

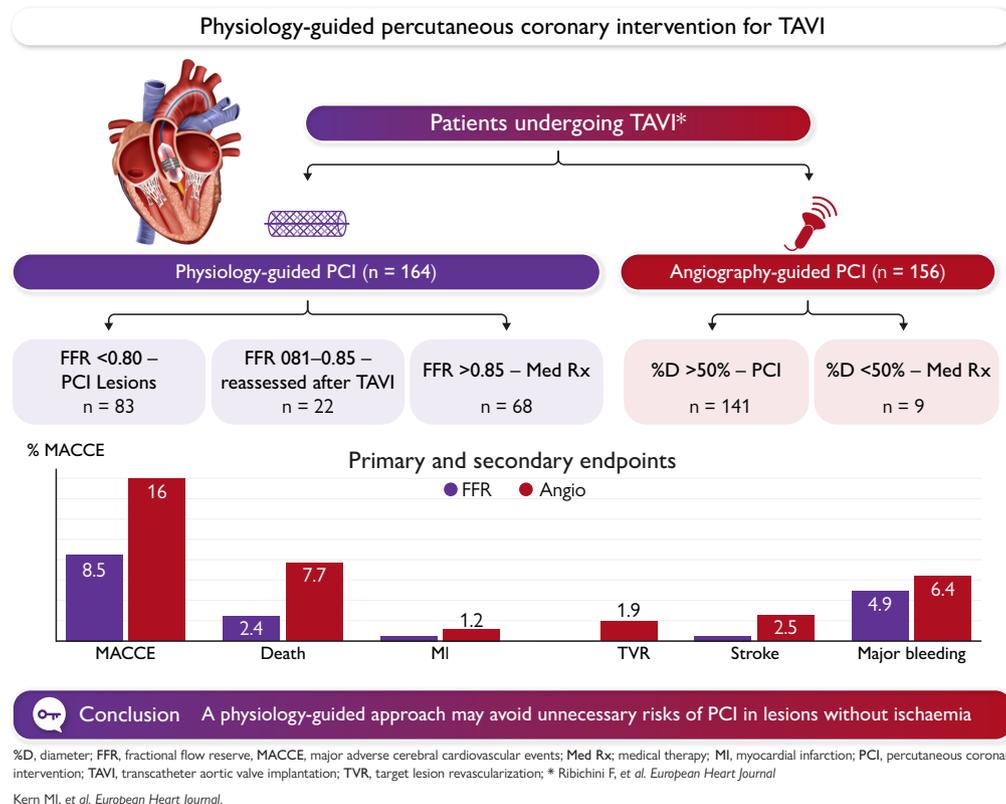
Fractional flow reserve-guided percutaneous coronary intervention for transcatheter aortic valve implantation: a FAITAVI accompli for better outcomes?

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This editorial refers to 'Physiology vs angiography-guided percutaneous coronary intervention in transcatheter aortic valve implantation: the FAITAVI trial', by F.L. Ribichini et al., <https://doi.org/10.1093/eurheartj/ehaf974>.

Graphical Abstract



The opinions expressed in this article are not necessarily those of the Editors of the *European Heart Journal* or of the European Society of Cardiology.

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From its inception, fractional flow reserve (FFR) was designed to provide interventionalists with more information on which to base their decision to revascularize coronary stenoses, especially for those with angiographic ambiguity, i.e. intermediate severity narrowings. FFR has stood the test of time, with most clinical studies demonstrating the value of FFR-guided percutaneous coronary intervention (PCI) over angiographically guided PCI.^{1,2}

Because of the dramatic haemodynamic changes and unknown variables impacting coronary flow in transcatheter aortic valve implantation (TAVI) patients, there has been uncertainty about the value of FFR.³ The near-ubiquitous association of coronary artery disease (CAD) in elderly patients with degenerative aortic stenosis presents operators with a dilemma regarding how best to approach revascularization. Some advocate for stenting all angiographically significant narrowings first, followed by TAVI. Others perform TAVI and then reassess the clinical need for coronary revascularization afterwards. Patients with multivessel disease may require coronary artery bypass surgery coupled with concomitant surgical valve replacement. These scenarios face the same challenges of relying only on angiography to treat CAD without a complete knowledge of which lesions were associated with ischaemia and which were angiographic ischaemic mimics having apparent anatomic but not physiological significance. The original FAME studies and a host of other randomized and observational large FFR trials⁴ repeatedly supported physiological guidance over angiographic guidance for revascularization.

However, in patients with aortic stenosis, some investigators noted differences in translesional haemodynamic significance when comparing FFR and non-hyperaemic pressure ratios, most notably the full cycle resting ratio (FRFR).³ FFR may underestimate a lesion's ischaemic potential due to microvascular dysfunction before and after TAVI, and hence a negative FFR might carry increased risk of events during follow-up. Other investigators found this premise to be false and that FFR did have important value. Currently, there is no reason to think physiological guidance should not also apply to TAVI patients with CAD.

