

Reply to Gasparovic *et al.*

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We thank Gasparovic *et al.* for their shared interest in preventing perioperative stroke in coronary artery bypass grafting [1]. This multifactorial complication is one of the most devastating risks in cardiac surgery. In our recent review, we have outlined the surgical strategies available to decrease the risk of stroke specifically in patients with aortic atherosclerosis [2].

The authors bring hybrid coronary revascularization (HCR) forward as an alternative strategy. HCR is a relatively recent development, introduced in 1996, that has yet to be established in the spectrum of revascularization strategies [3]. The most recent myocardial revascularization guidelines have granted HCR a class IIb recommendation, to be considered in specific patient subsets at experienced centres [4]. Combining the high patency of the left internal mammary artery to left anterior descending anastomosis with the less invasive nature of percutaneous coronary interventions, thereby avoiding a sternotomy, seems an attractive alternative to conventional surgery. Indeed, a recent network meta-analysis, comparing revascularization strategies and evaluating all 3 randomized trials on HCR, observed a lower need for target vessel revascularization in the long term, when compared with percutaneous coronary interventions [5]. Short-term outcomes were comparable to conventional revascularization, although the low number of patients might have led to a type II statistical error. Another network meta-analysis compared conventional coronary artery bypass grafting (CABG) to either simultaneous or staged HCR and observed a lower rate of stroke in simultaneous HCR when compared to CABG [6]. This contrasts with the results of the randomized controlled trials, which did not observe a lower stroke rate in HCR [5]. The observational studies included in the latter meta-analysis might be influenced by residual confounding [6]. Nevertheless, the results of these meta-analyses apply to HCR patients in general. The question at hand is whether patients with aortic intimal atherosclerosis make good candidates for HCR. No previous studies specifically aimed to evaluate HCR in these patients. Theoretically, HCR combines the inherent risk of haemodynamic stroke in major surgery, with the persistent risk of plaque disruption through intra-aortic catheter manipulation. Avoiding aortic manipulation altogether using either minimally invasive or no-touch

off-pump coronary artery bypass grafting, which so far has shown the most favourable results in these patients, therefore seems more prudent [2]. In practice, there are some considerations to take into account, such as the risks of intraoperative haemodynamic low flow by cardiac manipulation and the risk of incomplete revascularization. Furthermore, the results improve in experienced hands [2]. Ultimately, the heart team should decide which strategy is deemed best for the individual patient. HCR could serve as a useful alternative to on-pump CABG or in patients less suited for complete revascularization with off-pump coronary artery bypass grafting, but more data are needed both to evaluate the long-term outcomes of HCR in general and the risk of stroke by catheter manipulation specifically in patients with aortic atherosclerosis. In the absence of randomized controlled trials, we would like to urge the authors to publish their results in this specific group of patients.

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