between Percutaneous Coronary Intervention with Taxus and Cardiac Surgery (SYNTAX) trial, presented at the 2010 European Association of Cardio-Thoracic Surgery meeting,² the incidence of major adverse cardiac and cerebrovascular events remained significantly greater among patients undergoing percutaneous coronary intervention than among those undergoing CABG. This was a result of greater rates of both repeat revascularization and myocardial infarction beyond 1 year in the former group.

Improvements in surgical revascularization are often overlooked. The main criticism of surgery in the SYNTAX trial (also shown in our meta-analysis) is the increased rate of perioperative stroke compared with percutaneous coronary intervention with DESs.^{1,3} There has been renewed interest in off-pump CABG, ideally without manipulation of the ascending aorta, in an attempt to decrease the rate of perioperative stroke. We have recently published a meta-analysis comparing off-pump CABG with percutaneous coronary intervention.⁴ The results suggest equivalent rates of stroke for off-pump CABG and percutaneous coronary intervention (unlike the SYNTAX results) but significantly lower rates of major adverse cardiac and cerebrovascular events in the surgical group. Debate surrounding the relative graft patencies of conventional CABG and off-pump CABG is ongoing. There is evidence, however, that when performed by surgeons experienced in the technically demanding technique, off-pump CABG achieves a graft patency equivalent to that of CABG.^{5,6}

The debate regarding CABG versus DES treatment is complex, and the goalposts are continually being shifted by evolving DES technology. This makes comparison of DES treatment with CABG difficult—perhaps indeed a Gordian knot in the question of myocardial revascularization. A solution, however, may not require the resurrection of Alexander the Great to cut the knot. Rather, well-

constructed trials (such as SYNTAX) and then a combined approach to decision making involving both cardiologists and surgeons will ensure selection of the most appropriate intervention for each patient and ultimately the best outcome.

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SIMULATING VIDEO-ASSISTED THORACOSCOPIC LUNG RESECTION USING A VIRTUAL 3-DIMENSIONAL PULMONARY MODEL ON A PERSONAL COMPUTER

To the Editor:

We read the article by Solomon and associates,¹ “Simulating video-

assisted thoracoscopic lobectomy: A virtual reality cognitive task simulation,” with great interest. We agree with their virtual reality cognitive task simulation and think what they are doing is fantastic.

Video-assisted thoracic surgery has replaced open thoracotomy in the surgical treatment of many pleuropulmonary diseases.² Video-assisted thoracic surgery lobectomy has been gaining in popularity for early-stage lung cancer. On the other hand, anatomic variations of the pulmonary vessels present a potential risk of uncontrollable intraoperative bleeding; thus, it is necessary to collect information on the branching patterns of pulmonary vessels preoperatively.³

We previously described the virtual 3-dimensional pulmonary model on a personal computer (PC) for the preoperative simulation of video-assisted thoracoscopic lung resection.^{4,5} Our simulator has patient-specific anatomy incorporated.

In July 2001, we began using a virtual 3-dimensional pulmonary model on a PC in video-assisted thoracoscopic lung resection. A total of 140 patients underwent lobectomy and 158 patients underwent segmentectomy or subsegmentectomy for lung tumor.

By using 60 2-mm (at present 120 1-mm) high-resolution computed tomography images of the tumor and hilum, in DICOM format, we could mark on the pulmonary arteries, veins, bronchi, and tumor. We attempted to reconstruct these with anatomically correct images using a freeware program (CTTRY). After the images were uploaded to a PC, the pulmonary arteries, veins, and bronchi were traced in the images. The location and thickness of the bronchi and pulmonary vasculature were rendered as different-sized cylinders (Figure 1, A). Next, on the basis of the resulting numeric data, a 3-dimensional image (Figure 1, B) was reconstructed using shareware (Metasequoia). The reconstructed images can be manipulated

FIGURE 1. A, Location and thickness of the bronchi and pulmonary vascular system are rendered as different-sized cylinders. B, Three-dimensional image is reconstructed using shareware. C, Intraoperative navigation. D, Ubiquitous 3-dimensional imaging on a wireless hand-held device.

by virtual surgical procedures, such as reshaping, cutting, and moving, and used for intraoperative navigation (Figure 1, C).

Further, by using ubiquitous 3-dimensional imaging with a wireless hand-held device, it would be easier to show these images and patient-specific anatomic variations of the pulmonary vessels (Figure 1, D).

The virtual reality simulator not only surgically educates but also aids in selection of the suitable type of lung resection for an individual. Our virtual 3-dimensional pulmonary

model on a PC is a simple, low-cost, educational tool.

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