

EDITORIAL COMMENT

Treatment Strategy Change After Routine Pressure Wire Assessment for Coronary Artery Disease

What You See Is “NOT” What You Get*

Bon-Kwon Koo, MD, PhD



The presence of myocardial ischemia is the most important prognosticator in patients with coronary artery disease, and the revascularization of coronary artery stenosis should be performed on the basis of the objective evidence of ischemia (1). It is well known that anatomic assessment has several limitations in defining the ischemia-causing stenosis, and subsequent invasive physiological assessment in patients with ambiguous or intermediate stenosis can change the treatment strategy (Figure 1). Fractional flow reserve (FFR) and instantaneous wave-free ratio (iFR) are 2 commonly used pressure-derived invasive physiological indexes. FFR-guided percutaneous coronary intervention (PCI) was proved to be better than angiography-guided PCI or medical treatment (2,3). Two recent, large randomized trials showed that the iFR-guided revascularization strategy was not inferior to the FFR-guided strategy (4,5). However, the penetration rate of pressure wire assessment in clinical practice is still low, despite the vast amount of data supporting its benefit for patients with coronary artery disease.

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This leads to the question, what *would* happen if pressure wire assessments *were* routinely adopted in cardiac catheterization laboratories? In this issue of

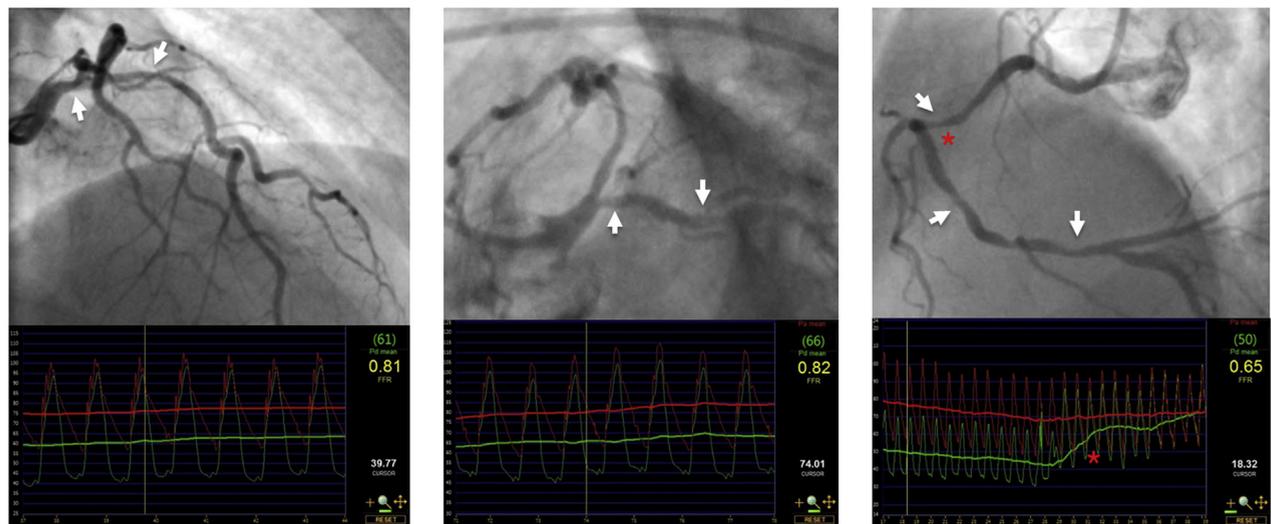
JACC: Cardiovascular Interventions, Van Belle et al. (6) tried to answer this interesting question. This multicenter prospective study assessed the impact of routine pressure wire assessment in 484 patients with multivessel disease. The investigators were asked to define their management strategy based on angiographic and clinical information, including results of noninvasive tests. The final treatment strategy was then selected after pressure wire assessment (FFR and/or iFR). They report findings that treatment strategy was changed in 30.0% of vessels and 26.9% of patients after pressure wire assessment. Although this result was similar to that of previous studies (Table 1), there are several important factors to consider. First, this study proved the influence of routine pressure wire assessment on treatment strategy in patients with multivessel disease. Second, this study showed that the high rate of strategy change was not influenced by the availability or results of noninvasive tests. Third, the interrogation of more vessels was associated with the increased rate of treatment strategy change. When pressure wire assessment was performed in 1 vessel, 2 vessels, or 3 vessels, patient management changed incrementally (19.7%, 30.7%, and 33.3%, respectively). Although the investigators tried to assess the influence of iFR implementation, only 12 patients (2.5%) were evaluated with iFR as the main method of physiological interrogation, thus needing further investigation.

