

Left main coronary artery systolic compression by a dilated pulmonary artery: intravascular ultrasound assessment of the milking phenomenon

Maude Sestier¹, Ali Hillani¹, Marouane Boukhris¹, Anne Shu-Lei Chin², Vu Hung Quan¹

¹ Division of Cardiology, Centre Hospitalier de l'Université de Montréal, Quebec, Canada

² Division of Radiology, Centre Hospitalier de l'Université de Montréal, Quebec, Canada

A 57-year-old man known for severe idiopathic pulmonary fibrosis and hypertension was referred to the hospital for lung transplant work-up. He never smoked and had no cardiovascular risk factors except controlled hypertension. No angina was reported in medical history.

Electrocardiography showed sinus rhythm with right atrial enlargement. Transthoracic echocardiography revealed severe pulmonary hypertension (systolic artery pressure, 66 mm Hg), dilated pulmonary artery (PA) trunk and normal right ventricular function. The left ejection fraction was preserved and there were no regional wall motion abnormalities. Cardiac multidetector computed tomography (MDCT) showed a focal ostial left main coronary artery (LMCA) stenosis of 60%, with multiple nonsignificant calcified plaques in the proximal and mid-segments of the 3 coronary arteries. The PA trunk was dilated (diameter, 39 mm) (FIGURE 1A). Importantly, the assessment of coronary lesions was biased by poor-quality image acquired during diastole; hence, images were acquired in systole.

Coronary angiography was then indicated, revealing a sharp angle of the LMCA origin from the aorta with a milking phenomenon involving it during systole (FIGURE 1B–1D; Supplementary material, *Video S1*). Nonsignificant atherosclerotic plaques were observed in the dilated proximal segment of the left anterior descending artery and right coronary artery. The LMCA was then assessed by intravascular ultrasound (IVUS), which confirmed the absence of significant luminal narrowing. Dynamic IVUS images, obtained while the probe was maintained in a static position in the LMCA, allowed a direct

visualization of the milking phenomenon during systole (FIGURE 1E and 1F; Supplementary material, *Video S2*). This milking phenomenon corresponded to ostial and proximal LMCA systolic compression by the dilated PA trunk resulting from pulmonary hypertension. Since the minimal lumen area in systole was 16.2 mm², no revascularization was indicated. The patient proceeded to undergo a transplant without further delay. The short-term outcome was good.

Left main coronary artery compression syndrome is a rare condition characterized by LMCA compression in-between the aorta and an enlarged main PA trunk, which could require revascularization.^{1,2} It is more often associated with congenital heart diseases, particularly atrial septal defect, ventricular septal defect, patent ductus arteriosus, or tetralogy of Fallot.^{3,4} The likelihood of significant myocardial ischemia depends both on the degree of LMCA compression and its angle with the left sinus of Valsalva (particularly if less than 30°).³ Galiè et al⁵ demonstrated that a PA diameter of at least 40 mm represented the best predictor of LMCA stenosis of 50% or greater. The ratio of the main PA to aorta of 2 or higher is also considered to be a risk factor for LMCA compression.⁴

Cardiac MDCT generally provides an accurate noninvasive dynamic assessment of LMCA compression throughout systole and diastole. In the case of a technical bias or need for invasive evaluation, IVUS might be a useful tool for direct visualization of this phenomenon as well as in the decision-making process for revascularization.

Correspondence to:

Vu Hung Quan, MD, Division of Cardiology, Centre Hospitalier de l'Université de Montréal, 1000 rue St-Denis, Montreal, Quebec, Canada, H2X 0C1, phone: +1514 890 8000, email: alpinist@gmail.com
Received: September 29, 2019.

Revision accepted:

January 17, 2020.

Published online:

January 21, 2020.

