Coronary Revascularisation in TAVR Candidates: The Evolving Evidence and Its Clinical Implications

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Abstract

Recent randomised trials now support physiology-guided revascularisation, particularly fractional flow reserve-guided percutaneous coronary intervention, as the preferred strategy for managing coronary artery disease in patients undergoing transcatheter aortic valve replacement. The authors review the evolving evidence from NOTION-3 and FAITAVI, examine the limitations of non-hyperaemic indices in severe aortic stenosis, and discuss the growing importance of coronary access planning and valve selection. This paradigm shifts practice from routine or deferred revascularisation towards individualised, evidence-based care.

Key Points

1. Physiology-guided revascularisation improves outcomes in transcatheter aortic valve replacement candidates with significant coronary artery disease and should be preferred over angiography-guided or routine conservative strategies.

2. Fractional flow reserve is preferred over instantaneous wave-free ratio for coronary assessment in severe aortic stenosis.

3. Valve selection and commissural alignment techniques are important to preserve future coronary access, especially in younger patients and patients with complex coronary disease.

FROM UNCERTAINTY TO CLARITY

The management of coronary artery disease (CAD) in patients undergoing transcatheter aortic valve replacement (TAVR) has been debated for years. With CAD prevalence ranging from 16–81% in this population, and approximately half having multivessel disease, the question of whether, when, and how to revascularise has direct implications for millions of patients worldwide. Practice patterns have varied widely across institutions, and they are often guided more by operator preference rather than data. The traditional approach of percutaneous coronary intervention (PCI) before TAVR, aimed to reduce ischaemic risk during the procedure and preserve future coronary access, has increasingly been questioned.

NOTION-3 in late 2024 and FAITAVI in 2025 were the first adequately powered randomised trials that informed medical decision-making.1,2 They supported physiology-guided revascularisation as the evidence-based approach for TAVR candidates with significant CAD.

LESSONS FROM RECENT TRIALS

ACTIVATION failed to demonstrate non-inferiority for PCI before TAVR and suggested that routine revascularisation offered no benefit.[3] However, the trial enrolled only 235 patients before stopping early due to futility. NOTION-3 was designed to address these limitations directly.[1] The trial randomised 455 patients with severe aortic stenosis (AS) and significant CAD (defined as fractional flow reserve [FFR] of 0.80 or lower, or diameter stenosis >90%) to either PCI or conservative management. Importantly, patients with left main disease were excluded, and approximately 60% had angina (Canadian Cardiovascular Society [CCS] Class I or higher). The median SYNTAX score was 9, which indicated that the population had relatively low anatomical complexity.

At a median follow-up of 2 years, the primary composite endpoint of all-cause mortality, myocardial infarction, or urgent revascularisation occurred in 26% of the PCI group versus 36% in the conservative group (hazard ratio [HR]: 0.71; 95% CI: 0.51–0.99; p=0.04).[1] This 29% relative risk reduction came primarily from reduction in myocardial infarction (8% versus 14%) and urgent revascularisation (2% versus 11%). Bleeding was higher in the PCI arm (28% versus 20%; HR: 1.51). Complete revascularisation was achieved in 89%, and 74% had staged PCI before TAVR.

FAITAVI, presented at the European Association for Percutaneous Cardiovascular Interventions (EuroPCR) 2025 congress, extended these findings and demonstrated superiority of FFR-guided versus angiography-guided PCI.[2] The trial enrolled 320 patients with intermediate CAD (stenosis >50%) undergoing TAVR at 15 Italian centres. FFR-guided revascularisation reduced 12-month major adverse cardiac and cerebrovascular events from 16.0% to 8.5% (HR: 0.52; 95% CI: 0.27–0.99). The benefit was driven by lower all-cause mortality (2.4% versus 7.7%) and ischaemia-driven target vessel revascularisation (0% versus 1.9%). There was no increase in bleeding, acute kidney injury, or vascular complications. FAITAVI excluded angiographically severe lesions (diameter stenosis >90%) and complemented rather than overlapped with NOTION-3. Together, these trials show that both severe and intermediate CAD benefit from physiology-guided assessment and treatment.

