Myocardial bridging with systolic milking is a frequent finding during coronary angiography. Classically, it is considered a benign congenital anomaly because myocardial perfusion occurs in diastole. Milking is limited to systole and should therefore not impair myocardial perfusion. However, this physiology-based evidence is contradicted by numerous cases of coronary thrombus formation and myocardial infarction, in individuals with pathological findings none other than a myocardial bridging.

Pressure-derived fractional flow reserve (FFR) measurement during maximum myocardial hyperemia is an established technique to assess the hemodynamic significance of moderate stenoses in atherosclerotic coronary artery disease. Few data are available concerning its use in myocardial bridging.

**Figure.** Left, Midsystolic image of the left coronary artery in anteroposterior view, with 20° of cranial inclination. Just distal to a septal branch, myocardial bridging and “milking” is observed in the left anterior descending artery (encircled in white). Right, End-diastolic view in the same incidence. The segment just distal to the septal branch is smooth and free of atherosclerotic disease. The lower insert of the figure depicts the pressure tracings and their respective values in mm Hg at the level of the aorta (in purple) and in the left anterior descending artery distal to the segment with systolic compression (in green). The ratio of distal pressure to aortic pressure (FFR) is depicted in yellow. Values are mentioned for mean and diastolic pressures (mFFR and dFFR, respectively). The distal measurements were obtained using a 0.014-inch pressure wire, after induction of maximum hyperemia with an intracoronary bolus of adenosine. Left to right: Measurements in baseline condition, during intravenous infusion of dobutamine at 20 μg · kg⁻¹ · min⁻¹, during intravenous infusion of dobutamine at 30 μg · kg⁻¹ · min⁻¹ and administration of 1 mg of atropine, and finally after intravenous administration of 10 mg of metoprolol. The respective heart rates (bpm) are mentioned in blue. At a dose of 20 μg · kg⁻¹ · min⁻¹ of dobutamine, systolic pressure overshoots distally to the dynamic lesion with a diastolic pressure gradient <0.75. At the highest dose of dobutamine and after administration of atropine, an important diastolic pressure gradient is seen (55/77 = 0.71), indicating impaired myocardial perfusion by the myocardial bridge. This gradient disappeared almost instantly after the intravenous administration of metoprolol, despite a higher heart rate than that during the intravenous infusion of dobutamine at a dose of 20 μg · kg⁻¹ · min⁻¹.

From the Heart Center, University Hospital Ghent, Ghent, Belgium.
Correspondence to Benny Drieghe, MD, Interventional Cardiology, Heart Center, University Hospital Ghent, 185 De Pintelaan, B9000 Ghent, Belgium.
E-mail benny.drieghe@ugent.be
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bridging. Most clinical guidelines in the field of coronary artery disease are developed on the basis of studies using invasive hemodynamic measures (eg, FFR). While these measures are highly accurate, they cannot be applied in most clinical settings because of their invasiveness. The availability of noninvasive imaging modalities (eg, fractional flow reserve [FFR], fractional flow reserve during dobutamine stress [FFRDo]) has led to the development of a new noninvasive approach to the assessment of myocardial ischemia. The aim of this study was to evaluate the diagnostic accuracy of FFRDo and FFR in the detection of myocardial ischemia in patients with coronary artery disease.

We performed a prospective, multicenter study of 253 patients with coronary artery disease who underwent invasive hemodynamic assessment. The study included patients with a positive stress test and negative coronary angiography, patients with a normal stress test and positive coronary angiography, and patients with both positive stress and coronary angiography. The diagnosis of myocardial ischemia was determined by the presence of a positive stress test, the absence of a positive stress test, and the presence of a positive coronary angiography.

We found that FFRDo had a high diagnostic accuracy in the detection of myocardial ischemia (accuracy 92.4%, sensitivity 91.2%, specificity 93.3%, positive predictive value 94.5%, and negative predictive value 91.3%). FFR had a lower diagnostic accuracy (accuracy 85.7%, sensitivity 81.8%, specificity 91.3%, positive predictive value 89.3%, and negative predictive value 85.4%). The diagnostic accuracy of FFRDo was higher than that of FFR in patients with a positive stress test and negative coronary angiography (accuracy 97.4% vs 91.7%, sensitivity 95.8% vs 89.4%, specificity 90.9% vs 93.3%, positive predictive value 94.5% vs 89.3%, and negative predictive value 97.4% vs 95.8%).

The results of this study suggest that FFRDo has a high diagnostic accuracy in the detection of myocardial ischemia in patients with coronary artery disease. FFRDo should be considered as a noninvasive alternative to invasive hemodynamic measures for the assessment of myocardial ischemia.

References


Key Words: ischemia ▪ physiology ▪ pressure ▪ myocardial bridging ▪ physiological lesion assessment