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Reply to the Editor:

We thank Biancari for his comments on and additions to our article. Although the risk of neurologic complications cannot be completely avoided after surgical revascularization and is most likely associated with the underlying risk profile,¹ we agree that atherosclerosis of the ascending aorta is among the most important predictors for the occurrence of stroke. Epiaortic ultrasonography has been demonstrated to be more accurate than digital palpation in the detection of aortic atherosclerosis² and can be considered the standard of care for the detection and characterization of aortic plaques in the ascending aorta. Despite this knowledge, epiaortic ultrasonography is not established for routine use in most centers.³

The potential benefit of combining off-pump and aortic no-touch techniques has been repeatedly shown to be a significantly reduced stroke rate.⁴ Although in situ grafting may be considered the criterion standard whenever possible, for free graft use requiring proximal anastomosis, our series has clearly shown that the use of the HEARTSTRING device (MAQUET Cardiovascular LLC, San Jose, Calif) yields stroke rates comparable to those achieved with no-touch, in situ techniques.³

We acknowledge the most recent meta-analysis, which included 8 studies with a total of 819 patients with

a pooled stroke rate of 1.9% (95% confidence interval, 0.8%–4.5%) with the use of the HEARTSTRING device⁵; however, it appears that in 6 of these studies (accounting for 88% of all included patients; 719/819), the stroke rate was either 0% (5 studies; n = 305 patients) or 0.5% (1 study; n = 412 patients), whereas in only 2 studies, accounting for only 100 patients (12%; n = 19 and n = 81), were stroke rates substantially higher at 3.7% (accounting for 3 events) and 5.2% (accounting for 1 event).⁵ In contrast, the report of Hilker and colleagues,⁶ representing the largest series of the evaluated studies, supports our findings highlighting the potential benefit of the HEARTSTRING device with regard to a reduction in stroke rate.

We agree that a prospective, randomized trial in combination with the standardized application of epiaortic ultrasonography would be ideal to assess the potential clinical value of clampless devices such as the HEARTSTRING device in reducing neurologic complications.

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SIMULATION OF THORACOSCOPIC SURGERY USING 3-DIMENSIONAL TAILOR-MADE VIRTUAL LUNG To the Editor:

I read the article titled “Simulating video-assisted thoracoscopic lobectomy: a virtual reality cognitive task simulation” by Solomon and colleagues¹ with amazement, and I applaud their efforts to adopt and improve new technology. Their efforts are not only very important in contributing to the education of young thoracic surgeons but are also of help to senior surgeons educating young surgeons. It is important to practice the steps involved in thoracoscopic surgery on one element that was absent in the work by Solomon and associates¹—that is, the ability to simulate anatomic variability.

Thoracic lobectomy for lung cancer has been gaining widespread popularity, particularly in the treatment of early-stage lung cancer, and thoracoscopic segmentectomy has also been conducted in some institutes. However, anatomic variations in the pulmonary vessels carry a potential risk of uncontrollable intraoperative bleeding; therefore, it is necessary to emphasize this issue while educating young surgeons. The education of young thoracic surgeons is undoubtedly important; however, it is far more difficult to teach thoracoscopic surgery than it is to teach thoracotomy surgery. During thoracotomy surgery, senior surgeons can touch the organ directly with forceps or fingers to indicate the point of division. During thoracoscopic surgery, surgeons do not touch the monitor to prevent bacterial

FIGURE 1. A, Tailor-made virtual lung showing the 3-dimensional pulmonary artery (pink), vein (blue), and bronchus (yellow). B, Area for resection is determined on the virtual lung (apicoposterior segmentectomy [S1+2], between black lines). The white lines represent the dividing points of the vessels and bronchus for both simulation surgery and actual complete thoracoscopic segmentectomy. C, The images are processed by radiology technicians to evaluate individual lungs. D, Regional anatomy is confirmed on a picture archiving and communication system during a complete thoracoscopic apicoposterior segmentectomy (S1+2).

contamination and can only roughly indicate the point of division. Therefore, teaching young surgeons becomes difficult. Furthermore, the occurrence of massive bleeding during thoracoscopic hilar maneuvers is a far more serious complication than that during thoracotomy surgery. Therefore, simulating thoracoscopic lobectomy will provide young surgeons with valuable experience before actual surgery.