THE PHYSIOLOGY CONUNDRUM

NOTION-3 and FAITAVI establish the efficacy of physiology-guided revascularisation, yet they leave open the question of which physiological index should be preferred. The instantaneous wave-free ratio (iFR; Philips, Amsterdam, the Netherlands) has proven unreliable in severe AS.[4] Studies demonstrate that 66.6% of patients with severe stenosis have an iFR of 0.89 or lower compared with 31.8% without stenosis (p<0.001), yet iFR lacks prognostic value in this population (HR: 1.31; p=0.6). In contrast, FFR of 0.80 or lower retains prognostic significance (HR:

2.71; p=0.034). Furthermore, approximately 15% of lesions cross the 0.89 iFR threshold after TAVR, and iFR-FFR agreement improves from 65% to 79% post-valve.[4] The COMIC-AS study reported that 42.3% of lesions were FFR-negative (>0.80) but iFR-positive (<0.89) before TAVR. The discordance is substantial.

A 2024 meta-analysis clarifies the mechanism: immediately post-TAVR, FFR decreases significantly (mean change: −0.013) and non-hyperaemic pressure ratios remain stable.[5] At 6 months, FFR decreases further (mean change: −0.023) and non-hyperaemic ratios show a non-significant increase. The implication is that, using standard cut-offs, FFR may underestimate lesion severity pre-TAVR, and iFR may overestimate it. These changes are clinically relevant for borderline lesions. For clearly positive or negative values, the standard thresholds can generally be trusted. Some investigators have proposed adjusted thresholds of 0.82 for FFR and 0.87 for non-hyperaemic indices in severe AS, but this requires prospective validation.[5,6]

PLANNING FOR THE FUTURE: CORONARY ACCESS CONSIDERATIONS

As TAVR expands to younger, lower-risk patients, preserving coronary access becomes very important. Post-TAVR coronary events occur in approximately 10% of patients within 2 years, and Type 2 myocardial infarction is unusually predominant (approximately 35% of events).[6] When ST-elevation myocardial infarction does occur, outcomes are worse: door-to-balloon times are 33% longer, PCI failure rates quadruple (16% versus 4%), and technical challenges such as cannulation or lesion crossing failures happen in 6% and 5% of cases, respectively. Perhaps more concerning, 65% of post-TAVR patients with acute coronary syndrome never receive revascularisation, often because of technical limitations.

Valve design influences future coronary access. The RE-ACCESS study documented a 7.7% cannulation failure rate overall, but 22 of 23 failures involved Evolut™ (Medtronic, Dublin, Ireland) valves.[7] Self-expanding supra-annular devices contact the coronary ostia in nearly all cases compared with 40–50% for balloon-expandable SAPIEN 3 (Edwards Lifesciences, Irvine, California, USA) valves. The CAvEAT registry showed selective bilateral coronary access rates of 89% for SAPIEN 3/Ultra versus 45% for Evolut Pro/Pro+.[6] Implantation depth, commissural misalignment, and tall-frame design all predict access failure.[7,8] These differences should inform valve selection in patients with known CAD or high likelihood of future coronary events.

Commissural alignment techniques are important improvements in the procedure. The RE-ACCESS 2 study used systematic alignment protocols with the cusp-overlap view and hat marker-guided shaft rotation, reducing unsuccessful cannulation to 5.5% with self-expanding devices.[9] These patient-specific approaches try to minimise neo-commissure overlap with coronary ostia and should be considered standard in younger patients with significant CAD burden or those in whom future coronary intervention is anticipated.[8,10]

LOOKING AHEAD

The ongoing COMPLETE TAVR trial (N=4,000) is comparing staged complete revascularisation 1–45 days post-TAVR versus medical therapy. TAVI PCI (N=986) is addressing similar questions with different endpoints. These trials should clarify optimal timing (staged versus concomitant), completeness, and patient selection. Emerging technologies, including CT-derived FFR, may eventually enable non-invasive physiology assessment during TAVR, potentially reducing procedural burden and improving patient selection for revascularisation. Integrating computational modelling and advanced imaging into pre-procedural planning may also improve individualised decision-making.

CLINICAL IMPLICATIONS

Current evidence supports several principles that should guide practice. First, FFR-guided PCI for physiologically significant CAD improves outcomes in TAVR candidates and should be preferred over conservative management or angiography-guided intervention alone. Second, FFR rather than iFR should be used for physiologic assessment in severe AS, while recognising that borderline values may need post-TAVR reassessment when feasible. Third, valve selection and implantation technique should consider coronary access, especially in younger patients or those with complex CAD. Fourth, commissural alignment should be routine with self-expanding devices. Fifth, treatment decisions should remain individualised through heart team discussion, weighing anatomical complexity, symptoms, bleeding risk, and life expectancy.

The field has evolved from equipoise to evidence. Questions about optimal timing, completeness, and long-term outcomes remain, but the foundation for physiology-guided revascularisation in TAVR candidates is established. Deferring all CAD treatment in TAVR patients should be abandoned in favour of individualised, physiology-guided revascularisation strategies.

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