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Commentary: Mobilizing the reserves in coronary artery bypass grafting with and without fractional flow

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Ever since the introduction of percutaneous coronary intervention (PCI) for the treatment of chronic coronary artery disease (CAD), there has been hope of curing CAD mechanically without exposing the patient to much more invasive coronary artery bypass surgery (CABG). Hefty controversies have created somewhat of a “battlefield of PCI and CABG” (see the EXCEL trial data controversy¹), where different guideline interpretations and possibly other incentives resulted in ratios of PCI to CABG performance ranging from approximately 2:1 in one country to more than 10:1 in the next.²

From a patient perspective, such differences should be acceptable only if treatment effects are similar. However, results may differ significantly,³ and we recently suggested that CABG and PCI differ in their mechanisms.⁴ CABG, in addition to revascularizing chronically ischemic myocardium, provides protection against new myocardial infarctions by creating “surgical collaterals.” Collaterals can prevent infarctions if a proximal coronary lesion causes vessel occlusion. This infarct preventative effect appears to be responsible for the survival effect of invasive CAD therapy.⁴ Since most infarct-causing lesions are not stented, CABG’s advantage over PCI



Front: Torsten Doenst. Second row, left to right: Gloria Faerber, Markus Richter, and Mahmoud Diab.

CENTRAL MESSAGE

For optimal surgical care, we need to mobilize all our reserves and improve graft patency, including fractional flow (eg, multiarterial grafting, improved vein handling, and surgeon specialization).

emerges with increasing risks for new myocardial infarctions.⁴

This effect requires patent bypass grafts; however, graft occlusions are common (up to 50% at 10 years⁵). Thus, it may be time to mobilize our reserves to improve graft patency, including multiarterial grafting, surgeon specialization, and/or improved vein harvesting and handling techniques.⁶⁻⁹ Our current decision making for PCI or CABG is based on outcomes from the CABG trial, with patients not always having received our best.

The collateralization hypothesis would require all diseased territories to be grafted. However, besides surgical technicalities, graft patency is also affected by the flow relevance of coronary lesions. Fractional flow reserve (FFR) assesses the functional flow relevance of coronary lesions and has improved outcomes in PCI (primarily by reducing the need for re-revascularization). In this issue of the *Journal*, Glineur and colleagues¹⁰ elegantly review the value of FFR for CABG. For fully arterial CABG, it indeed allows the prediction of graft occlusions. At an FFR value <0.78, 97% of grafts were perfect at 6 months. At higher values, the risk of occlusion increased, depending on graft targets (circumflex or right) and configuration (single vs sequential).

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Two findings appear to be most important in this context. First, the detected graft occlusions were clinically silent. Thus, grafting a diseased vessel with a 50% risk of occlusion would still provide infarct protection in the other 50% without adding harm. Second, vein grafts do not appear to be as sensitive to competitive flow, suggesting that other mechanisms may be more relevant for graft failure. Thus, applying strategies to improve vein patency, such as no-touch techniques⁸ or external stenting,⁹ may be attractive options in case veins are required.

Glineur and coauthors conclude that FFR should not be used to decide between PCI and CABG. However, it can be used to improve graft type selection and thereby enhance our ability to provide more patients with patent grafts. On the battlefield of invasive CAD therapy, graft patency is key.⁴ Therefore, it is time to mobilize all our reserves, with and without fractional flow.

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