When combining 5 studies investigating treatment change after pressure wire assessment (6–10), the rate of change in the initial decision was 38.2% (1,091 of 2,853 patients). These results were consistent for patients in stable condition, acute coronary syndrome, and multivessel disease, regardless of the

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From the Department of Internal Medicine and Cardiovascular Center, Seoul National University Hospital, Seoul, Korea; and the Institute on Aging, Seoul National University, Seoul, Korea. Dr. Bon-Kwon Koo has received institutional research grants from Abbott and Philips-Volcano.

FIGURE 1 FFR-Guided Coronary Revascularization Strategy in a Patient With Multiple Lesions and Multivessel Disease



The patient presented with stable angina and invasive angiography revealed distal left main stenosis and 3-vessel disease (**arrows**). The fractional flow reserve (FFR) of the left anterior descending coronary artery (**left**) and left circumflex coronary artery (**middle**) were 0.81 and 0.82, respectively. FFR of the right coronary artery was 0.65, and the pullback pressure tracing under hyperemia revealed the significant step-up at mid-segment (**asterisk**). After 1 drug-eluting stent implantation, FFR became 0.81. In summary, despite angiographic 3-vessel disease and left main disease, the patient's ischemia was relieved by a single drug-eluting stent.

criteria for invasive physiological assessment (**Table 1**). Although these studies could not provide a direct answer to the question regarding long-term clinical benefits of this treatment change, information on clinical outcomes can be inferred from other studies. Ahn et al. (11) demonstrated that routine incorporation of FFR in real practice improved PCI outcomes in patients with left main disease or 3-vessel disease. The outcomes of PCI were comparable to those of coronary artery bypass graft surgery after routine use of FFR. In the SYNTAX II

(A Trial to Evaluate a New Strategy in the Functional Assessment of 3-Vessel Disease Using the SYNTAX II Score in Patients Treated With PCI) study (12), wherein patients with 3-vessel disease were assessed with an iFR/FFR hybrid approach and treated with intravascular ultrasound-guided, thin-strut drug-eluting stent implantation, clinical outcomes were better compared with those from the original SYNTAX I trial. In addition, several studies have demonstrated the prognostic implications of routine 3-vessel FFR measurement,

TABLE 1 Summary of Previous Studies

Trial (Year) (Ref. #)	Subjects	PW Assessment	Change in Management Strategy
DEFINE REAL (2018) (6)	Multivessel disease	FFR and/or iFR Intermediate lesions	26.9% (130 of 484 patients)
POST-IT (2016) (7)	FFR in ≥ 1 vessel	FFR Operator's discretion	44.2% (406 of 918 patients)
FAMOUS-NSTEMI (2015) (8)	NSTEMI	FFR All lesions with $\geq 30\%$ stenosis	21.6% (38 of 176 patients)
R3F (2014) (9)	Ambiguous stenosis +	FFR Angiographically 35% to 65% stenosis	43.2% (464 of 1,075 patients)
RIPCARD (2014) (10)	Stable chest pain	FFR All coronary arteries ≥ 2.25 mm	26.5% (53 of 200 patients)

FFR = fractional flow reserve; iFR = instantaneous wave free ratio; NSTEMI = non-ST-segment elevation myocardial infarction; PW = pressure wire.

comprehensive anatomic and physiological assessment, and microvascular assessment using a pressure wire (13-15).

Taken together, these data clearly demonstrate the clinical benefits derived from pressure wire assessments, underscoring that the pressure wire *should* be used routinely in the process of disease assessment and treatment strategy selection for patients with coronary artery disease. The challenge, then, is how

to fill the gap between the ideal and the real, and to incorporate this valuable clinical asset for the patients we treat every day.

ADDRESS FOR CORRESPONDENCE: Dr. Bon-Kwon Koo, Department of Internal Medicine and Cardiovascular Center, Seoul National University Hospital, 101 Daehang-ro, Chongno-gu, Seoul, 110-744, Korea. E-mail: bkkoo@snu.ac.kr.

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