

## Myocardial bridges and left coronary artery trifurcation: a case report

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### Abstract

During the performance of an angiotechnic in a human heart, to highlight the coronary circulation, we observed the presence of myocardial bridges in the anterior and medial branches of the left coronary artery, in this heart was also demonstrated the presence of an artery trifurcation left coronary branches that originated the anterior interventricular, circumflex and median. Myocardial bridges are intriguing entities that do not always show signs and symptoms, the presence of the median artery in hearts with myocardial bridges, is one of the factors that may explain the absence of signs and symptoms in some patients with this entity. Moreover the myocardial bridges can explain the signs and symptoms of ischemia on functional testing.

**Keywords:** myocardial bridges, coronary circulation, trifurcation of the left coronary artery.

### 1 Introduction

In humans, the major arteries which comprise the coronary circulation are located within the anterior interventricular and posterior and coronary grooves, which are surrounded by fatty tissue and covered by the epicardium. Normally the situation of the arteries of the coronary circulation is sub epicardial, but can delve into the myocardium and then reappear on the surface of the heart (FAZLIQGULLARI, KARABULUT, KAYRAK et al., 2010). Thus, myocardial bridge may be defined as one myocardial fiber bundle which overlaps one segment of a coronary artery (BANDYOPADHYAY, DAS, BARAL et al., 2010; FAZLIQGULLARI, KARABULUT, KAYRAK et al., 2010).

Myocardial bridges (MB) have already been reported in the coronary artery branches right and left, but studies show an increased incidence of MB in the branches of the left coronary artery (BAPTISTA and DIDIO, 1992; ACUNÁ, ARISTEGUIETA and TELLEZ, 2009; BHARAMBE and AROLE, 2008; LOUKAS, CURRY, BOWERS et al., 2006). The branch of the left coronary artery that has the highest incidence of MB is the anterior interventricular. This artery the MB is located generally at the middle third (LOUKAS, CURRY, BOWERS et al., 2006; MOHLENKAMP, HORT, GE et al., 2002; LIMA, CAVALCANTI and TASHIRO, 2002; KALARIA, KORADIA and BREALL, 2002).

Previous studies have shown differences in the incidence of MB and this finding may be related to the method of evaluation. The diagnostic methods used to determine the MB are coronary angiography and coronary computed tomography angiography. In coronary angiography, which is a dynamic test, it is observed a partial occlusion of the

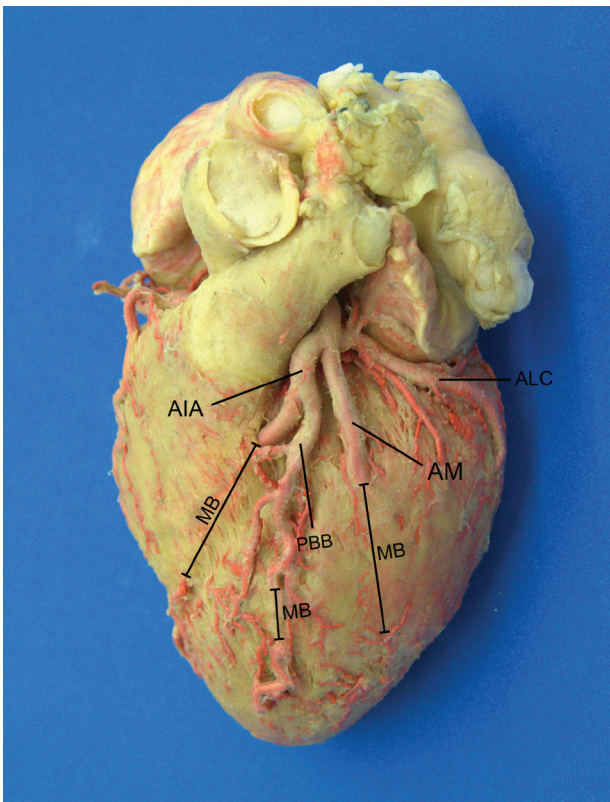
coronary flow during systole. This phenomenon is caused by compression of the segment involved MB (LAZOURA, KANAVOU, VASSIOU et al., 2010).

In the autopsy MB are present in 15%-85% of corpses and in clinical studies the frequency of MB is 05%-40% (LOUKAS, KRIEGENBERGH, GILKES et al., 2011). This discrepancy suggests that only a minority of patients with MB exhibit symptoms and clinical cardiac events. Moreover, the prevalence of MB in postmortem studies is higher compared to angiographic studies because only the deep bridges may be apparent by angiography (FERREIRA, TROTTER, KONIG et al., 1991).

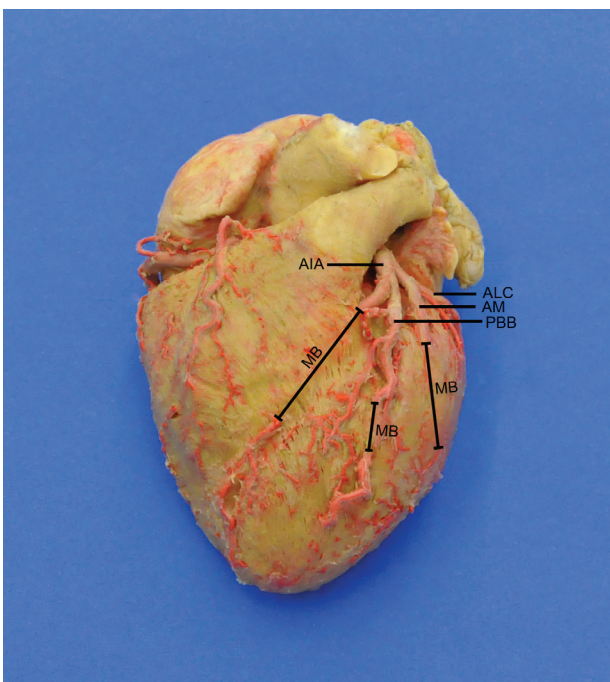
While the MB may be considered a normal variant and clinically silent, many cases are associated with myocardial ischemia (VIVES, DOLZ, BONET et al., 1999), infarction myocardial (AKDEMIR, GUNDUZ, EMIROGLU et al., 2002) and sudden death (BESSTETTI, COSTAS, ZUCOLOTTI et al., 1989).

