Reply to the Editor:

My coauthors and I thank Drs Takagi and colleagues for their interest in our article, and we agree with their comments in regard to the inclusion of trials reporting the results of off-pump surgery in 2006. Our omission was simply the result of the time lag between the completion of our search (October 2005) and that of manuscript preparation, review, and publication.

Concerning the inclusion of early or late graft patency results, the sensitivity analysis from our work did reveal an increasing difference between the results of early and late graft patency.¹ The analysis was, however, fraught with statistical heterogeneity—hence our caution with the interpretation. It is clear that evidence continuously emerges on the poorer graft patency in off-pump surgery. With the inclusions of trials from 2006 and late graft patency, Takagi and colleagues have managed to obtain further insights into comparative patency by (left anterior descending versus non-left anterior descending) territory. We await the results of their forthcoming meta-analysis and welcome their agreement with our work.

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doi:10.1016/j.jtcvs.2007.01.009

Carotid artery cannulation in aortic surgery**To the Editor:**

We read with great interest the article from Dr Urbanski and colleagues¹ describing the results of carotid artery cannulation in aortic surgery. We congratulate them for their success and outstanding effort in one of the most challenging issues in cardiac surgery. However, we have some concerns about the routine cannulation of the left carotid artery for both systemic and antegrade cerebral perfusion (ACP) in aortic surgery.

Data have accumulated that the major cause of cerebral insults after repair of aor-

tic arch or ascending aortic aneurysms is cerebral embolization rather than inadequate cerebral protection, unless the operation is very prolonged. For this reason, selection of the arterial cannulation site for cardiopulmonary bypass is one of the most critical steps during these complex procedures. Ascending aortic, femoral, and axillary arteries are commonly preferred cannulation sites for systemic and/or cerebral perfusion. Dr Urbanski and colleagues¹ claimed that carotid artery cannulation prevents interruption of the cerebral blood flow during placement of the perfusion cannulas in the supra-aortic vessels and the risk of cerebrovascular events as a result of air embolism or the consequent dislodgment of atherosclerotic debris. Also, it avoids the manipulation of the arch arteries for perfusion cannula placement for ACP. On the other hand, in the cardiovascular system, carotid arteries are one of the most vulnerable sites for systemic atherosclerosis. Patients indicated for elective repair of ascending aortic and arch repair usually have multiple risk factors for atherosclerosis and multiple comorbidities like coronary artery disease (CAD) and chronic obstructive pulmonary disease (COPD). Dr Urbanski and colleagues reported 85% hypertension, 35% CAD, 16% COPD, and 5% previous neurologic events in their patient population. It has been stated that a significant number of patients undergoing surgical repair for degenerative aneurysm of the descending thoracic and thoracoabdominal aorta has hemodynamically important carotid and coronary artery disease.² Atherosclerotic carotid artery disease, either hemodynamically significant or not, is fairly common in this patient population. In our opinion, carotid artery manipulation for anastomosing a graft to the artery itself and the turbulence secondary to the arterial flow directed to the carotid system further increase the risk for cerebral embolization in these patients. Additionally, carotid artery cannulation for antegrade cerebral protection eliminates the vertebral artery, which is an important collateral for cerebral perfusion.

On the other hand, axillary arteries are relatively resistant to the atherosclerotic process. It has been shown that the right axillary artery cannulation by either direct or side graft technique is an easy and effective technique for both systemic and ACP in aortic surgery.³ Brachial plexus injury, dissection, arm ischemia, compart-

ment syndrome, and local wound complications have been reported to develop after axillary artery cannulation.^{3,4} However, we believe that technical problems and complications of axillary cannulation are obviously less considerable, compared with the carotid artery cannulation. Overall, we believe that right axillary artery cannulation is superior to carotid artery cannulation in aortic surgery.

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doi:10.1016/j.jtcvs.2006.12.046

Reply to the Editor:

My colleagues and I very much appreciate Dr AK and Dr Dogan's interest in our article published in the December issue of the *Journal*.¹

The authors of the letter try to demonstrate that axillary artery cannulation is superior to carotid artery cannulation. Apparently, their opinion is based mainly on recent reports, especially on that of Kieffer and associates,² in which among 130 patients operated on because of degenerative aneurysm of the descending thoracic and thoracoabdominal aorta, 9% had significant stenosis of one carotid artery.² However, the coexistence of the proximal aortic aneurysm and significant arteriosclerosis of carotid arteries is noticeably less, averaging about 2%, not only in our population described, but also in our overall

experience. Nevertheless, as we stated in our article, Doppler ultrasonography of extracranial arteries should be the basis for choosing the proper cannulation site in all elective patients in whom carotid cannulation is planned. Among almost 250 elective patients with aortic aneurysm in whom Doppler ultrasonography was performed prior to surgery, we saw no significant carotid arteriosclerosis of both sides in any patients.

