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OCT and angiography-derived vFFR post-PCI in the assessment of anatomical and physiological optimization

ARTICLE INFO

The integration of physiological assessment and intracoronary imaging has become increasingly relevant in the quest for optimal post-PCI outcomes. While pressure-wire based FFR has long served as a reference for functional lesion assessment, the emergence of angiography-derived FFR modalities offer a promising, wire-free alternative [1,2]. However, the extent to which those technologies, like vFFR, can identify suboptimal anatomical results—such as small minimal lumen area (MLA), stent underexpansion, or residual edge disease—remains insufficiently defined. Can vFFR reliably approximate intravascular imaging findings and potentially streamline post-PCI decision-making?

The study by Ziedses des Plantes et al. provides a detailed investigation into this question [3]. In a prospective, multicenter analysis of 109 vessels in 100 patients with NSTE-ACS, the authors assessed the association between post-PCI vFFR and OCT-derived MLA, stent expansion, and residual disease. The primary finding—a statistically significant inverse correlation between post-PCI vFFR and vessel MLA—supports the physiological relevance of angiography-derived indices. Specifically, a vFFR ≤ 0.92 demonstrated good specificity (87.9 %) for predicting vessel MLA ≤ 4.5 mm^2, albeit with limited sensitivity (60.5 %). These findings suggest that vFFR may serve as a gatekeeper for further imaging, but not a substitute. Is the specificity of vFFR sufficient to guide selective OCT use in a resource-conscious environment?

The diagnostic utility of segmental vFFR gradients, a secondary focus of the study, offers further clinical implications. While in-stent vFFR gradients were poor discriminators of stent underexpansion (AUC 0.52), proximal vFFR gradients showed a promising ability to detect proximal residual disease (AUC 0.80, sensitivity 85.7 %). This observation aligns with prior studies suggesting that localized focal pressure drops may indicate edge-related pathology. However, the number of proximal residual lesions in this cohort was low (n = 7), which limits statistical power. Nevertheless, the consistency of these results with prior IVUS and FFR gradient studies raises the question: could proximal vFFR gradients become a non-invasive surrogate for identifying edge-related mechanical failure?

Perhaps most striking is the lack of association between post-PCI vFFR—both global and segmental—and OCT-defined stent underexpansion. Given the strong prognostic value of adequate stent expansion demonstrated in multiple OCT-based studies, this discrepancy underscores the limitations of pressure-based physiology in detecting mechanical factors that may not translate into significant pressure gradients. This finding reinforces the notion that angiography-derived indices, while functionally informative, do not capture the full spectrum of anatomical optimization parameters.

In summary, the FAST OCT study offers compelling evidence that post-PCI vFFR correlates with vessel MLA, and that proximal vFFR gradients may have diagnostic value for edge-related disease. However, the modest sensitivity for detecting small MLA and the inability to identify underexpansion highlight the need for a combined imaging-physiology strategy. Further large-scale studies are warranted to evaluate whether the integration of vFFR and OCT into post-PCI workflows can enhance procedural outcomes, reduce adverse events, and provide cost-effective guidance in diverse clinical populations.

Disclosures

CRediT authorship contribution statement

Ioannis Skalidis: Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing. **Livio D'Angelo:** Conceptualization, Validation, Writing – original draft, Writing – review & editing. **Thomas Hovasse:** Conceptualization, Formal analysis, Supervision, Validation, Writing – original draft, Writing – review & editing. **Philippe Garot:** Conceptualization, Supervision, Validation, Writing – original draft, Writing – review & editing. **Mariama Akodad:** Conceptualization, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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