Kardiologia Polska 2020; 78 (4): 338-339
doi:10.33963/KP.15149

Copyright by the Author(s), 2020

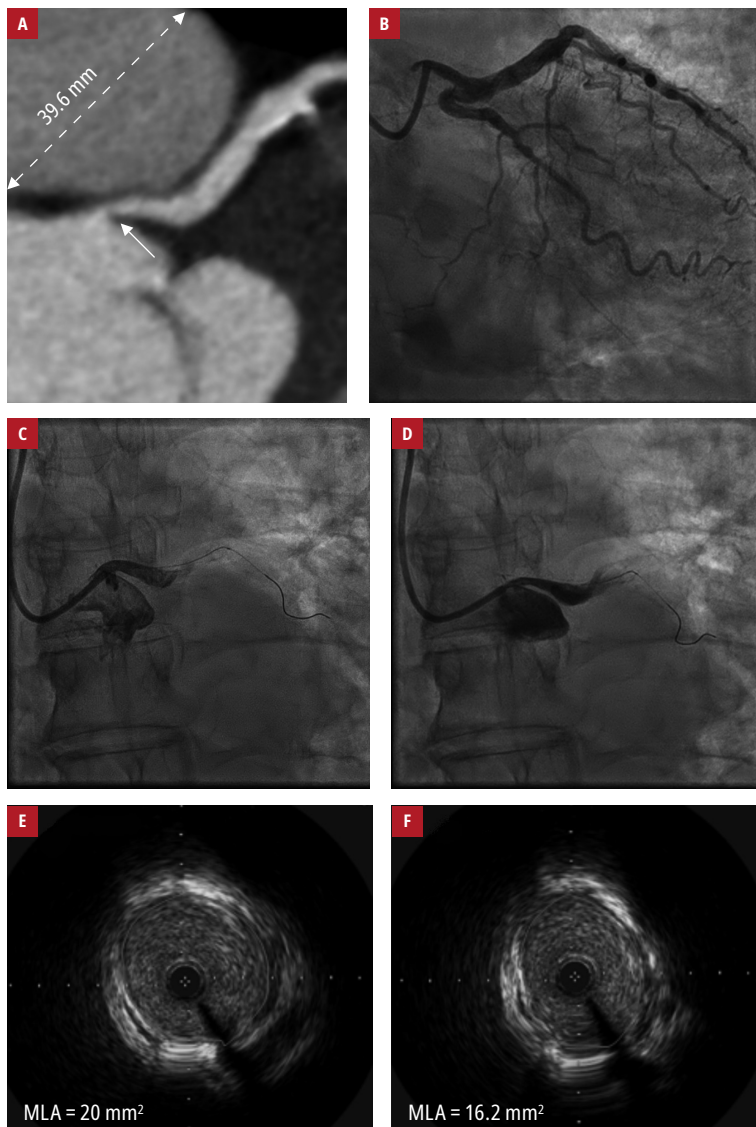


FIGURE 1 **A** – multidetector computed tomography showing ostial and focal left main coronary artery (LMCA) stenosis (60%; arrow) and dilated pulmonary artery trunk; **B** – left coronary angiogram; **C, D** – diastolic and systolic filling of the LMCA, respectively; **E, F** – intravascular ultrasound images of the ostial LMCA during diastole and systole, respectively

Abbreviations: MLA, minimal lumen area

SUPPLEMENTARY MATERIAL

Supplementary material is available at www.mp.pl/kardiologiapolska.

ARTICLE INFORMATION

CONFLICT OF INTEREST None declared.

OPEN ACCESS This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License (CC BY-NC-ND 4.0), allowing third parties to download articles and share them with others, provided the original work is properly cited, not changed in any way, distributed under the same license, and used for non-commercial purposes only. For commercial use, please contact the journal office at kardiologiapolska@ptkardio.pl.

HOW TO CITE Sestier M, Hillani A, Boukhris M, et al. Left main coronary artery systolic compression by a dilated pulmonary artery: intravascular ultrasound assessment of the milking phenomenon. *Kardiol Pol.* 2020; 78: 338-339. doi:10.33963/KP.15149

REFERENCES

- 1 Kwiatkowska J, Herrador Rey A, Meyer-Szary J, et al. Long-term outcome after surgical repair of anomalous origin of the left coronary artery from the pulmonary artery: 24 years of experience. *Kardiol Pol.* 2019; 77: 716-718.
- 2 Majewski J, Shelton R, Varma M, Davis G. Anomalous origin of the right coronary artery from the left Valsalva sinus in a patient presenting with syncope, ventricular tachycardia, and electrocardiographic early repolarization pattern. *Kardiol Pol.* 2019; 77: 883-885.
- 3 Doyen D, Mocerri P, Moschietto S, et al. Left main coronary artery compression associated with primary pulmonary hypertension. *J Am Coll Cardiol.* 2012; 60: 559.
- 4 Dodd JD, Maree A, Palacios I, et al. Images in cardiovascular medicine. Left main coronary artery compression syndrome: evaluation with 64-slice cardiac multidetector computed tomography. *Circulation.* 2007; 115: 7-8.
- 5 Galie N, Saia F, Palazzini M, et al. Left main coronary artery compression in patients with pulmonary arterial hypertension and angina. *J Am Coll Cardiol.* 2017; 69: 2808-2817.