

## Myocardial bridging as a possible cause of unexplained sudden death: A case report

Kirurški obvod miokarda kot možen vzrok nepojasnjene nenadne smrti: prikaz primera

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### Ključne besede:

nenadna smrt, koronarna arterija, obvod miokarda, forenzična obdukcija

### Key words:

sudden death, coronary artery, myocardial bridging, forensic autopsy

### Citirajte kot/Cite as:

Zdrav Vestn 2013; 82: 357–60

Prispelo: 11. apr. 2012,  
Sprejeto: 3. jul. 2012

### Abstract

A 35-year-old man was found dead on the road by the police patrol. As the cause of his death was unknown, a forensic autopsy was performed in the morgue department. No traumatic change was detected on external or internal examination. Macroscopic investigation of the heart revealed a 2.2 cm extension of the left anterior descending coronary artery embedded in the myocardium 1 cm from its origin; a 1–1.2 cm superficial myocardial bridge overlying the left anterior descending coronary artery was detected. Histological examination of the heart revealed no evidence of acute or chronic ischemia, only mild hypertrophy was detected. We reported that myocardial bridging could be a cause of unexplained sudden death in the presented case.

### Izvleček

Petintridesetletnega moškega je policijska patrulja našla mrtvega na cesti. Ker vzrok njegove smrti ni bil znan, so v mrtvašnici opravili forenzično obdukcijo. Tako zunanja kot notranja preiskava nista pokazali nobene poškodbe. Makroskopska preiskava srca je pokazala 2,2-cm dolg podaljšek leve sprednje descendentne koronarne arterije, vstavljen v srčno mišico 1 cm od njenega izhodišča; ugotovljeno je bilo, da gre za 1–1,2 cm dolg obvod leve sprednje descendentne koronarne arterije. Histološka preiskava srca ni odkrila znakov akutne ali kronične ishemije; ugotovljena je bila le blaga hipertrofija. Poročali smo, da bi lahko bil obvod miokarda vzrok za nepojasnjeno smrt v prikazanem primeru.

## Introduction

Myocardial bridging is a congenital coronary pathology described as a segment of coronary artery that goes intramurally through the myocardium beneath the muscle bridge.<sup>1–3</sup> While the prognosis is generally benign, ventricular arrhythmia, myocardial ischemia, infarction and sudden death have been reported.<sup>1,2,4</sup> Our aim in this report was to analyse the pathophysiological mechanisms of myocardial bridging from the medicolegal aspect.

## Case report

According to the document of death, a 35-year-old man was found dead on the road by the police patrol. The case was investigated by the local prosecutor, as the cause of his death was unknown; a forensic autopsy was performed in our department. There was no family history of cardiac disease or premature sudden cardiac death among relatives. During hospital evaluation, any ECG abnormalities such as arrhythmia, ST changes, ischemia and heart block were noted.



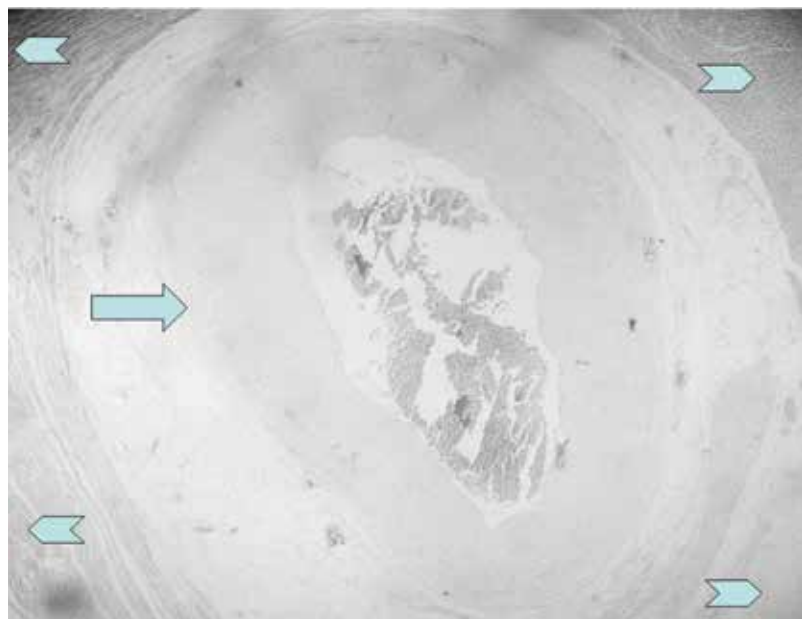
**Fig. 1:** The left descending coronary artery embedded in the myocardium (arrow).

