for each patient should be selected only after precise determination of any air leakage sites.²

Moreover, we agree that avoiding the use of general anesthesia during surgery may have considerable positive implications for the postoperative immunologic response.³ In our own study,⁴ after propensity score matching, the incidence of postoperative respiratory complications including pneumonia and acute respiratory distress syndrome was lower in the epidural and local anesthesia groups than in the general anesthesia group. We therefore suspect that perioperative barotraumas caused by mechanical ventilation and aspiration pneumonia caused by suppression of cough reflex in general anesthesia can be prevented. With regard to the respiratory condition of awake patients during thoracic operations, in the series of Pompeo and colleagues,³ lung collapse was most of the times equivalent to that achieved with single-lung ventilation. Although video-assisted thoracoscopic management of pneumothorax in awake patients is feasible and was tolerated in almost all our cases, we could not use this technique in 1 case in which the awake patient had wound pain and respiratory deficiency. From the standpoint of safety, it is very important to control pain in patients while performing surgery without the use of general anesthesia.

We thank Mineo and Ambrogi once again for their informative and encouraging comments on video-assisted thoracoscopic surgery with local and epidural anesthesia. Moreover, we hope that in the future this procedure will play a prominent role in routine thoracic surgical practice.

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ANAORTIC OFF-PUMP CORONARY ARTERY BYPASS GRAFTING: THE CRITERION STANDARD FOR MINIMIZATION OF NEUROLOGIC INJURY

To the Editor:

We congratulate Emmert and colleagues¹ on their study, which shows that avoiding manipulation of the ascending aorta is the most effective method of minimizing neurologic injury during coronary artery bypass grafting (CABG).

The reputation of off-pump CABG (OPCAB) has been damaged by the ROOBY trial,² which failed to show a neurologic benefit when cardiopulmonary bypass was avoided. That trial, however, failed to use the anaortic technique and was performed by surgeons inexperienced in the

demanding OPCAB technique. It is likely that the true benefits of OPCAB were underestimated in this and other studies that did not use the anaortic technique and are better represented by the results presented by Emmert and colleagues.¹

We have recently published a meta-analysis of trials comparing neurologic injury after various degrees of aortic manipulation during CABG: anaortic OPCAB, OPCAB with a side clamp, and conventional CABG.³ The results demonstrated a significant decrease in neurologic injury when manipulation of the ascending aorta was avoided. We have updated the results of the meta-analysis to include those of Emmert and colleagues.¹

When anaortic OPCAB (n = 3158) was compared with conventional CABG (with cardiopulmonary bypass and aortic crossclamping with or without a side clamp for proximal anastomosis of grafts to aorta; n = 10,628), the rate of stroke was 0.41% versus 1.98% (risk ratio, 0.28; 95% confidence interval, 0.16–0.48; $P < .00001$). When anaortic OPCAB (n = 4813) was compared with OPCAB with a side clamp (n = 5581), the rates of stroke were 0.29% and 1.34%, respectively (relative risk, 0.35; 95% confidence interval, 0.19–0.64; $P = .0006$; Figure 1).

The results from the meta-analysis confirm a significant decrease in stroke when aortic manipulation is avoided. In our meta-analysis, we excluded studies that used a device for

FIGURE 1. Revised meta-analysis of stroke risk for anaortic off-pump coronary artery bypass grafting versus off-pump coronary artery bypass grafting with a side clamp. Details of studies used appear in reference 3. M-H, Mantel-Haenszel test; CI, confidence interval.

anastomosis of a coronary graft to the aorta. The results presented by Emmert and colleagues¹ for the HEART-STRING device are equivalent to their aortic no-touch technique. Although we believe that anaortic OPCAB with total arterial revascularization should be the criterion standard, we also appreciate that some surgeons prefer not to perform a T or Y graft anastomosis to the left internal thoracic artery. In this case, the use of a device for proximal anastomosis (rather than use of a side clamp) should be considered for anastomosis of the graft to the aorta.

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Reply to the Editor:

We thank Edelman and colleagues for their comments and additions to our article.

The ROOBY trial, as the largest available prospective, randomized trial has been criticized for its limitations with regard to its significant selection bias, for mainly including low-risk patients.¹ The low off-pump coronary artery bypass grafting (OPCAB) case load of the involved

surgeons was reflected by a conversion rate as much as 10-fold higher, less complete revascularization, and lower patency rates than the data from high-volume OPCAB centers. Another randomized trial focusing on graft patency after OPCAB and on-pump coronary artery bypass grafting confirmed that OPCAB was associated with a significantly lower overall graft patency rate and did not rule out a potential benefit for OPCAB with regard to major adverse cardiac and cerebrovascular events and neuropsychologic functioning.²

As pointed out by Edelman and colleagues, however, and as also presented in most of the available studies, the ROOBY trial importantly failed to use aortic no-touch, total arterial grafting strategies. The significant value of combining OPCAB and aortic no-touch, total arterial revascularization techniques has been repeatedly highlighted in several studies, which have reported significantly decreased rates for stroke, ranging from 0% to 1%.³ In addition, in their recent meta-analysis, Edelman and associates⁴ have demonstrated the potential benefit of aortic no-touch techniques relative to both conventional on-pump coronary artery bypass grafting and to partial clamping techniques during off-pump coronary artery bypass grafting.

We agree that the use of in situ grafts or composites should be the criterion standard whenever possible. The use of free grafts requiring a proximal anastomosis is preferable in some patients, however, and may be the preferable revascularization strategy for some surgeons as well. In this situation, the proximal anastomosis can be efficiently carried out by using a clampless anastomotic technique to avoid any aortic manipulation, yielding similar results for stroke as achieved with a no-touch, all arterial grafting approach.⁵

The risk of neurologic complications cannot be completely eliminated, even if a no-touch, total

arterial off-pump approach is used. This risk also applies to interventional revascularization strategies, such as percutaneous coronary intervention, and seems to be associated with the underlying, individual risk profile defined by the general health condition and comorbidities of the patient. A no-touch, total arterial off-pump approach yields similar neurologic outcomes to those reported with percutaneous coronary intervention, and the often used argument of inferior neurologic outcomes after surgery can therefore be invalidated.

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IS ANNULOPLASTY ENOUGH FOR FUNCTIONAL TRICUSPID REGURGITATION?

To the Editor:

Congratulations to the authors for this study.¹ We benefited from this report, but we want to emphasize some