 18     | 41.86 |
| Family History of CAD | 15     | 34.88 |
| Smoking History       | 22     | 51.16 |

Study of risk factors seen hypertension 33 (76.74%), diabetes mellitus 28 (65.11%), hyperlipidaemia 18 (41.86%), family history of CAD 15 (34.88%), smoking history 22 (51.16%).

**Table 3.** Clinical presentation of the patients. (n=43).

| Variable              | N  | %     |
|-----------------------|----|-------|
| Chronic stable angina | 28 | 65.11 |
| Unstable angina       | 07 | 16.27 |
| NSTEMI                | 05 | 11.62 |
| AMI                   | 03 | 6.97  |

Clinical presentations CSA 28 (65.11%), UA 07 (16.27%), NSTEMI 05 (11.62%) and AMI 03 (6.97%).

**Table 4.** Left ventricular ejection fractions on Echocardiography (n=43).

| LVEF          | N  | %     |
|---------------|----|-------|
| LVEF >55%     | 28 | 65.11 |
| LVEF 45% -55% | 10 | 23.25 |
| LVEF 35% -45% | 05 | 11.62 |

LVEF >55% were 28 (65.11%), 45% -55% were 10 (23.25%) and 35%-45% were 05 (11.62%).

**Table 5.** Location of MB in angiography (n=43).

| Vessel | N  | %     | Segment  | N  | %     |
|--------|----|-------|----------|----|-------|
| LAD    | 34 | 79.06 | Proximal | 08 | 23.52 |
|        |    |       | Mid      | 22 | 64.70 |
|        |    |       | Distal   | 04 | 11.76 |
| LCX    | 07 | 16.27 | Proximal | 02 | 28.57 |
|        |    |       | Mid      | 04 | 57.14 |
|        |    |       | Distal   | 01 | 14.28 |
| RCA    | 02 | 4.65  | Proximal | 00 | 00    |
|        |    |       | Mid      | 02 | 100   |
|        |    |       | Distal   | 00 | 00    |

Location of MB in LAD were 34 (79.06%) of them 08 were proximal, mid 22 and distal were 04, in LCX 07 (16.27%), of them proximal 02, mid 04 and distal 01 and in RCA 02 (4.65%), of in mid segment.

**Table 6.** Presence of MB in number of vessels (n=43).

| Variable       | N  | %     |
|----------------|----|-------|
| Single Vessel  | 38 | 88.37 |
| Double Vessels | 05 | 11.62 |
| Triple Vessels | 00 | 00    |

MB was in single vessel 38 (88.37%), double vessels were 05 (11.62%) and no triple vessels.

**Table 7.** MB with atherosclerotic stenosis (n=43).

| Variable | N  | %     |
|----------|----|-------|
| LAD      | 18 | 41.86 |
| LCX      | 02 | 4.65  |
| RCA      | 01 | 2.32  |

MBs with atherosclerotic stenosis LAD were 18 (41.86%), LCX were 02 (4.65%) and RCA was 01 (2.32%).

**Table 8.** Severity of luminal narrowing by MB segment (n=43).

| Variable | 50-70% | %     | >70% | %     |
|----------|--------|-------|------|-------|
| LAD      | 27     | 62.79 | 07   | 16.27 |
| LCX      | 06     | 13.95 | 01   | 2.32  |
| RCA      | 02     | 4.65  | 00   | 00    |

Luminal narrowing of MB segment LAD 50 -70% were 27 (62.79%), >70% were 07 (16.27%), LCX 50-70% were 06 (13.95%) and >70% was 01 (2.32%) and in RCA 50-70% was 02 (4.65%).

**Table 9.** Length of MB Segment (n=43).

| Length of Segment | N  | %     |
|-------------------|----|-------|
| < 10 mm           | 06 | 13.95 |
| 10-20 mm          | 25 | 58.19 |
| >20 mm            | 12 | 27.90 |

Length of segment of MB <10 mm were 06 (13.95%), 10-20 mm were 25 (58.19%) and >20 mm were 12 (27.90%).

## 4. Discussion

Our study is a descriptive report of baseline, clinical and angiographic characteristics in a series of 43 patients who were diagnosed with myocardial bridging. The angiographic appearance of myocardial bridges depends on several factors, including the length of myocardial bridge<sup>17</sup>. The use of provocation tests may enhance systolic myocardial compression and thereby reveal myocardial bridges in 40% of cases<sup>18</sup>. In this study, the lengths of myocardial bridges were between 10 mm to above 20 mm, which were within the typical range. Moreover, in our study we got some other risk factors like hypertension, diabetes mellitus, hyperlipidaemia and family history of CAD. Myocardial bridges, though recognized about 200 years ago, were first reported in depth by Gerringer in 1951 and angiographically by Portsmann in 1960<sup>1</sup>. Disparity in the incidence of myocardial bridges exists between reports from anatomic (15- 85%) and angiographic (0.5-1.6%) studies<sup>1</sup>. This is because angiography can detect only MB accompanied by a milking effect. Our study is in agreement with one of the largest studies, the one by Juillière, where the presence of myocardial bridges was 0.82 percent (out of 7467 consecutive coronary angiograms). In our study incidence of MB is 2.9% and the locations of MBs were in LAD, LCX, and RCA in angiography. MBs are classified in different types. In this study single vessel were 88.37%, Double vessels were 11.62% and 28 (65.11%) patients had chronic stable angina, 07 (16.27%) had unstable angina, 05 (11.62%) had NSTEMI and 03 (6.97%) presented with AMI. Other studies have reported stable or unstable angina as frequent, and myocardial infarction, ventricular tachyarrhythmia, and cardiac death as infrequent clinical presentations<sup>19</sup>. On the other hand; we only included myocardial bridges with at least >50% severity of stenosis. The segment that was affected was in this study in the LAD, LCA and RCA which were same to some cases that have been found in some other coronary segments<sup>11, 12</sup>. It has been reported that the compressed segment is frequently spared from atherosclerotic changes<sup>2, 3</sup>. In our study MB with atherosclerotic stenosis were the highest in LAD 18 (41.86%) and the severity of MB stenosis were also high in LAD and it was 41.86%. The highest MBs were (58.19%) between the length of segment is 10-20 mm. Though this study was a retrospective observational study and all clinical

and angiographic procedures were reviewed carefully to observe the risk factors and angiographic profile of myocardial bridges and it was possible to perform the angiographic evaluation successfully to identify the location of myocardial bridges in proximal, mid and distal part of coronary arteries.

## 5. Conclusion and Recommendations

In this study the prevalence of MB was 2.91%, commonly presented with chronic stable angina. The most risk factors of myocardial bridges were hypertension, diabetes mellitus, hyperlipidaemia, family history and smoking history and. In coronary angiography most of MB was present in association of acute coronary syndrome with documented coronary artery disease and was mainly located in LAD mid segment and the length of MB was mostly 10-20 mm. Further large numbers of case are needed to validate the result of the study.

## Limitations of the Study

The limitation of the study is that all of the patients did not receive intracoronary nitroglycerin at the time of angiography in our study. The article was retrospective in nature and a small number of populations were studied.

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