Furthermore, we do not agree with the letter's authors that carotid artery cannulation eliminates the circulation through the vertebral artery during antegrade perfusion. Cannulation of the right carotid artery provides the same right vertebral perfusion as does cannulation of the right axillary artery. However, as we have demonstrated, it remains questionable whether additional perfusion of the vertebral artery during unilateral cerebral perfusion under moderate hypothermia is even necessary.

Dr AK and Dr Dogan believe that axillary artery cannulation is superior to carotid artery cannulation even though they recognized that several, partly life-threatening, complications related to axillary cannulation have been reported. Also, they do not even mention that axillary cannulation is not always possible and a switch to other cannulation sites is necessary in some cases. In our present, overall experience with almost 300 carotid artery cannulations, no switch to another cannulation site was necessary in any patient, and no vascular, local neurologic, or wound complications were observed. The overall stroke rate was 1%. Despite these results we do not intend to suggest that carotid cannulation is superior to axillary cannulation; let the surgical experience speak for itself.

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Limitations with transapical aortic cannulation in type A aortic dissection: What about aortic regurgitation and cardiopulmonary bypass time?

To the Editor:

I read with great interest the recent article by Dr Wada and colleagues¹ detailing their experience with transapical cannulation in type A dissection (n = 138; 22.5% with significant aortic regurgitation). In their Methods section, they list the following contraindications to this technique: severe aortic stenosis, prior aortic valve replacement, and certain reoperation cases, presumably with dense adhesions.

What about the impact of significant aortic regurgitation that occurred commonly in this study?^{2,3} Baseline significant aortic regurgitation in the setting of transapical cannulation would be expected to cause significant retrograde flow into the left ventricle. The consequences could be inadequate forward flow with vital organ ischemia, left ventricular distention with inadequate myocardial protection, and/or excessive left ventricular vent return.

The authors conducted this cannulation technique with echocardiographic guidance. Clearly, the degree of aortic regurgitation and ventricular distention could be precisely monitored with transesophageal echocardiography. Careful review of their article does not reveal their management strategy for these important considerations.

Last, a possible disadvantage of this technique is the inability to clamp the ascending aorta during cooling, which represents lost operative time and, as a consequence, extended cardiopulmonary bypass time with added risk for morbidity. The authors do not present their cardiopulmonary bypass times in their article.

I would greatly appreciate feedback from the authors about these intraoperative considerations.

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doi:10.1016/j.jtcvs.2006.11.067

Reply to the Editor:

I would like to answer Dr Augoustides' questions regarding possible aortic regurgitation, the disadvantage of not clamping the aorta, and the prolongation of operative time with our technique.

In fact, the degree of aortic regurgitation decreased during cardiopulmonary bypass with transapical aortic cannulation. We do not know the exact mechanism, but this certainly has been our experience. Type A aortic dissection causes detachment of the commissures of aortic cusps and prevents central coaptation, resulting in aortic regurgitation. The aortic flexible cannula located in the center of the aortic valve during cardiopulmonary bypass may enhance coaptation of the leaflets. We could observe by transesophageal echocardiography that the degree of aortic regurgitation was decreased.

We consider the inability to clamp the ascending aorta during cooling not particularly disadvantageous. Rather, we prefer the no-clamp technique during cooling on cardiopulmonary bypass to avoid undue pressurization or malperfusion of the aortic false lumen. Our mean cardiopulmonary bypass time was already presented in our article; it was 233 ± 68 minutes (median, 222 minutes).

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doi:10.1016/j.jtcvs.2007.01.005

Transapical aortic cannulation: The technique of choice for type A dissection

To the Editor:

We congratulate Dr Wada and colleagues for their excellent and extensive experience in transapical aortic cannulation for type A dissection.¹ Although first described more than 35 years ago,² transapical aortic can-