500 OPCAB cases.⁴ All these studies demonstrated that, in the hands of experienced surgeons, OPCAB had similar outcomes to CCABG for mortality and the number of bypass grafts but also had advantages in reducing blood transfusion, time of ventilation, and the length of postoperative hospital stay. The long-term outcome (5 or 10 years) needs to be further explored. But we have to pay attention to the fact that the patients enrolled in CORONARY study (according to their inclusion and exclusion criteria) were required to be suitable for both OPCAB and CCABG by the operating surgeons. So it is difficult to tell from the CORONARY study how many patients were enrolled out of their total number of patients who underwent coronary artery bypass surgery during the same period. Because of this selection bias, the conclusions drawn may thus not be appropriate for our daily practice. On the other hand, OPCAB has a distinct learning curve and has higher demand on surgical skills. It takes time to master the new techniques for surgeons who have been accustomed to performing coronary bypass grafting surgery on nonbeating and bloodless hearts with cardiopulmonary bypass and cardioplegia. In fact, surgeon experience is the most important factor that could influence the surgical outcome of OPCAB.

It is noteworthy that some surgeons only apply OPCAB to high-risk patients, and this strategy may not be the best practice. They are using a technique that requires the most skill for high-risk patients, which may increase the surgical morbidity and mortality and result in worse outcomes. Smart surgeons should use their most familiar surgical techniques for high-risk patients to get the best results.

Clinically, OPCAB has some special strong indications. For those elderly patients with a heavy calcified ascending aorta and contraindications to cardiopulmonary bypass, OPCAB with bilateral internal thoracic artery may be the best option to decrease such complications as stroke. In contrast, CCABG may be the best technique for patients with small target coronary vessels, diffuse coronary artery disease, intramyocardial coronary arteries, or obviously dilated hearts that might not tolerate the cardiac manipulation required for OPCAB. Perioperative stroke is one of the most serious complications after coronary artery bypass grafting surgery, and it has been reported that OPCAB may result in lower stroke rates. There have been further studies demonstrating that the incidence of stroke was increased if a side-biting clamp was applied to the aorta for proximal anastomoses. The ideal strategy should be total arterial bypass grafting (bilateral internal thoracic arteries and radial artery) with OPCAB without manipulating the aorta, which may reduce the incidence of stroke caused by aortic manipulation.

In summary, not all patients undergoing coronary bypass can benefit from OPCAB, and this technique should be reserved for those surgeons who demonstrate at least

equivalent outcomes to CCABG. CCABG will continue to be the main option for most cardiac surgeons in the near future.

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Reply to the Editor:

It is time for the debate about on-pump versus off-pump CABG to be finally settled. Off-pump CABG was introduced with the hope of avoiding the morbidity of cardiopulmonary bypass, but randomized trials, including Veterans Affairs Randomized On/Off Bypass, Coronary Artery Bypass Surgery Off or On Pump Revascularization study, and the German Off-Pump Coronary Artery Bypass Grafting in Elderly Patients, have shown no clear advantage for off-pump CABG with regard to hard clinical end points such as mortality and stroke. The debate has been perpetuated because off-pump proponents continue to cite advantages associated with this technique, including reduced perioperative morbidity, particularly in the hands of experts. In contrast, critics of off-pump CABG cite reports of diminished graft patency, incompleteness of revascularization, and long-term implications.

In reality, there is little to debate about. In the best-case scenario for off-pump CABG, current data show no clear winner with respect to important early clinical outcome measures for the 2 surgical approaches. Because off-pump CABG is technically a more difficult operation, the on-pump technique is naturally the default approach for the majority of surgeons. This reality is reflected by the Society of Thoracic Surgeons National Adult Cardiac Surgery

Database, which shows that off-pump CABG use has declined and that only a small percentage of surgeons perform this procedure routinely.¹

As pointed out in the letter by Dr Chen,² there are certain high-risk patients for whom surgical intuition suggests that off-pump CABG would offer an advantage over the on-pump technique (and vice versa). However, these patients represent a small percentage of the overall CABG population; many would have been excluded from randomized trials, and data about their unusual or extreme risk profiles may be diluted or even uncaptured by the databases. These are the very patients for whom tailoring the right operation in the context of the expertise of the surgeon and the cardiac care team is always the appropriate approach, regardless of whether or not it involves the use of the pump.

On-pump CABG will continue to be the most commonly used approach. Long-term outcomes of the randomized

trials are eagerly anticipated to fill important remaining pieces of a puzzle that, in my opinion, has already been shaped.

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