It is very clear that diabetes is one of the potent risk factors of coronary artery disease (CAD). Diabetic CAD are characterized by greater atheromatous plaque burden, smaller vessel size, more diffuse, longer narrowing and involving multiple coronary arteries compared to non-diabetic patients.\(^1\)\(^2\)

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Most studies have shown that revascularization of coronary athrosclerosis could improve long-term outcomes such as mortality rate, occurrence of myocardial infarction and stroke.\(^3\) Before the drug-eluting stent (DES) era, numerous studies had demonstrated that surgical revascularization was the preferred method, due to the more complete revascularization rate and the bypassing of large amounts of atheromatous lesions in the high-risk and multi-vessel disease group.

Recently, the improvement of percutaneous coronary intervention (PCI) technique and introduction of DES have dramatically reduced the rate of re-stenosis and target vessel revascularization. Between percutaneous or surgical revascularization, however, controversy exists as to which method is better for high-risk patients. According to the recent guideline,\(^4\) PCI is an inappropriate method for revascularization in diabetes with 3-vessel disease or left main disease.

In the Bypass Angioplasty Revascularization Investigation 2 Diabetes (BARI 2D) study, coronary artery bypass surgery (CABG) was superior to PCI.\(^5\) A 15.1% absolute reduction of mortality at 5-year follow up was noted in the CABG group compared with the PCI group. This difference, however, was not identified in BARI registry data, because the BARI trial was conducted before the introduction of the bare-metal stent (BMS). CABG has been established as a standard revascularization method in complex diabetic patients.

After the introduction of DES, PCI expanded its indication to longer lesions, multivessel and left main disease. Recently, in the Arterial Revascularization Therapies (ART)-II trial, 3-year follow-up results showed that PCI with sirolimus-eluting stent (SES) produced better long-term outcomes than PCI using BMS, irrespective of patient diabetes status in the ART-I PCI arm.\(^6\) In that study, compared with the ART-I CABG arm, although there was a higher rate of 3-vessel disease and severe lesion subset, PCI with SES had nearly the same survival rate as the CABG group (90.5% vs 86.4%, RR 0.7, 95% CI 0.35–1.40, P=0.27).

In the diabetes substudy of Synergy between PCI with Taxus and Cardiac Surgery (SYNTAX) trial using paclitaxel-eluting stent (PES), the overall 1-year major adverse cardiac and cerebrovascular event (MACCE) rate was higher in diabetic patients with PES compared with CABG.\(^7\) But there was no difference in the death/stroke/myocardial infarction rate in diabetic patients (10.3% CABG vs 10.1% PES, P=0.96) or in non-diabetic patients (6.8% CABG vs 6.8% PES, P=0.97). Compared with the non-diabetic patients, however, the presence of diabetes was associated with significantly increased mortality after either methods of coronary revascularization. On subgroup analysis, the PES group with a high SYNTAX score (>33) had a higher incidence of revascularization and mortality in the PCI group than in CABG group. CABG is still the better therapeutic strategy in very complex CAD.

In this issue of the Journal, Yamagata et al reported 3-year outcome data of both methods in multi-vessel diabetic patients.\(^8\) Characteristically, the revascularization method was the most up to date, using SES and IVUS in most cases (92%) of PCI arm, and off-pump CABG (OPCAB) using arterial grafts in the surgical arm. At 3-year follow up, MACCE was not different in both groups (27% SES, 23% OPCAB, P=0.290). As expected, the SES group had a higher incidence of revascularization than the OPCAB group; this finding is comparable with other randomized or observational studies.\(^5\)\(^–\)\(^8\) The OPCAB group had a higher incidence of cerebrovascular event (CVE). This finding was inconsistent with other trials.\(^5\)\(^–\)\(^9\) In the SYNTAX trial a higher incidence of CVE was observed in the total cohort (0.6% PCI, 2.2% CABG, P=0.003), but subgroup analysis of the diabetes, percutaneous or surgical revascularization did not differ in occurrence of CVE (2.5% PCI, 0.9% CABG, P=0.26).\(^7\) The reasons why the incidence of CVE was higher than in other trials could be due to older patient age, differences in medication, and less use of the renin–angiotensin system inhibitor and statin.

Another important limitation of that study was that most patients with double-vessel disease (87% in the SES group) underwent PCI, and those with triple-vessel disease (97% of the OPCAB group) underwent OPCAB. That study, however, was designed retrospectively on the basis of real-world clinical practice of selection of patients for PCI or surgery. This selection bias also affected the results. In the ART-II...
trial, however, compared with the ART-I CABG arm, the ART-II PCI group had more severe coronary stenosis and a higher number of diseased vessels, but it failed to demonstrate a difference in MACCE and death rate between the groups.6

In the CARDIA trial, the first randomized trial of coronary revascularization in diabetes, Kapur et al reported that PCI was non-inferior to CABG in diabetic patients at 1-year follow up.10 On subgroup analysis, in the PCI with DES group, the death/myocardial infarction/stroke incidence was very similar to that in the CABG group (12.4% CABG, 11.6% DES, HR 0.93, 95%CI 0.51–1.71). In addition, including revascularization, MACCE was not statistically different in both therapeutic strategies (12.8% CABG, 18.0% DES, HR 1.41, 95%CI 0.82–2.42) at 1-year follow up.

Yamagata et al reported that at 3-year follow up MACCE was not statistically different between the groups (27% SES, 23% OPCAB, P=0.492), but early MACCE was higher in the OPCAB group (0% PCI, 6% OPCAB, P=0.021).6 Surprisingly, stent thrombosis occurred in only 2 patients in the SES group: one definitive stent thrombosis occurred 1,141 days after stent implantation, the other presented as a sudden death. In that study the occurrence of stent thrombosis was very low compared with the other trials. In addition, target lesion revascularization (TLR) occurred in only 9 patients (9.8%) at 3-year follow up. The TLR rate was lower than that in the ART-II trial (15%) and in the diabetic subset of the SYNTAX trial (20.3% in patients with low-grade SYNTAX score). The authors indicated that they performed IVUS-guided PCI in 92% of the SES group. This might be helpful in reducing the TLR rate in PCI for long diffuse lesions, as well as the incidence of stent thrombosis.

Compared with non-diabetic patients, the peri-procedural complication rate is high in both methods of revascularization.12 In surgical revascularization, stroke occurs more commonly in diabetic patients, and also, cognitive decline is common after CABG.13 These adverse outcomes worsen the quality of life in the longer term. In percutaneous revascularization, procedural complication is more common in diabetic patients, even though angiographic success is similar to that in non-diabetic patients.13 Long-term mortality, however, is comparable to that of non-diabetic patient in many clinical trials.

In conclusion, PCI is as safe as surgical intervention and has acceptable long-term outcomes in the DES era. We should consider, however, how many patients are not suitable for PCI in the difficult lesion subset such as those with chronic total occlusion, heavily calcified lesion, and small vessel. Although these were randomized clinical trials, they cannot represent all kinds of diabetic CAD. For this reason, we need more clinical trials for complicated diabetic CAD patients.

References