Incidence of Intramyocardial Bridge in a Population Sample

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Abstract

Background: The anomaly caused by intramyocardial bridge has been identified as a differential diagnosis of coronary artery disease.

Objective: To analyze the incidence of intramyocardial bridge (IMB) in a population sample.

Methods: Retrospective observational study that analyzed medical records of 200 patients diagnosed with intramyocardial bridge (IMB) or myocardial bridge (MB) using coronary computed tomography angiography (CCTA) from September 2010 to March 2015 at Hospital Beneficência Portuguesa de São Paulo and MedImagem — the Radiology service of the Hospital. The following variables were analyzed: sex, age, height, weight, skin color, family history of cardiovascular disease, smoking, presence or absence of stent, incidence of dyslipidemia, symptoms, systemic arterial hypertension (SAH) and diabetes mellitus (DM), and the coronary arteries mostly affected.

Results: Of the 200 patient records reviewed, there was a higher incidence of IMB in male patients (63.7%, n=128); mean age 57.78±15.0 years; predominance of white color (85.0%); average weight 84.5 kg, with more than half (n=125, 62.5%) of patients below average weight; 15 (7.5%) patients were stented; 81 (40.5%) had symptoms (chest pain or dyspnea); 108 (54.0%) had a family history of cardiovascular disease; 73 (36.5%) presented dyslipidemia; 83 (41.5%) had SAH; 28 (14.0%) had MD; 98 (49.0%) patients had atherosclerosis; and 56 (28.0%) patients were smokers. The main affected artery was the left anterior descending artery (n=193, 96.0%).

Conclusions: The conclusion is that, in the study population, IMB is prevalent in male patients of white color, non-obese, older, with family history of cardiovascular disease. The main affected artery was the left anterior descending artery.

Keywords: Myocardial bridging; Incidence; Tomography; Coronary vessels

Introduction

Intramyocardial bridge (IMB) is a congenital anomaly consisting of structural change of one or more epicardial coronary arteries — being more frequent in the left coronary artery distribution — in which there is penetration of a segment of the affected artery in the myocardial muscle bundle, and may or may not cause symptoms¹².

The coronary blood flow is subject to variations during the cardiac cycle, as during systole — mainly from the left ventricle whose contraction force is naturally more intense — the flow of nutrient capillary vessels is temporarily blocked. However, when the so-called “intramural artery” is in place, which would be epicardial coronary artery coated by heart muscle bundles, the relevance of this temporary blood stasis becomes greater, and may cause symptoms¹.
Because it is a relatively common condition and mostly benign, it is considered an important differential diagnosis of coronary artery disease (CAD). Acute myocardial infarction caused by systolic contraction on an intramural coronary artery is rare, but other consequences such as unstable or stable angina, cardiac arrhythmias (ventricular tachycardia and supraventricular tachycardia) or, more rarely, sudden death, should be considered.

As IMB is a common, underdiagnosed condition, which makes its pathophysiological and therapeutic mechanisms to be poorly understood, this study is expected to help better understand this anomaly and the affected population.

**Methods**

Retrospective observational study that analyzed medical records of 200 patients diagnosed with IMB using coronary computed tomography angiography (CCTA) from September 2010 to March 2015 at Hospital Beneficência Portuguesa de São Paulo and MedImagem — the Radiology service of the Hospital.

This study has been submitted and approved by the Research Ethics Committee of Universidade Anhembi Morumbi and Hospital Beneficência Portuguesa under no. 5492. Informed Consent was not required, as this is a retrospective observational study.

Patients were selected on the MedImagem database, from Hospital São Joaquim da Beneficência Portuguesa, in the state of São Paulo. The study population was composed of patients diagnosed with IMB using coronary computed tomography angiography from September 2010 to March 2015.

The following variables were analyzed: age, height, weight, skin color and the most affected coronary arteries. The following was also evaluated: family history of cardiovascular disease, smoking, presence or absence of stent, incidence of dyslipidemia, symptoms, presence of systemic arterial hypertension (SAH) and diabetes mellitus (DM).