In this issue of the *European Heart Journal*, Ribichini *et al.*⁵ addressed this question, randomizing 320 patients from 15 Italian centres scheduled for TAVI, all having at least one intermediately severe coronary lesion, to FFR-guided or angiographic-guided PCI. The primary endpoint was major adverse cardiovascular and cerebrovascular events (MACCE) at 12 months. The FFR-guided PCI was significantly better than angiographically guided PCI, with lower MACCE (8.5% vs 16%, hazard ratio [HR] = 0.5, $P = .047$). Importantly, the primary endpoint was driven by reduction in all-cause mortality while the other MACCE components were numerically lower, but not statistically different (see [Graphical Abstract](#)). The results of the FFR-guided PCI in TAVI patients were consistent with FFR-guided PCI in almost all studies comparing it with angiography for stable CAD (with a few notable exceptions). These data support a physiological approach to revascularization, which seems to be especially impactful in this frail elderly patient population. We compliment the investigators for demonstrating the value of an important approach to coronary revascularization in the TAVI patient.

This well-detailed study raises some interesting issues previously not addressed in comparative revascularization studies. For example, comparing the FFR and angiographic arms, PCI was performed in 60% of patients in the FFR group (40% not haemodynamically significant) but in 91% of the angiographic arm. Ribichini *et al.*⁵ note that the patients in the angiographic group who did not undergo PCI had a significantly lower TAVI success rate, (80% vs 95%, $P = .015$) and they experienced more peri-procedural complications, particularly bleeding (20% vs 2.1%, $P = .001$), suggesting that in the operator's clinical judgement PCI should be deferred when the valve procedure was suboptimal or complicated.

Noteworthy was the fact that unlike the FFR-guided group, in the angiographically guided group, there was no difference in MACCE between patients who did or did not undergo PCI (14% vs 26%, $P = .167$).

In the FFR group nearly all patients were provided with complete functional revascularization, something which remained unknown in the angiographic group since there is no way to determine which lesions might be physiologically significant while appearing only angiographically mild. We can speculate that visually significant lesions may have been deferred due to procedural risk or perceived marginal benefit in non-LAD territories leading to more incomplete revascularization.

While the event rate was twice as high in the angiography group, the only statistically significant subcomponent was mortality. Was this difference due solely to deferring stenting in the TAVI patient? The number of mortality events was quite small, with three cardiovascular deaths in angiography and none in the FFR group. Was this distribution related to revascularization or play of chance? The early procedural complication rate overall is lower in the FFR group, (1.8% vs 7.1%, $P = .02$) which may be explained by the fact that FFR-guided PCI limits harm through fewer stent implantations and associated bleeding or ischaemic complications, factors that may contribute to a survival benefit. Curiously, there was no significant difference in myocardial infarction or target vessel revascularization, a finding that may be due to a sample size underpowered to detect such individual component differences. The main contributors to MACCE were mortality, stroke, and major bleeding, highlighting the broader benefit of avoiding unnecessary PCI in elderly frail patients with known increased procedural risks.

The fate of borderline FFR after TAVR

Unique to this study was the examination of those lesions in which PCI was initially deferred if the FFR values fell within their 'grey zone' of 0.81–0.85. FFR of these lesions was repeated after TAVI. Among the 22 borderline lesions assessed post-TAVI, 7 became ischaemic with FFR < 0.80 and were treated. Of these lesions, 6 of the 7 involved LAD or left main lesions. Those lesions that remained unchanged post-TAVI were more evenly distributed among the three arterial territories. No myocardial infarction, ischaemia-driven revascularization, or cardiovascular deaths occurred in the borderline or deferred groups, confirming the safety of this approach.

The bottom line

As in stable CAD patients and now in TAVI patients, FFR-guided PCI demonstrated the benefit of having additional information to support decisions to stent or defer revascularization. This study also pointed out that PCI deferral based on FFR is safe and that post-TAVI assessment of borderline lesion haemodynamics is clinically appropriate and useful. Coupled with the recent NOTION-3 study supporting pre-TAVI PCI of FFR-positive or angiographically severe stenoses,⁶ FFR-guided PCI of intermediate stenoses should qualify as a fait accompli to be a new standard for TAVI.

Declarations

Disclosure of Interest

M.J.K. is a speaker for Abbott Vascular, Acist Medical Inc., Boston Scientific, Cathworks, Medtronic Inc., Hemonetics/Opens Inc., and

Philips Inc., and a consultant to Merit Medical, and Summacor. A.H.S. is a speaker for Getinge and GE Healthcare, and a consultant to Merit Medical, Frond Medical, and Summacor.

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