On-pump or off-pump? Right debate, but wrong question!

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Central Message

The good results reported in RCTs are due to the expertise of OPCAB surgeons, very likely not to the effectiveness of the technique. Ueki and colleagues¹ push us hard to find a solution.

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Ueki and colleagues¹ report the results of an impressive cohort of patients with chronic renal failure (CRF) who underwent either on-pump coronary artery bypass grafting (ONCAB) or off-pump coronary artery bypass grafting (OPCAB). The latter showed significant reduction of early mortality and prevalence of composite events (mortality and major morbidity) in both overall population and subset of patients with moderate or severe CRF or with preoperative dialysis. The convincing results of the study support the use of OPCABG in patients with CRF.

Since the 1990s there has been huge interest in OPCAB because cardiopulmonary bypass was believed to be harmful for patients with atherosclerosis. The results of the first reports—mostly observational and limited to the early postoperative period—were dramatically in favor of OPCAB in terms of reduction of mortality and morbidity. With time, the debate became more analytic and the replacement of unmatched observational studies with propensity-matched studies and randomized controlled trials (RCTs) allowed a more valid understanding of the benefits and the limits of both techniques. The progress of cardiopulmonary bypass during past years and the increased quality of perioperative management improved the results of ONCAB, whereas OPCAB remained stable. It is hard to summarize the findings because conflicting results are reported even in the most recent articles. In general, propensity-matched studies that include all patients, independently from the risk, better reflect the real world, whereas RCTs tend to include selected patients with low or medium risk, making it difficult for the right perspective to be given to the conclusions.

A recent meta-analysis that included 1.2 million patients at mostly low and medium risk confirmed that long-term survival after OPCAB seems to be lower than ONCAB.² On the other side, there is evidence that high-risk patients can benefit from OPCAB.^{1,3,4}

The right target of the debate is this: Because there are some subgroups of patients who can benefit more from OPCAB, how is it possible to appropriately train surgeons? In the analysis of the 5-year results of the Arterial

Revascularization Trial,⁵ most OPCAB cases were performed by 3 surgeons with optimal results. On the contrary, patients who underwent OPCAB performed by surgeons with a low number of cases had higher mortality.^{5,6}

This statement is confirmed by the results of recent trials comparing OPCAB with ONCAB. A main criticism of the Veterans Affairs Randomized On/Off Bypass (ROOBY) Trial⁷ is related to the low threshold used to define a surgeon's experience; that is, those who had performed only ≥ 20 off-pump cases. This bias very likely impaired either early or late results of OPCAB. The CABG Off or On Pump Revascularization Study (CORONARY) study overcame this issue by enrolling surgeons who had performed more than 100 OPCAB procedures in 2 years.⁸ In the German Off-Pump Coronary Artery Bypass Grafting in Elderly Patients (GOPCABE) study,⁹ surgeons were defined as expert with an average of 514 OPCAB procedures performed.

Data from an enormous cohort of patients undergoing isolated coronary artery bypass grafting (N = 2,094,094 patients from the Nationwide Inpatient Sample from 2003 to 2011) suggest that results of OPCAB depend on the volume not only of the center, but also of the single surgeon.⁶ Inevitably the price to pay to obtain a better outcome in high-risk patients is a possible worse outcome in low-risk patients. The good results reported in RCTs are due to the expertise of surgeons who are performing OPCAB, very likely not to the effectiveness of the technique.

This is the real conundrum, where the debate has to be driven. The study from Ueki and colleagues,¹ with its stringent conclusions, pushes us hard to find a solution.

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