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## Case Report

# Multiple myocardial bridging in the elderly: A rare case <sup>☆☆☆</sup>

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## ABSTRACT

Myocardial bridging occurs when a segment of major epicardial coronary artery courses intramurally through myocardium, commonly involving the left anterior descending. However, myocardial bridging involving coronary arteries other than left anterior descending is less-common and rarely reported, especially in the elderly population. We report a rare case of multiple myocardial bridging involving the left anterior descending, first obtuse marginal, and ramus intermedius in a 68-year-old Asian female. We also briefly discuss the imaging evaluation and pathophysiology of myocardial ischemia in myocardial bridging. This is the second reported case of myocardial bridging involving such combination, and to our knowledge, the first for elderly patient.

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## Introduction

Myocardial bridging occurs when a segment of a major epicardial coronary artery courses intramurally through myocardium. It commonly involves the left anterior descending (LAD) artery [1]. Myocardial bridging involving multiple coronary arteries is less common and rarely reported, especially in the elderly population. We report a rare case of multiple my-

ocardial bridging involving the LAD, the first obtuse marginal (OM1), and the ramus intermedius.

## Case report

A 68-year-old Asian female presented with atypical chest pain for 5 months. She had a history of hypertension, which was well-controlled with 1 × 5 mg bisoprolol daily. She had no

**Abbreviations:** CTCA, computerized tomography (CT) coronary angiogram; LAD, left anterior descending; OM, obtuse marginal; RCA, right coronary artery.

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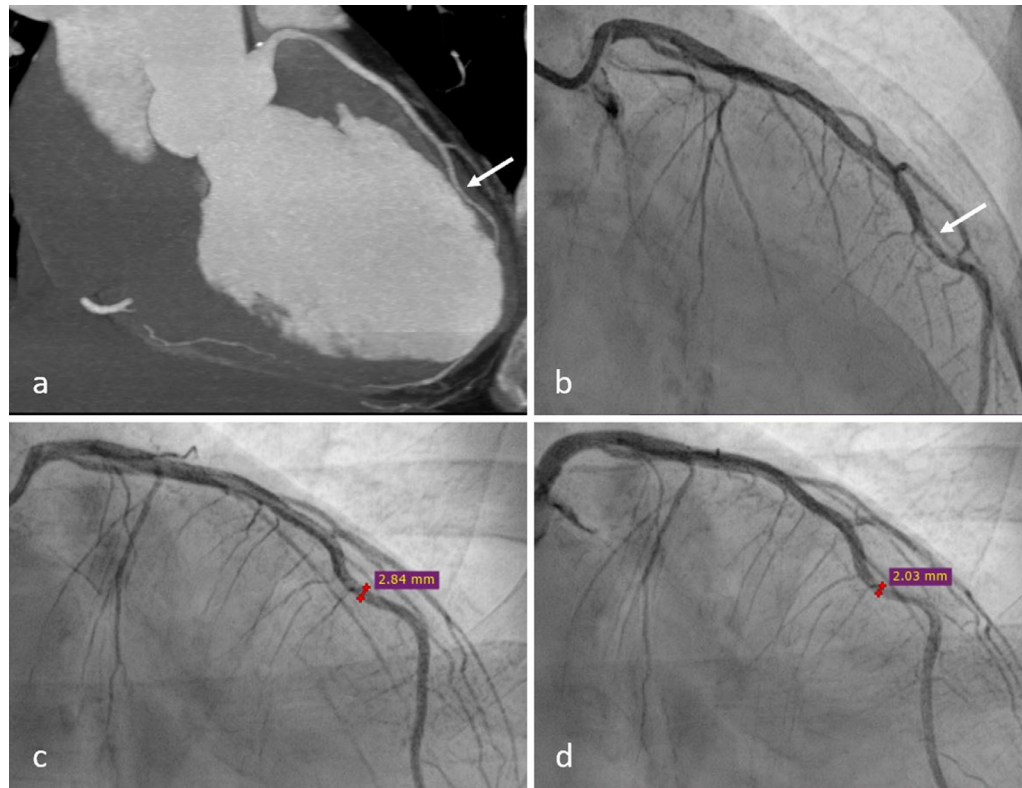
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**Fig. 1 – (A) CTCA showing tunneled segment in mid-distal LAD (white-arrow); (B) corresponding conventional angiography of LAD showing the pathognomonic “step down-step up” appearance (white arrow). Measurement of vessel diameter in diastolic (C) and systolic (D) phase demonstrated “milking effect.”**

