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LETTER TO THE EDITOR

Microcatheter-based measurements of fractional flow reserve – ready for prime time?

Any interventional cardiologist will tell you: 'never lose a hardly acquired distal position in a coronary artery.' Indeed, the basic technique in percutaneous coronary intervention (PCI) is to first advance a soft and atraumatic wire in the distal part of the coronary artery then carefully advance balloons and stents over the wire. Sometimes getting the coronary wire distal to the lesion is the hardest part of a procedure and requires several types of wires, microcatheters and specialised techniques. The wire is the lifeline, and if pulled back, you must start all over again, which increases the risk of dissections or rewiring behind stent struts.

In this regard fractional flow measurements (FFR) with a pressure wire contradicts some of the most basic principles of interventional cardiology. The wire is advanced, then pulled back to evaluate which segment of the artery is responsible for the pressure drop and check for drift. If there is drift, the measure is repeated. If the FFR indicates ischaemia, a PCI wire is re-advanced through the lesion to perform the angioplasty, then finally an FFR-wire is advanced yet again, this time through the stent to check the final result [1]. This back-and forth movement of the pressure wire means that in routine practice, many operators forego the recommended post-PCI FFR-measurements.

It is possible to reduce the number of steps and perform the PCI over the FFR-wire. However, the pressure wire has to contain a pressure sensor within a wire of 0.014-inch (0.36 mm) diameter. This comes with a trading cost regarding steerability and support. Contrary to what is claimed by manufacturers, pressure wires still have a way to go to match the properties of dedicated PCI wires. After seeing several pressure wires getting stuck in calcium and stent struts, caution is to use the pressure wire for PCI only in simple non-calcified lesions.

Microcatheter-based measurements have been available since 2015 [2], with the promise of addressing the limitations of traditional wire-based systems. It respects the traditional workflow of interventional cardiology – advance a wire once, then do everything over this wire and remove it at the end of the procedure. In theory, it has the potential to speed up the procedure and reduce irradiation time and allows for repeated measurements pre- and post-PCI without having to rewire the lesion. The potential drawback is that the device is bulkier. In smaller vessels this may create an iatrogenic stenosis resulting in lower FFR-measurements [3].

It is thus with interest that I read the 'Microcatheter-versus Wire-based Measurement of the Fractional Flow Reserve' by Dr. Boutaleb et al. which explores the real-life challenges and advantages of the respective microcatheter- and wire-based systems. Interestingly, they find similar performances in terms of pressure measurements, but with a clearly higher proportion of crossing failures with the microcatheter-based system (9.2% vs 0.7%). They also documented that coronary artery calcifications and tortuosity were associated with crossing failure.

From their findings, it seems that the microcatheter is not yet ready to supplant the more traditional pressure wire. However, in selected lesions the advantages of microcatheter-based FFR may outweigh its disadvantages. In the present study, lesion crossing was possible in >90% of cases with the microcatheter and the majority (58%) of measurements were done in the left anterior descending coronary artery. This large and often least tortuous coronary vessel, is responsible for >40% of total myocardial blood supply [4]. If both systems were available, the operator could use the microcatheter in larger arteries where stent optimisation and measurement of post-PCI FFR is desirable and use the wire-based system for measurements in smaller, tortuous, and calcified lesions.

As always in medicine, there is no one-size-fits-all, and larger prospective multicentre trials are needed to help the operator determine which techniques and equipment is best to treat a given patient.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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