

Letters to the Editor

Does the introduction of off-pump coronary artery bypass into aortic arch aneurysm repair minimize the period of myocardial ischemia and cardiopulmonary bypass?

To the Editor:

We read with interest the brief communication by Yokoyama and associates¹ regarding the introduction of off-pump coronary artery bypass (OPCAB) into the simultaneous operation of aortic arch repair and coronary revascularization to minimize the period of aortic crossclamping (myocardial ischemic time) and cardiopulmonary bypass (CPB), but we disagree with the new solution for the surgical treatment of multiorgan arteriosclerosis by reason of the following.

Our strategy, which most cardiovascular surgeons may prefer, and Yokoyama and colleagues' procedure are shown in

Figure 1. After the initiation of CPB, we perform distal anastomoses of coronary artery bypass grafting (CABG) during the core cooling under on-pump beating heart surgery. After the completion of arch and branch repair under hypothermia and antegrade cerebral perfusion, proximal anastomoses of CABG are undertaken during the rewarming under partial clamping of the proximal ascending aorta or the replaced prosthetic graft (when the proximal ascending aorta is inappropriate for partial clamping). The period of distal or proximal anastomoses of CABG presented in the figure of Yokoyama and colleagues' article (reconstructed in Figure 1) might be exaggerated to be as long as that of arch or branch repair. Because the period of distal or proximal anastomoses of CABG (only 1.5 ± 0.8 anastomoses in Yokoyama and colleagues' study) must be far shorter than

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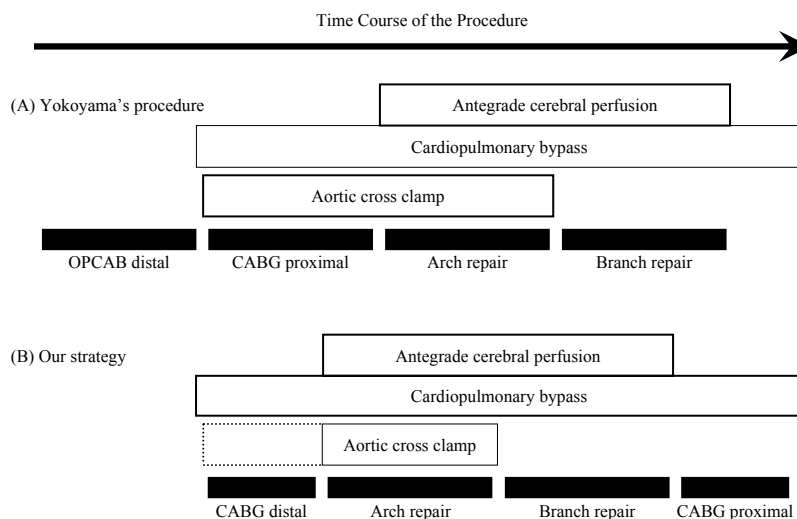


Figure 1. Time course in the combined procedure of coronary artery revascularization and aortic arch repair. A, OPCAB and aortic arch repair in Yokoyama and associates' procedure.¹ B, CABG and aortic arch repair with our strategy. Note the period of cardiopulmonary bypass (CPB) in B is as long as that in A, and the period of aortic crossclamping (myocardial ischemic time) in B is shorter than that in A. Even though distal anastomoses of CABG are undertaken during aortic crossclamping (dotted column) in our strategy, the period of aortic crossclamping is as long as that in Yokoyama's procedure. OPCAB, Off-pump coronary artery bypass; CABG, coronary artery bypass grafting.

that of arch or branch repair, the period of CPB is not prolonged even though distal anastomoses of CABG are performed during CPB. Aortic crossclamping (myocardial ischemia) in our strategy is required only during arch repair and is far shorter than that in Yokoyama and colleagues' procedure (during both proximal anastomoses of CABG and arch repair). Even though distal anastomoses of CABG are undertaken during aortic crossclamping (dotted column in Figure 1) in our strategy when the anastomoses are technically complicated and cannot be performed under on-pump beating heart surgery, the period of aortic crossclamping is as long as that in Yokoyama and colleagues' procedure.

Yokoyama and colleagues' combined procedure of OPCAB grafting and aortic arch repair prolongs total operation time, because the extra period of distal anastomoses of OPCAB grafting is indispensable in addition to the period of CPB. Distal coronary artery anastomoses under on-pump beating heart surgery with sufficient decompression of the heart and without hemodynamic deterioration must be technically easier than that under off-pump beating heart surgery. Moreover, the period of aortic crossclamping (myocardial ischemic time), including proximal anastomoses of CABG, in Yokoyama and colleagues' procedure is longer than that in our strategy. Which strategy do you prefer?