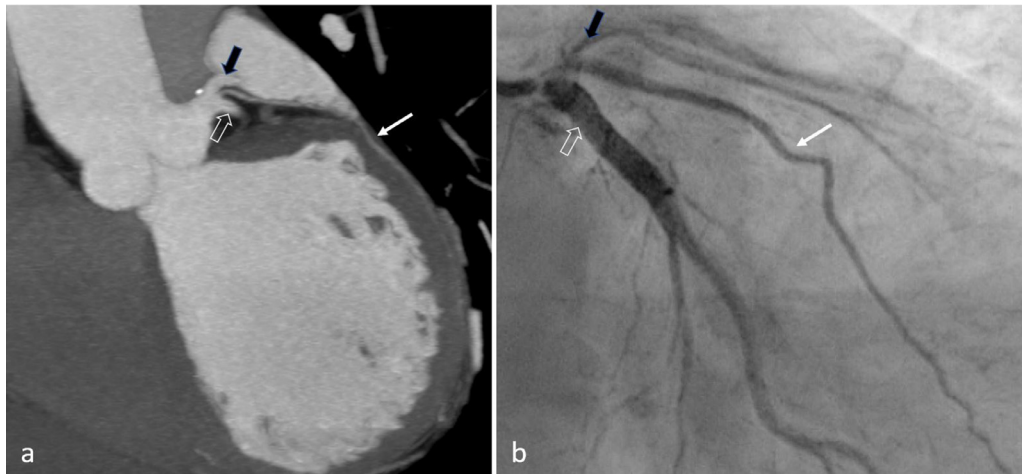
history of diabetes or smoking and no family history of stroke or heart attack. Physical examination, electrocardiogram, blood tests, and echocardiography showed no abnormality. Treadmill exercise test was inconclusive. Patient was referred for CT coronary angiogram (CTCA) to exclude atherosclerotic disease. The CTCA showed a soft plaque in the proximal RCA causing mild stenosis and myocardial bridging involving multiple vessels (OM1, ramus intermedius, LAD). Patient also underwent cardiac catheterization and coronary angiography, which were normal (Figs. 1–3). Myocardial bridging was not reported in coronary catheterization angiography. Patient was put into medications (bisoprolol 1 × 5 mg, simvastatin 1 × 20 mg, aspirin 1 × 80 mg) and her symptoms were well-controlled.

## Discussion

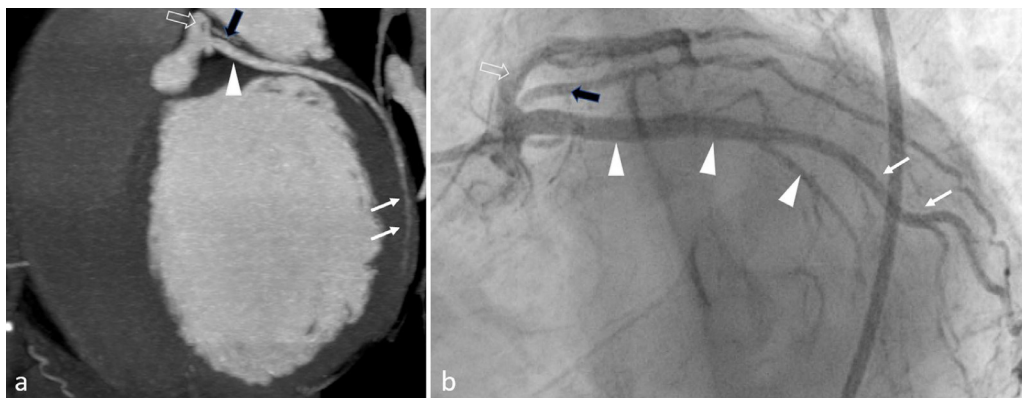
The gold standard to diagnose myocardial bridging is coronary catheter angiography; “milking effect” and “step down - step up” phenomena are pathognomonic findings. However, it is invasive and can be difficult to interpret, since myocardial bridging can have different appearance in systolic and diastolic phase. Additionally, only deep myocardial bridging is clearly apparent on angiography, and conventional angiography is commonly recognized as underestimating the prevalence of myocardial bridging. Therefore, an additional imaging modal-