Common signs of an electrolyte imbalance like low to high blood pressure, fatigue and circulation problems were not reported in his previous medical records obtained from the prosecutors' office, only a medication for treating schizophrenia was indicated. The family members also stated that he had been medically evaluated in a public hospital during past several years, and it was explained that the patient had a psychotic disorder not otherwise specified. The only drug the patient was taking prior to the event was risperidone at a dosage of 2 mg/day, which he had been taking for the past six years. His body height was 172 cm and weight 70 kg. No traumatic change was detected either on external or internal examination. On macroscopic investigation, the heart was normal in size (12 x 10.4 x 3.9 cm) and weighed 350 g. Heart valves: mitral, tricuspid and both semilunar valves were normal. The main left coronary artery originated normally from the left sinus of Valsalva. A 2.2 cm part of the left anterior descending coronary artery was embedded in the myocardium 1 cm from its origin; a 1–1.2 cm thick superficial myocardial bridge overlying the left descending coronary artery was detected; the tunnelled segment revealed no atherosclerotic changes (Fig.1). Other parts of the coronary arteries revealed atherosclerotic changes without obstruction, only subintimal lipid deposits were observed. Histological examination of the heart, performed with haema-

toxylin-eosin, showed no evidence of acute or chronic ischemia, only mild hypertrophy was detected. Histological cross-section samples of the overbridged coronary artery showed the subepicardial vessel running between two layers of myocardial fibres. On microscopic evaluation, there was no direct interaction between the muscle bridge and the adventitia of the associated coronary artery. Only adipose and loose connective tissues were interposed between the muscle bridge and the artery (Fig. 2). Macroscopic and microscopic examination of the other organs was unremarkable, only the lungs revealed oedema and congestion, and the liver slight steatosis. Analysis of the blood, urine, and organ specimens revealed only 66 mg/dl ethanol, and risperidone in the blood. We reported that myocardial bridging could be a cause of unexplained sudden death in the presented case.

## Discussion

Myocardial bridging, proposed as scientific term in 1961, by Polacek,<sup>3</sup> is a congenital coronary abnormality<sup>1,2</sup> described as a segment of a major epicardial coronary artery, the "tunnelled artery", that goes intramurally through the myocardium beneath the muscle bridge. In some autopsy series, its incidence was reported as high as 23–85 %, <sup>1,2,4</sup> while on the other hand, the frequency in coronary angiography studies was reported to be 1.5 to 16 %.<sup>5,6</sup> In the Turkish population it was detected in 1.22 % by Çay et al.<sup>7</sup> The left anterior descending artery was the major coronary artery branch overbridged, and the most frequent (60–70 %) location of the abnormality was reported to be the proximal half of this artery<sup>1,2,4,7</sup> as it was in the presented case. The main angiographic finding in medical literature was reported as systolic compression of the involved epicardial coronary artery.<sup>2</sup> Systolic compression of the coronary artery is considered to be a benign phenomenon, although numerous case reports have suggested an association between bridging and sudden death or ischemia in certain patients without other abnormalities on cardiovascular evaluation.<sup>2,8</sup> Furthermore, Polacek stated that systolic compression



**Fig. 2:** Coronary artery (arrow) inserted between layers of myocardial fibres (arrowhead) (H/E stain  $\times 40$ ).

may increase the trauma sustained by the intima proximal to the bridged section.<sup>3</sup> The prognosis is generally benign, but different complications of myocardial bridging are presented in the literature. Yetman et al.<sup>9</sup> revealed an association between myocardial bridging and chest pain, ventricular arrhythmias and sudden death in young patients with hypertrophic cardiomyopathy. Channer et al.<sup>10</sup> detected that bridging was associated with left ventricular hypertrophy if it affected a longer segment, and caused more severe compression, whereas, when bridging was found in patients with coronary artery disease, it was not associated with atheroma at its site. Michels et al.<sup>11</sup> reported myocardial bridging case associated with Tako-tsubo-like left ventricular dysfunction syndrome, characterized by ischemia, anterior ST-segment elevation, without significant coronary artery disease, and reversible left ventricular ballooning. On the other hand, Mohiddin and associates<sup>12</sup> stated that there was no association between bridging and clinical outcome.

The presented case of sudden death was a 35-year-old man having a left anterior descending coronary artery myocardial bridging as the only identifiable cause of sudden unexplained death. Moreover, according to the toxicological analysis the documented blood ethanol level was low and the detected risperidone was found only in trace amounts.

There were no findings of myocardial fibrosis and myocardial ischemia, the features previously mentioned in the literature to explain the fatal episode of malignant arrhythmia.<sup>13,14</sup> However, Kracoff et al.<sup>15</sup> claimed a possible relationship between the arrhythmia and the myocardial bridging (malignant course of a benign anomaly) in a 35-year-old man, with a recent onset of angina, who developed recurrent episodes of syncope, which was also the first report of electrophysiologically documented sustained ventricular tachycardia associated with myocardial bridging.

Alegria et al.<sup>2</sup> stated that additional research is needed to define patients in whom myocardial bridging is potentially pathologic, and randomized multicentre long-term follow-up studies are needed to assess the natural history, patient selection, and therapeutic approaches.

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