The study included patients who underwent CCTA and had a history of coronary artery bypass grafting and stent.

IMB diagnosis was given if the patient presented intramural bridging of a coronary artery on axial images. The extent and depth of the segment were measured after reconstruction. The presence of atherosclerotic plaque was defined as ≥1 mm² structures within and/or adjacent to the coronary artery lumen, being determined whether the lesion was obstructive using a 50% threshold of luminal narrowing.

The collection of demographic data was based on information collected from the patient for the CCTA scan. In this study, there was not a specific standard to determine skin color. The first examiner was in charge of entering this data in the admission form.

**Results**

There was a predominance of males (n=128, 63.7%) compared to females (n=72, 36.3%, p<0.001). The mean age was 57.78±15.0 years, and 113 (56.5%) patients were older than the observed average.

The average weight found was 84.5 kg (51 kg – 118 kg), of which 27 (13.5%) were obese and 173 (86.5%) non-obese. More than half (n=125, 62.5%) of the patients were below average weight.

As for skin color, 9 (4.5%) patients were classified as yellow, 14 (7.0%) as black, 7 (3.5%) as brown and 170 (85.0%) as white.

The main artery affected was the anterior descending artery (n=193 cases, 96.0%) or one of its branches, such as the first diagonal (n=3, 1.5%) and the second diagonal (n=2, 1.0%) and, finally, there was impairment of the coronary artery in 2 (1.0%) patients.

In the population studied, 15 (7.5%) patients were stented; 81 (40.5%) had symptoms (chest pain or dyspnea); 108 (54.0%) had a family history of cardiovascular disease; 73 (36.5%) presented dyslipidemia; 83 (41.5%) patients had systemic arterial hypertension (SAH); 28 (14.0%) had diabetes mellitus (DM); 98 (49.0%) patients had atherosclerosis; and 56 (28.0%) patients were smokers (Table 1).
The first mention of muscle bundles involving the intramyocardial segment of an epicardial coronary artery was in Reyman in 1737 and the first description of IMB was in early 1920 by Crainicianu, apud Möhlenkamp et al.¹-⁴. Myocardial bridge is named as such because it consists of a kind of “tunnel” from the myocardial tissue to the epicardial tissue, in which a coronary artery is compressed by these two tissues¹. The epicardial coronary artery — now surrounded by muscle fibers — is then called “tunneled” or “intramural” artery³.

The prevalence of MB varies a lot from study to study, and the occurrence rate reported in studies using autopsy is significantly higher than those in angiographies⁴. While in pathological studies the prevalence varies from 5.0% to 86.0%, in angiographic studies the prevalence ranges from 0.5% to 33.0%⁵,⁶. This variation in angiographic studies may be related to small and thin bridges, causing minimal compression.

Conventional coronary angiography is considered the gold standard in the diagnosis of MB⁶,⁷. However, it is known that it is an invasive and little sensitive test compared to autopsy. As coronary computed tomography angiography is a test with high temporal and spatial resolution, it enabled the noninvasive evaluation of the incidence, location and morphology of MB in living individuals. It also makes it possible to analyze the vessel wall, presence of plaques and diameter of the arteries involved this abnormality.

The highest incidence of IMB in male patients has been described previously in other studies¹,⁶, confirming the findings of the population studied here.

The LAD (left anterior descending) artery was the most affected artery in the population studied, matching the prevalence reported in the literature. An even greater incidence of white individuals was found in this study, suggesting in that phenotype a greater predisposition to this anomaly — requiring a multicenter study to confirm this assumption.

The number of patients studied was limited and further studies may show new data.

**Conclusions**

It can be concluded, in the study population, that IMB is prevalent in male patients, white, non-obese, older, with family history of cardiovascular disease. The main affected artery was the left anterior descending artery.

**Potential Conflicts of Interest**

This study has no relevant conflicts of interest.

**Sources of Funding**

This study had no external funding sources.

**Academic Association**

This manuscript is part of the Final Term Paper of Medicine of Fabiana Ceribelli Nechar from the School of Medicine of Universidade Anhembi Morumbi.
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