What Is Optimal Revascularization for Hemodialysis Patients?

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In this issue of the Journal, Yamaguchi et al present their results of coronary artery bypass grafting (CABG) performed in hemodialysis (HD) patients.¹ Their study design was retrospective, large volume (19,687 patients), multicenter data sampling and short-term follow-up. The Japan Adult Cardiovascular Surgery Database (JACVSD) was used to collect the data between 2005 and 2008. The short-term results of CABG in HD patients were compared with those for non-HD patients, and predictors of mortality were analyzed.

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Most impressively, this study is one of the largest series to compare post-CABG outcomes between HD and non-HD patients. JACVSD has strongly contributed to this study. The JACVSD was inaugurated in 2000 to assess outcomes after cardiovascular surgical procedures on a multicenter basis, and the data collection form has 255 variables that are almost identical to those of the STS NCD.² Thus, as mentioned in this study, the data were compared with the STS database.

Although JACVSD is an epoch-making database, it reflects only the short-term (30 days) outcome of surgery. Variables for long-term survival and event-free survival are really required in JACVSD. This is also discussed by Yamaguchi et al, and the lack of a long-term result is a limitation of their study.

The 7.8% overall mortality of CABG in HD patients is considered to be low, and fairly consistent with previous reports. The parameters Yamaguchi et al show as indicative of operative mortality of CABG for HD patients are age, chronic pulmonary disease, extracardiac arterial disease, congestive heart failure, arrhythmias, preoperative inotropic agent, NYHA IV, urgent or emergency operation, ejection fraction (EF) <30%, aortic regurgitation >2 and mitral regurgitation >3. These are also appropriate as risk factors, as published before. They list the postoperative predictors of operative mortality of CABG for HD patients as stroke, infection, prolonged ventilation, pneumonia, gastrointestinal complication and heart block, which are also consistent with prior studies.

This study has proven the results and predictors of CABG in HD patients with a high-volume sample; however, only CABG was discussed. We need to move the discussion toward the optimal therapy for HD patients. Although the result of CABG for HD patients has improved, as shown in this report, CABG mortality is still high in HD patients compared with non-HD patients.

We think the keys to improving the result of revascularization of HD patients are to take into consideration the results of (1) PCI vs. CABG and (2) on-pump CABG vs. off-pump CABG.

PCI vs. CABG

There are some studies that have compared the results of CABG and PCI. Manabe et al showed the superiority of CABG.³ Their 2-year survival rates were similar between the 2 groups, but major adverse cardiac event-free survival (CABG: 85.9% vs. PCI: 37.1%; $P=0.001$) and angina-free survival (CABG: 84.9% vs. PCI: 28.9%; $P<0.001$) rates were significantly higher in the CABG group. They had concluded that the clinical results favored CABG, even in the era of drug-eluting stents (DES). The difference in clinical results is related to the sustainability of successful revascularization. The limitation of that study is sample volume (CABG: $n=28$, PCI: $n=18$).

On the other hand, it is although for patients with chronic kidney disease (CKD: GFR <60 ml/min), Wang et al presented a large-volume study of PCI vs. CABG in CKD patients and concluded that compared with PCI with DES, CABG showed a similar incidence of death, myocardial infarction or cerebrovascular events in patients with multivessel disease and CKD, but was associated with decreased repeat revascularization in the 3-vessel population.⁴

The superiority of CABG with regard to major adverse cardiac events compared with PCI is emphasized; however, refinements of DES may overcome this disadvantage. Sakakibara et al found that use of the everolimus-eluting stent (EES) was as safe as that of the sirolimus-eluting stent (SES), and that the EES significantly prevented restenosis in patients on maintenance HD compared with the SES at 8-month follow-up.⁵ Technological advances in PCI may improve the results of revascularization.

Thus, we strongly recommend establishing a database of PCI similar to JACVSD to compare the outcomes of PCI and CABG. It is impossible to discuss which is suitable for HD patients when no-one knows how many PCIs are performed in Japan.

On-Pump vs. Off-Pump CABG

Off-pump coronary artery bypass (OPCAB) is not an isolated predictor for outcome in the report by Yamaguchi et al, but it may reduce the risk of CABG in HD patients. Murai et al re-

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ported that during a mean follow-up of 27.0 ± 13.7 months, the actuarial 1- and 5-year survival rates of the HD group were 80% and 70%, respectively, and they had concluded that OPCAB is safe and improves survival in patients receiving HD.⁶ Horai et al⁷ conducted a retrospective review of 37 consecutive HD patients who underwent OPCAB. Complete revascularization was successfully performed in all patients and the 30-day and in-hospital mortality was 2.7% and 8.1%, actuarial survival rate at 1 and 3 years was 88.8% and 77.0%, and cardiac event-free rate at 1 and 3 years was 85.9% and 72.6%, respectively. Preoperative left ventricular EF and smoking history were significant predictors for mid-term mortality, and coexisting peripheral vascular disease was a significant predictor for cardiac events.

In another study, a total of 216 patients undergoing OPCAB were compared with 101 undergoing on-pump CABG, and the adjusted long-term survival was similar in both groups.⁸ Thus OPCAB may improve the operative outcome of CABG in HD patients. A large-volume study may be required using the JACVSD database.

Conclusion

The study by Yamaguchi et al is one of the largest of CABG in HD patients in Japan, and has shown excellent results. Possible factors in improving the outcome of revascularization are OPCAB and the next generation of DES. In addition, construction of a PCI database is desirable to evaluate PCI with a large number of patients.

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