

## Letters

### A Correct FFR Trace Interpretation Is Important for a Clinical Decision



We read with great interest the case report in by Bouaouina et al,<sup>1</sup> who showed the successful occlusion of a coronary-to-pulmonary artery fistula after measuring functional significance by fractional flow reserve (FFR), and we congratulate them for the outcome.

As Bouaouina et al<sup>1</sup> mentioned, coronary-to-pulmonary artery fistulas are infrequent and usually asymptomatic. However, an ischemia-inducing fistula may need surgical or percutaneous closure to treat symptoms.<sup>2</sup>

Bouaouina et al<sup>1</sup> decided to perform FFR measurement under maximal hyperemia to unmask a steal phenomenon and eventually to occlude the fistula. They used an established cutoff threshold of  $FFR \leq 0.8$ , which was exactly the result they reported. Although we agree with the proposed approach and cutoff threshold, we would like to caution about the proper interpretation of the FFR trace.<sup>3</sup> FFR results from the relationship between the guide catheter mean pressure and the pressure wire mean pressure at the distal coronary artery. FFR measurement is performed on a beat-to-beat basis, with the lowest value provided by the FFR software. In Figure 1 of Bouaouina et al,<sup>1</sup> it is represented as the purple line in the screen, with white horizontal lines representing the FFR scale from 0 to 1 (0.1 FFR per line). However, a closer look at the FFR tracing (Figure 1) shows that the value of  $FFR \leq 0.8$  provided may have been attributed to an artifact. In fact, the lowest FFR value shown in Figure 1 Bouaouina et al<sup>1</sup> may be the result of an aberrant configuration of the pressure wave (second beat from left to right) that does not represent a normal pressure waveform. This is of the utmost importance for FFR interpretation,<sup>3,4</sup> and it is usually not recognized by the FFR software. Many factors can alter the pressure form, including some involuntary manipulation of the guide catheter

during measurement.<sup>5</sup> Moreover, the purple line does not contact the 0.8 white line in the FFR, and thus the results provided by Bouaouina et al<sup>1</sup> may not show any hemodynamically significant FFR value. Finally, most of the FFR values provided in Figure 1 before fistula occlusion have a value of 0.9 or above.

In summary, we would like to caution about a proper interpretation of an FFR measurement and advise using meticulous technique to improve outcomes.<sup>6</sup>

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<https://doi.org/10.1016/j.jaccas.2022.05.039>

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The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the [Author Center](#).

#### REFERENCES

1. Saighi Bouaouina M, Perier M, Kechabtia K, et al. Transcatheter occlusion of coronary-pulmonary fistula with a liquid embolic agent after evaluation by FFR. *J Am Coll Cardiol Case Rep.* 2022;4(7):391-394.
2. Warnes CA, Williams RG, Bashore TM, et al. ACC/AHA 2008 guidelines for the management of adults with congenital heart disease: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Develop Guidelines on the Management of Adults With Congenital Heart Disease). Developed in Collaboration With the American Society of Echocardiography, Heart Rhythm Society, International Society for Adult Congenital Heart Disease, Society for Cardiovascular Angiography and Interventions, and Society of Thoracic Surgeons. *J Am Coll Cardiol.* 2008;52(23):e143-e263.
3. Matsumura M, Johnson NP, Fearon WF, et al. Accuracy of fractional flow reserve measurements in clinical practice: observations from a core laboratory analysis. *J Am Coll Cardiol Interv.* 2017;10(14):1392-1401.
4. Fearon WF, Chambers JW, Seto AH, et al. ACIST-FFR study (Assessment of Catheter-Based Interrogation and Standard Techniques for Fractional Flow Reserve Measurement). *Circ Cardiovasc Interv.* 2017;10(12):e005905.
5. Johnson NP, Johnson DT, Kirkeeide RL, et al. Repeatability of fractional flow reserve despite variations in systemic and coronary hemodynamics. *J Am Coll Cardiol Interv.* 2015;8(8):1018-1027.
6. Myung LJ, Hun LS, Doosup S, et al. Physiology-based revascularization. *JACC Asia.* 2021;1(1):14-36.