### 2 Case Report

During a routine anatomical preparation we observed the presence of a heart MB. Initially, a corpse was fixed in 10% formalin, the heart was removed, and later performed an angiotechnic in order to highlight the coronary circulation. The coronary arteries were cannulated with use of a polyethylene tube and injected with latex, which received a pigment in red. After the initial procedures, the heart was dissected to remove fat and epicardium. With the withdrawal of epicardial became evident the presence of MB in the branches of the left coronary artery, which showed



**Figure 1.** View anterolateral sternocostal side of the heart. AIA - Anterior interventricular artery, PBB - branch pre-bridge, AM - median artery, ALC - left circumflex artery, MB - myocardial bridging.



**Figure 2.** Front view of sternocostal side of the heart. AIA - Anterior interventricular artery, PBB - branch pre-bridge, AM - median artery, ALC - left circumflex artery, MB - myocardial bridging.

a trifurcation causing the anterior interventricular (AIA), left circumflex (ALC) and median (AM). A morphometric analysis of MB was accomplished by using a caliper (*Eccofer*<sup>®</sup> with a precision of 0.05 mm) to determine the length of MB and caliber arteries before and after MB. The MB of the AIA had 36 mm long with a artery diameter of 4 mm before and after 2 mm. The MB located in AM had 31 mm in length, artery diameter 4 mm before and 2 mm after MB. The heart showed a branch pre-bridge (PBB) emerging from AIA before MB. This branch followed the path of the AIA, presenting also a MB of 11 mm in length with a artery diameter of 3 mm before and after MB. Subsequently passed through the heart preservation method glycerin, which consists of the following phases: thirty days immersion in absolute alcohol and thirty days of immersion in glycerin (Figures 1 and 2).

### 3 Discussion

Some hypotheses to explain the presence of MB. Previous studies have suggested that MB are formed during the embryonic period, while the coronary arteries of the original capillary network are developed. Other authors believe that the MB is not a vascular abnormality, but a defect in the reabsorption of the muscles surrounding the artery (LIMA, CAVALCANTI and TASHIRO, 2002; CAKMAK, CAVDAR, YALM et al., 2010). Cakmak, Cavdar, Yalm et al. (2010) evaluated the presence of MB in the hearts of human fetuses, checking a prevalence of MB in the same proportion found in adult hearts. For this reason, the authors conclude that the MB are formed during fetal period and are not an acquired anatomical structure.

The presence of MB is closely associated with the development of an artery adjacent (FERREIRA, TROTTER, KONIG et al., 1991), in preparation investigated, there has been a PBB emerging AIA before the PM. Acunã, Aristeguieta and Tellez (2009) demonstrated a high incidence of PBB, which 54% originated from the AIA. For the authors, the presence of an PBB can act as a compensatory mechanism to irrigate the adjacent region which could have been without the presence of ischemia PBB. This may explain the presence of MB in some asymptomatic patients.

In this context, the heart studied presented a PBB and also an third branch emerging of left coronary artery. The presence of a trifurcation at the left coronary artery has been reported in the literature and well known as AM (SURUCU, KARAHAN and TANYELI, 2004; ANGELINI, 1989), normally this artery runs obliquely sternocostal surface of the left ventricle extending from the base toward the apex (ANGELINI, 1989).

Fazliogullari, Karabulut, Unver et al. (2010) found that 22 of the 50 hearts studied had a trifurcation on the left coronary artery (44%), besides the AIA and ALC, an AM originated in this trifurcation. These authors showed an interesting fact, 81.5% of hearts that presented a AM they had also MB in some branch of the left coronary artery. Our study has shown that there is a statistically significant relationship between the presence of AM and MB ( $p = 0.003$ ).

Do not know why there are no signs or symptoms of MB before the third decade of life, since the MB are present at birth (ALEGRIA, HERRMANN, HOLMES JUNIOR et al., 2005). A plausible explanation for the presence of asymptomatic MB until the third decade of life is justified by studies Acunã, Aristeguieta and Tellez (2009)

and Fazliogullari, Karabulut, Unver et al. (2010) who demonstrated a high incidence of PBB and MB in hearts with MB. The presence of these branches compensates the deficit caused by MB, providing an additional flow of blood. In the opinion of Peralta, Alfaro, Gómez et al. (1998), the MB be congenital and symptoms related to them in childhood are rare, and chronobiological extrinsic factors should influence the progression or not this entity.

Furthermore, the appearance of symptoms and signs in patients who were asymptomatic can be explained by anatomical and functional changes in coronary segment involved by the MB.

The MB is still an intriguing topic, leading to many speculations. Regarding PBB and AM, some studies have reported the presence of these blood vessels, but there is still disagreement in the literature regarding the names given to these vessels. Future research may further elucidate the relationship of MB with the adjacent arteries and set a standard as to the naming of these blood vessels.

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