

Long-Term Survival Following Off-Pump Coronary Surgery: Does Surgeon Experience Make a Difference?

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On-pump coronary artery bypass graft surgery (ONCAB) is the criterion standard by which all surgical revascularization procedures have been compared. However, performing coronary revascularization on cardiopulmonary bypass may result in neurocognitive deficits and strokes, and activate inflammatory pathways that may result in pulmonary, renal, and hematologic complications. By eliminating cardiopulmonary bypass, off-pump coronary artery bypass (OPCAB) emerged as a promising alternative strategy to decrease perioperative morbidity and mortality, thereby prolonging long-term survival. However, OPCAB has been associated with an increased incidence of incomplete revascularization, early and late graft occlusion, and the need for repeat revascularization.^{1,2} These disadvantages associated with OPCAB are now reflected in long-term studies. Two recent meta-analyses reported decreased survival in OPCAB versus ONCAB patients after 5 years of follow-up.^{3,4} Similar findings have also been reported in large observational studies.^{5–7}

In view of these overwhelming data in support of ONCAB, should OPCAB surgery be abandoned? Not so fast, say proponents of OPCAB. They argue that in the vast majority of these studies, the preponderance of OPCAB procedures were performed by surgeons who were inexperienced in OPCAB techniques. For example, in the 5-year outcomes of the ROOBY (Randomized On/Off Bypass) trial, which showed a significant decrease in survival in OPCAB patients, the requirement for performing OPCAB was only 20 cases/surgeon, and 58% of the primary surgeons were residents.⁸

In this issue of the *Journal of the American Heart Association (JAHA)*, Gaudino et al sought to determine the

effects of surgeons' experience on long-term outcomes following ONCAB versus OPCAB.⁹ In their meta-analysis of randomized control trials, they found that although OPCAB and ONCAB had similar operative mortalities, OPCAB was associated with decreased long-term survival when the follow up was >3 years. There was no statistical difference in the incidence of incomplete revascularization between ONCAB and OPCAB, but OPCAB was associated with a trend toward a greater risk for repeat revascularization. Gaudino et al used the crossover rate from OPCAB to ONCAB as a surrogate for a surgeons' experience to perform OPCAB. In a subgroup analysis, they found no difference in long-term mortality in studies in which the crossover rate was 0% to 10%; but survival was significantly reduced in OPCAB patients in studies that reported a crossover rate of >10%.

Is the crossover rate a valid surrogate for determining surgeon experience in OPCAB surgery? It is the "mature," experienced surgeon who will crossover from OPCAB to ONCAB to avoid scenarios that will result in hemodynamic instability, which has been shown to increase morbidity and mortality in OPCAB patients. One would rather observe a higher crossover rate during OPCAB and a lower perioperative mortality than vice versa. A higher crossover rate may also occur when surgeons realize that the exposure for the target vessels is not optimal using OPCAB techniques. Finally, a higher crossover rate may be more indicative of a surgeon who has poor judgment as to when to perform an OPCAB versus an ONCAB, rather than one who is inexperienced in the OPCAB technique.

A better assessment of surgeon experience with OPCAB is to determine the actual number of OPCAB procedures performed by individual surgeons. This was the method used by Chikwe et al in their comparison of long-term outcomes after ONCAB versus OPCAB.¹⁰ Their study included patients undergoing coronary artery bypass graft surgery from the Open Heart Surgery Registry of New Jersey from 2005 to 2011. Propensity matching resulted in 3975 matched pairs of patients undergoing ONCAB versus OPCAB procedures. Patients were only included if the individual surgeon performed >100 ONCAB or OPCAB procedures. After 10 years of follow-up, OPCAB was associated with a higher incidence of death (33.4% versus 29.6%; $P=0.002$), incomplete

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revascularization (15.7% versus 8.8%; $P<0.001$), and increased rates of repeat revascularization (15.4% versus 14.0%; $P=0.048$). Among surgeons who performed $>90\%$ of their procedures as OPCABs, OPCAB was still associated with increased long-term mortality compared with ONCAB; $P=0.02$. These results are in keeping with other trials in which OPCAB performed by experienced surgeons failed to show any superiority over ONCAB techniques.^{11,12}

It has been recommended that the learning curve for acquiring expertise in OPCAB is between 50 and 75 cases.¹³ However, a recent survey of North American surgeons revealed that one third performed no OPCAB procedures and the vast majority (86%) performed <20 cases per year.¹⁴ It is not surprising that long-term OPCAB results, even in “experienced” surgeons, are no better, and can be inferior to results achieved with ONCAB techniques. Long-term outcomes following any coronary artery bypass graft procedure are determined by patient comorbidities, completeness of revascularization, graft patency, and the use of multiple arterial grafting. It is important to remember that these factors, and not whether the procedure is performed on or off pump, will determine the long-term survival of patients following coronary artery bypass graft surgery.

Disclosures

None.

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