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Reference

1. Yokoyama H, Sato Y, Takase S, Takahashi K, Wakamatsu H, Sato Y. Introduction of off-pump coronary artery bypass into aortic arch aneurysm repair: a new solution for the surgical treatment of multiorgan arteriosclerosis. *J Thorac Cardiovasc Surg.* 2005;129:935-6.

doi:10.1016/j.jtcvs.2005.05.019

Reply to the Editor:

We thank Dr Takagi and associates for raising important questions on our recent proposal of the introduction of off-pump coronary artery bypass (OPCAB) into the combined operation of coronary revascu-

larization and aortic arch repair (AAR) using antegrade selective cerebral perfusion.¹

The first question is, "Does the introduction of off-pump coronary artery bypass into aortic arch aneurysm repair minimize the period of myocardial ischemia and cardiopulmonary bypass?" The answer is, "Yes." Recently, we reviewed our experience on the patients who underwent the simultaneous operation of total arch replacement (TAR) for atherosclerotic aortic aneurysm and coronary artery bypass grafting (CABG) between 1992 and 2004 (unpublished data). In the conventional coronary artery bypass (CCAB) group, distal coronary artery anastomosis (CABG distal) was constructed using the CCAB technique. Since 1998, CABG distal has been constructed on the beating heart before the cardiopulmonary bypass (CPB) period (OPCAB group). The demographics were similar in both groups; however, the surgical outcomes were dissimilar (Table 1). These preliminary data showed a decreased period of myocardial ischemia and CPB with fewer postoperative adverse effects in the OPCAB group.

Dr Takagi and associates also described another conventional technique in their letter, in which distal CABG is constructed on the beating or fibrillating heart under CPB during the cooling period and proximal CABG is constructed after AAR using a lateral aortic clamp. Then, the second question is raised: "Which procedure is preferred?" The answer is, "Either, as long as the outcome is excellent." The choice of procedure depends on the specific patient's pathology and status, as well as the specific surgeon's strategy and skill. The operation should be fitted for the patient.

In this simultaneous operation, there are several options; CABG distal can be constructed on the beating, arrested, or fibrillating heart; CABG proximal can be constructed before or after AAR, with aortic crossclamping or lateral clamping. As long as the entire procedure is performed, either way, with appropriate myocardial protection and coronary revascularization within a tolerable CPB period, the outcome is expected to be satisfactory. Recently, a CPB period longer than 300 minutes in AAR was demonstrated as an independent

TABLE 1. Demographics, intraoperative data, and early outcome of the patients who underwent coronary revascularization and total arch replacement for atherosclerotic aortic arch aneurysm

	Solo TAR (n = 18)	OPCAB (n = 18)	CCAB (n = 14)
Demography			
Age (y)	72 (58-79)	70 (62-80)	71 (64-79)
Gender (M/F)	15/3	17/1	11/3
Diseased coronary artery	0	* 1.5 (1-3)	1.5 (1-3)
Hypertension	17 (94%)	18 (100%)	13 (93%)
Left ventricular hypertrophy	7 (39%)	11 (62%)	10 (71%)
Old cerebral infarction	12 (67%)	* 5 (28%)	3 (21%)
Intraoperative data			
CPB time (min)	206 ± 33	* 239 ± 35	* 306 ± 61
>300 min	0	1 (6%)	* 7 (50%)
Myocardial ischemic time (min)	125 ± 30	133 ± 24	* 180 ± 48
>180 min	1 (6%)	0	* 5 (36%)
Early outcome			
Perioperative myocardial infarction	1 (6%)	0	2 (14%)
Stroke	1 (6%)	0	2 (14%)
Prolonged (>48 h) intubation	6 (33%)	6 (33%)	* 11 (79%)
In-hospital death	1 (6%)	1 (6%)	3 (21%)

TAR, Total arch replacement; OPCAB, off-pump coronary artery bypass; CCAB, conventional coronary artery bypass; CPB, cardiopulmonary bypass. Solo TAR group: The patients underwent TAR without coronary revascularization. OPCAB group: Distal coronary artery anastomosis was constructed on the beating heart before cardiopulmonary bypass (CPB). CCAB group: Distal coronary artery anastomosis was constructed on CPB. Data are expressed as mean ± standard deviation. Parentheses represent the value range, unless otherwise stated. *P < .01 difference between the 2 groups, analyzed by Mann-Whitney U test or chi-square test.