ity can be used. CTCA is non-invasive and can clearly depict intramuscular course of a coronary artery [1–3]. In this case, the patient had a relatively superficial myocardial bridging and no significant systolic compression, therefore it was not detected during conventional angiography. This case shows the importance of using CTCA for evaluating coronary artery anatomy.

Myocardial bridging is not always symptomatic, but when it is, symptoms usually appear in younger age [3]. It is still unclear how myocardial bridging can cause symptoms. Current literature suggests that it is most likely due to the narrowing of myocardial bridging during systolic contraction. Additionally, the presence of atherosclerosis and stenosis proximal to myocardial bridging will aggravate the ischemia [1]. Our patient had a unique presentation of myocardial bridging due to her older age and no apparent atherosclerotic plaque in the tunneled arteries. The LAD narrowing at the level of the myocardial bridging during systole was less than 50% (Fig. 1), and cannot explain the patient’s symptoms. There was no significant plaque seen in the tunneled arteries, but based on patient’s age and history of hypertension, we can assume that atherosclerosis was most likely present in the coronary vessels. In our opinion, her unique presentation may be due to non-significant narrowing of myocardial bridging, which can be asymptomatic when she was younger. Nevertheless, as her age advanced and her coronary arteries become atherosclerotic, the effect was aggravated and she became symptomatic.



**Fig. 2 – (A) CTCA showing LAD (black arrow), left circumflex artery (empty arrow), and tunneled segment in ramus intermedius (white arrow); (B) corresponding conventional angiography of left main coronary artery showing LAD (black arrow), left circumflex artery (empty arrow), and ramus intermedius with slightly apparent “step down-step up” appearance (white arrow).**



**Fig. 3 – (A) CTCA showing LAD (empty arrow), ramus intermedius (black arrow), left circumflex (arrow-head), and tunneled segment in OM1 branch (white arrows); (B) corresponding conventional angiography of left main coronary artery showing LAD (empty arrow), ramus intermedius (black arrow), left circumflex artery (arrow-head), and OM1 branch with slightly apparent “step down-step up” appearance (white arrow).**

However, it still cannot fully explain her symptoms, since coronary blood flow occurred mostly during diastole, and theoretically, systolic narrowing alone cannot be sufficient to cause ischemia. As explained in previous studies, myocardial bridging is a dynamic stenosis, and there is much more to its evaluation beyond the morphologic characteristics. Length and/or depth of tunneled segment, degree of systolic dysfunction, and local coronary endothelial dysfunction are several factors related to myocardial ischemia and its associated symptoms in myocardial bridging [1,2]. Further studies are needed to evaluate the pathophysiology of myocardial ischemia in myocardial bridging, and how imaging can help to detect which type of myocardial bridging would cause the ischemia.

Myocardial bridging involving coronary arteries other than LAD is less common. Previous study in Chinese population showed that myocardial bridging mostly affected LAD (60.4%), while only 15% occurred in obtuse marginal branches, and none in ramus intermediate; additionally, only 12.7% involved multiple coronary arteries [1]. Kumar, et al [4] previously reported a case of myocardial bridging in 34-year-old Indian male, involving left main, LAD, left circumflex, and proximal major obtuse marginal branch. Kiris, et al [5] reported myocardial bridging involving the same combination as our patient, but in younger (46-year-old) Turkish male. This is the second reported case of myocardial bridging involving LAD, ramus intermedius, and OM1. For elderly patients, to our knowledge, this is the first reported case involving such combination. This

case also highlighted the important role of CTCA in evaluating coronary artery anatomy.

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### Patients consent

Written informed consent was obtained from the patient of this case report.

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