

Letter to the Editor

A Digital Tool for Incorporating Right Atrial Pressure into Fractional Flow Reserve Determination

TO THE EDITOR

Fractional flow reserve (FFR) determination is commonly performed in cardiac catheterization laboratories to assess the hemodynamic significance of coronary artery stenosis. FFR is a ratio of the current maximum achievable flow rate to the maximum achievable rate in the absence of a coronary artery stenosis, making it an assessment of the functionality of a coronary artery in the presence of a stenosis [1]. In practice, the myocardial FFR is the maximum myocardial flow achievable in the presence of an epicardial stenosis in relation to the theoretical maximum flow without the obstruction and is calculated by simultaneous measurement of mean aortic (Pa), right atrial (Pra), and distal coronary pressure (Pd) under conditions of maximal hyperemia [$FFR = (Pd - Pra)/(Pa - Pra)$]. Right atrial pressure is typically ignored in traditional FFR calculations because its impact is assumed to be negligible, but ignoring it can significantly misclassify the hemodynamic significance of a lesion, especially in patients with high right atrial pressures and low systemic pressures.

While it is probably unrealistic and unnecessary to correct the FFR for right atrial pressure in every patient, it may be of clinical significance in specific scenarios such as patients with pulmonary hypertension and right heart failure as well as those on hemodialysis [2–4].

In practice, clinicians rely on automatically calculated FFR values provided by the commercially available systems that do not allow for the incorporation of the right atrial pressure in the calculation. We have developed a simple free mobile application, available on the Apple App Store (<https://itunes.apple.com/us/app/corrected-ffr/id1084880562?mt=8>) and Android Google Play Store (https://play.google.com/store/apps/details?id=appinventor.ai_snislam64.CorrectedFFR2), that allows the user to input the machine calculated FFR at peak hyperemia, the mean aortic pressure at peak hyperemia, and

the right atrial pressure (ideally also at obtained at the time of peak hyperemia) and have found this to result in clinically impactful change in FFR in a subset of scenarios usually characterized by high right heart filling pressures.

A recent study has questioned the need for incorporating right atrial pressure assessment into routine clinical assessment of FFR but it is important to recognize that the majority of patients in that study had low right atrial pressures and the impact of routine ascertainment of right atrial pressure becomes important only when right atrial pressure is high and the FFR is in the borderline range [5]. Thus in a patient with a relatively “high” FFR but typical symptoms, a corrected FFR might yield a value that would be considered pathological but conversely a low FFR will not become clinically “non-significant” after incorporation of the RA pressure. A selective approach incorporating RA pressure derived correction of the FFR in the setting of borderline FFR values in the appropriate clinical settings might help guide appropriate clinical care.

Sabir Meah

Skyline High School,
Ann Arbor, Michigan

Hitinder S Gurm, MD, FASCI*

Division of Cardiovascular Medicine,
Department of Medicine,
University of Michigan,
Ann Arbor, Michigan

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*Correspondence to: Hitinder S. Gurm, MD, 2A 394, 1500 East Medical Ctr Drive,, University of Michigan Cardiovascular Center, Ann Arbor, MI 48109-5853, hgurm@med.umich.edu

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