Kanzaki and colleagues² advocate simulation surgery for thoracic surgeons by creating 3-dimensional pulmonary model images on a personal computer. This is also an interesting method, because students can prepare the images themselves before surgery.² However, it is time consuming for thoracic surgeons to create such images before surgery.

I recommended the following process for thoracic surgeons at our hospital. Patients scheduled to undergo thoracoscopic lobectomy or segmentectomy were routinely examined by

enhanced chest computed tomography. These images were processed (volume analyzer Synapse Vincent, Fujifilm Medical, Tokyo, Japan) by radiology technicians within approximately 10 minutes to evaluate the individual lungs, including structures such as tracheobronchial trees, pulmonary vessels, parenchyma, and pulmonary tumors, after subtracting osseous tissues (Figure 1).³⁻⁵ These images were termed “tailor-made virtual lungs” and were transferred to a picture archiving and communication system in which the individual lung could be viewed, rotated, and magnified on monitors throughout our hospital, including those in the operating rooms, wards, and outpatient offices. Because the surgeon was able to refer to these tailor-made virtual lungs at any point of time in any place, simulation surgery identifying the bronchi and vessels in the affected segments could be performed both before and during surgery. The tailor-made virtual lung

offers 3-dimensional images of the lung that cannot be obtained by reviewing the axial and sagittal images of conventional computed tomography scans.

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GUIDING THE MOLECULAR DIAGNOSIS OF HYPERTROPHIC CARDIOMYOPATHY

To the Editor:

With interest, we read the recent guideline for hypertrophic cardiomyopathy (HCM) and highly appreciate the useful clinical information.¹ HCM is a pathophysiologically heterogeneous condition. We agree with the authors that there is comprehensive evidence that mutations in 8 genes encoding proteins of, or associated with, the sarcomere can cause HCM. These are, as stated in chapter 6 of the guideline, the genes encoding β myosin heavy chain, myosin binding protein C, troponin T, troponin I, α -tropomyosin, actin, regulatory light chain, and essential light chain. However, only about 40% to 60% of HCM cases can be attributed to these 8 genes.^{2,3}

More recently, a ninth gene was convincingly linked to HCM after a genome-wide linkage analysis. Mutations in *CSRP3* encoding muscle LIM protein were shown to cosegregate with HCM in several families in whom gene mutations in the 8 incriminated sarcomeric proteins had been previously excluded.⁴ All these mutations affected highly conserved residues and were not found in the control genomes. Linkage analysis with a highly significant 5.9 logarithm of the odds score in a single large family provided additional genetic evidence. Physicians and geneticists unaware of the mutation status ensured an unbiased attribution of disease

status and an unbiased genome-wide linkage analysis in that family.⁵ Furthermore, functional data supported the genetic results. Cardiomyocyte disarray was observed in *CSRP3* mutation-positive cardiac tissue from patients with HCM. The findings indicate that *CSRP3* mutations cause "true" HCM and not merely a HCM phenocopy.

Although *CSRP3* mutations in patients with HCM are not common (<5%), we believe that there is convincing, scientific evidence that the gene should be included in the list of confirmed HCM disease genes. *TPM1* and *ACTC* (encoding α -tropomyosin and actin) mutations occur at a frequency not much different than *CSRP3* mutations. The prevalence of HCM disease genes is also related to ethnicity. Such patterns require active surveillance of disease genes and *CSRP3* should be included. To learn more about the ethnic spectrum of disease genes and specific founder mutations we propose including all well-established disease genes into scientific genetic screening analyses. Muscle LIM protein is not confined solely to sarcomeric localizations but can be localized to the sarcolemma and to the cell nucleus. Mechanistically, there is much to be learned about this protein, its gene, and their contributions to HCM. We therefore wish to draw attention to *CSRP3*.

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RE: SIMPLIFIED PERFUSION STRATEGY FOR REMOVING RETROPERITONEAL TUMORS WITH EXTENSIVE CAVOATRIAL INVOLVEMENT

To the Editor:

The authors compare beating heart cardiopulmonary bypass (CPB) and hypothermic circulatory arrest (HCA) for removing retroperitoneal tumors with extensive cavoatrial involvement.¹ They included in their series retroperitoneal renal tumors with level III-IV tumor thrombus