Off-Pump Versus On-Pump Coronary Bypass Surgery

To the Editor:

A careful, randomized study of coronary artery bypass surgery (CABG) concluded that, “in selected patients, off-pump CABG [OFFCABG] is safe and yields short-term cardiac outcomes comparable to that of on-pump CABG [ONCABG].”\(^1\)\(^2\) Despite this positive interpretation, OFFCABG had no benefit in these highly selected patients in the ways in which it was most expected: intensive care unit stay, stroke, atrial fibrillation, quality of life, and hospital cost.

The authors attribute lower creatine kinase muscle-brain isoenzyme release in OFFCABG patients to less ischemia from individual coronary artery clamping, compared with the global ischemia often used during ONCABG. Actually, local vessel clamping is also appropriate (and is even more convenient) during ONCABG.\(^2\) Alternatively, ONCABG can be done with brief periods of intermittent global ischemia,\(^3\) thus gaining the benefits of ischemic preconditioning.

It is also disappointing that the patients and their physicians were not blinded; because virtually all patients had a sternotomy, only the operating team need have known whether the pump was used. OFFCABG patients averaged one day less hospitalization, but readiness for discharge is a subjective assessment that could have been biased by the lack of blinding.

The paucity of benefit is made even more striking by the dearth of triple-vessel disease (20% in the OFFCABG group, 27% ONCABG) and poor left ventricular function (0%). OFFCABG is easier to perform in patients with single- or double-vessel disease and normal left ventricular function, but the typical contemporary CABG patient who escapes percutaneous intervention has multivessel, diffuse disease or a bad ventricle with a dangerous coronary lesion jeopardizing residual contractile myocardium.

Patients were enrolled only if OFFCABG was deemed technically feasible; in 28 months, 3 hospitals only enrolled 281 patients. How many eligible patients refused to participate? How many patients underwent CABG during this interval and were unsuitable for OFFCABG? In sum, what percentage of all CABG patients were unsuitable for OFFCABG? OFFCABG is a valuable technique in certain patients, but many questions remain unanswered.\(^4\)

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Response

We appreciate Dr Bonchek’s comments with regard to our report on the randomized comparison of off-pump and on-pump coronary bypass surgery.\(^1\) We share his view that off-pump coronary surgery is a valuable technique in selected patients, as well as his concerns about questions that remain unanswered.\(^2\)

The randomized study was initiated to address some of those questions, albeit originating from a more positive perspective.\(^3\) Blinding patients and physicians was, in theory, possible. The study\(^1\) was designed, however, as a pragmatic trial comparing 2 strategies: (1) on-pump bypass surgery, as currently practiced in the participating hospitals, which includes the use of cardiotomy suction and anesthesia with high-dose opioids, and (2) off-pump surgery, which not only allows a less invasive approach to the heart in selected cases, but also the safe use of thoracic epidural anesthesia. Therefore, the immediate postoperative period differed between most off- and on-pump cases in one or several aspects, which indicated to both the patient and physicians whether or not cardiopulmonary bypass had been used.

Obviously, some of the present beneficial results\(^1\) may not be applicable to a comparison with on-pump coronary surgery that uses other techniques of cardioprotection during global cardiac arrest or other techniques of cell saving.

As emphasized in our report, one day less hospitalization in the off-pump group is a potentially biased benefit. The lack of benefit in a number of variables in the off-pump group must be viewed in light of the fact that the present population consisted of relatively young and healthy people, which is indeed not completely representative of typical bypass surgery patients. The patients included in the study represent 15% of the total number of first-time bypass surgery patients operated on in the same time period. Only 21 eligible patients refused participation. Selection of the patients was determined by the inclusion and exclusion criteria of the present trial.\(^1\) The selection does not indicate, however, that off-pump surgery cannot be performed on older patients with multivessel disease, impaired ventricular function, and extensive comorbidity.\(^4\) We agree that the patient selection has implications for the generalizability of the study results. It is conceivable that older patients, with more atherosclerotic disease and comorbidity, will benefit more from off-pump surgery, especially with regard to cerebral outcome.\(^5\) The observations on neurocognitive outcome at 3 months are currently under review elsewhere.

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