eComment: Valid comparisons between off-pump and on-pump coronary artery bypass surgery can only be based on strict study design

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I read with great interest the study of Gao and associates regarding graft patency following off-pump (OPCABG) and conventional coronary artery bypass grafting (CCABG) using spiral computed tomography angiography [1]. The authors need to be commended for their exceptional results. Zero mortality after a study period of up to four years is unusual but consistent with the normal or only mildly depressed left ventricular ejection fraction of 95% of their patients and the excellent reported mid-term patency of vein grafts. Unfortunately, patients’ clinical profile is not complete. Preoperative characteristics potentially influencing operative but also long-term mortality are not reported, namely peripheral vascular disease including cerebrovascular disease, renal failure, left ventricular hypertrophy [2], prior cardiac surgery and so forth. The patients’ EuroSCORE or other score based on a valid pre-operative risk stratification model is not provided either [3]; Since propensity score analysis was evidently not employed, the matching methodology of 100 CCABG to 137 OPCABG patients is uncertain and clearly imperfect as significant clinical variables were not included.

Conversely, there is evidence to support that patient selection and management was biased (the authors acknowledge such a potential bias in their discussion): despite virtually identical percentages (79% and 79.1%) of three-vessel disease in the two groups, there were significantly less distal anastomoses performed in the OPCABG group (2.47 ± 0.73 vs. 3.01 ± 0.90 in the CCABG group, P = 0.0001), mainly because less saphenous vein grafts were constructed to other than the LAD territory (1.45 ± 0.82 in the OPCABG vs. 2.06 ± 0.91 in the CCABG group, P = 0.002). The authors attempt to justify this divergence stating that ‘similar results were seen in two prospective randomized researches’ [4, 5]. This is actually true only for one of these studies [4]. Yet, this similarity of results cannot justify or obscure definite methodological flaws. In fact, it demonstrates an inherent potential treatment bias of studies comparing off-pump with on-pump coronary surgery, including prospective randomized ones. Even when patients are randomized only after the preoperative decision has been made that complete revascularization without cardiopulmonary bypass can be performed, the treatment plan may be altered intra-operatively for various reasons, such as deeply intramyocardial target vessels, poorly appreciated diffuse vessel calcification, hemodynamic instability, or a combination thereof [4]. The proportion of patients in whom this change of treatment plan will occur most likely depends on the surgeon’s experience and skills but probably so does the final outcome of off-pump surgery. Irrespective of the method of analysis (intent-to-treat vs. as-treated), any intra-operative deflection from the original plan has diverse effects on the outcome, jeopardizing the validity of conclusions on long-term efficacy of OPCABG vs. CCABG.

I therefore feel that the authors’ conclusion (‘OPCAB provides similar patency to CCABG surgery with CPB’) should be reconsidered. In my view, what this study demonstrates is that an experienced surgeon – as illustrated by the authors – can achieve similar mid-term graft patency rates after OPCABG in selected patients, explicitly in patients the surgeon deems good candidates for the procedure both preoperatively and intra-operatively. This is an important conclusion per se.

References