meticulous harvest of the BITA conduits to the appropriate length and quality,⁶ the use of arterial conduits in various configurations without limiting yourself only to the in situ grafting configuration, capability of performing both off-pump and on-pump CABG at the same proficiency level when required, all those including others, are not just “recommendations” any more but incumbent prerequisites upon a coronary surgeon.

Finally, the openly well-discussed flaws in the ART as well as the recent striking discoveries with the controversial EXCEL (Evaluation of the Xience Everolimus-Eluting Stent vs Coronary Artery Bypass Surgery for Effectiveness of Left Main Revascularization)⁷ trial opened a narrow loophole reflecting somewhat on the quality and fragility of scientific randomized clinical trials. Physicians should have the integrity to explore flaws in their clinical conduct as well as in their clinical research, so patients could rely upon their actual surgical capabilities, unbiased clinical judgment, and on authoritative medical guidelines based on accurate and well-designed research, as perfectly recently stated: “We’re not talking about 2 tablets for a headache. We’re talking about people dying.”⁸

See Article page 591.

Commentary: Off-pump coronary arterial bypass grafting, a demanding instrument only for a master?

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On-pump conventional coronary arterial bypass grafting (CABG) surgery has been a gold standard for surgical

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Joon Bum Kim, MD, PhD (left), and Sung Jun Park, MD (right)

CENTRAL MESSAGE

As off-pump CABG seems to obtain comparable long-term outcomes with on-pump surgery only when performed by experts, structured training platforms need to be developed and organized.

coronary revascularization, whereas off-pump CABG also has gained widespread acceptance and entered into the mainstream of clinical practice with improvements in surgical devices and techniques.¹ Off-pump CABG primarily intends to enhance overall outcomes by avoiding perioperative complications associated with the use of cardiopulmonary bypass; however, long-term outcomes have been questioned due to concerns regarding potential incomplete revascularization and more frequent graft failure.^{2,3} Until now, the procedural validity of off-pump CABG compared with on-pump surgery has remained one of the most controversial issues in cardiac surgery. Recent large-scale randomized clinical trials on this issue have revealed conflicting results,⁴⁻⁶ which was explained mainly by differing operating surgeon's expertise in off-pump approach. As off-pump CABG is technically more demanding, its outcomes are more likely to depend on the experience of the surgeon. In the current issue of the *Journal*, Taggart and colleagues⁷ reconfirmed the importance of surgeon's experience in off-pump CABG using the renowned Arterial Revascularization Trial (ART) data.

This post-hoc analysis of the ART trial involved 2951 patients who received CABG either off-pump (1252) or on-pump (1699), and 10-year outcomes, including all-cause mortality and a composite of outcomes of death, myocardial infarction, stroke, and repeat revascularization, were compared in the 1078 pairs of a propensity-matched cohort.⁷ The study concluded that, when performed by experienced-hands, off-pump CABG showed comparable long-term outcomes over 10 years with those of on-pump surgery. Moreover, the authors further emphasized that the comparable outcomes were not influenced by the use of single versus bilateral internal thoracic artery.

In the ART trial,⁸ the level of experience in off-pump surgeries of the original cohort appeared to be substantially high, which is somewhat reflected by the following features: (1) comparable number of grafts in off- versus on-pump surgeries (3.20 vs 3.19; $P = .70$), (2) exceptionally low conversion rate (2.5%) from off- to on-pump surgery, and (3) significantly frequent use of bilateral internal thoracic arteries in off-pump CABG versus on-pump CABG (47.4% vs 40.7%; $P < .001$). Furthermore, 1075 off-pump procedures performed only by 21 surgeons (average >50/surgeon) also represent a high level of expertise in off-pump surgeons. Of note, even performed by experienced hands, however, off-pump CABG failed to acquire superior outcomes compared with on-pump surgery. Furthermore, in the subset of cases performed by low-volume surgeons, off-pump surgery was associated with significantly greater risks of cardiovascular death (hazard ratio, 2.39; 95% confidence

interval, 1.28-4.47; $P = .006$) and late stroke (hazard ratio, 3.97; 95% confidence interval, 1.81-7.95; $P < .001$) when compared with on-pump CABG. In available randomized clinical trials or large-scale registry-type series to date, there have been no convincing evidence that off-pump CABG has superior long-term outcomes than conventional on-pump CABG, which was confirmed by the present post-hoc analysis once again.^{4-6,9}

It is true that off-pump CABG is a valuable strategy in certain conditions, such as cases with porcelain/heavily atherosclerotic ascending aorta. Furthermore, patients with severely reduced ejection fraction or chronic kidney disease may benefit from an off-pump strategy by reducing perioperative risks associated with cardiopulmonary bypass use.¹⁰ As the volume of CABG surgery has continuously declined worldwide, however, mastering the off-pump technique is getting more and more difficult than ever. To acquire desirable results with off-pump CABG, the authors also emphasized in the manuscript that off-pump CABG may need to be recognized as a discrete subspecialty; in addition, a formally structured training platform may offer opportunities for less-experienced surgeons to overcome technical challenges and subsequently to pass beyond the learning curve.

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