A Simple, Effective, and Durable Treatment Choice for Left Main Coronary Artery Disease

Stents or Surgery?*

Cheol Whan Lee, MD,a Mineok Chang, MDb

Left main coronary artery disease (CAD) (stenosis ≥50%) is found in 5% to 7% of patients undergoing coronary angiography and is associated with poor prognosis because occlusion of the left main coronary artery compromises blood flow to about 75% of the left ventricle (1). Coronary artery bypass graft (CABG) surgery has been the standard of care because of its significant survival advantage over medical therapy (2). However, its prognosis remains highly unpredictable, and the benefits of CABG surgery for moderate left main CAD are currently not definitive. In a recent study (3), the long-term outcomes of patients with intermediate left main CAD in whom surgery was deferred on the basis of fractional flow reserve values >0.80 were favorable and similar to those of patients in whom CABG surgery was performed by fractional flow reserve values <0.80. Furthermore, medical therapy has greatly evolved, with improved outcomes for medically treated patients, which suggests a more benign prognosis for left main CAD than previously reported. Traditionally, percutaneous coronary intervention (PCI) has been limited to patients with left main CAD, who are at high risk for CABG surgery, or with protected left main CAD. However, over the past decades, PCI has rapidly advanced, and a growing body of evidence supports the use of PCI with drug-eluting stents (DES) in selected patients with left main CAD (4,5). In this issue of JACC: Cardiovascular Interventions, Zheng et al. (6) report their comparison of long-term outcomes following PCI with DES and CABG surgery in 4,046 consecutive patients with unprotected left main CAD. At 3-year follow-up, PCI compared with CABG surgery had a significantly increased risk for all-cause mortality (hazard ratio: 1.71; 95% confidence interval: 1.32 to 2.21; p < 0.01). The difference was significant among patients with high SYNTAX (Synergy Between Percutaneous Coronary Intervention With Taxus and Cardiac Surgery) scores but not those with low to intermediate SYNTAX scores. In addition, PCI was associated with higher risk for all-cause mortality in a subgroup of patients with left main bifurcation lesions (hazard ratio: 2.48) or left ventricular dysfunction (hazard ratio: 6.99). These findings support current guidelines stating that PCI with DES is a reasonable alternative to CABG surgery for treating patients with less complex left main CAD (4,5).

SEE PAGE 1102

*Editorials published in JACC: Cardiovascular Interventions reflect the views of the authors and do not necessarily represent the views of JACC: Cardiovascular Interventions or the American College of Cardiology.

From the aDivision of Cardiology, Heart Institute, Asan Medical Center, University of Ulsan, Seoul, Korea; and the bDivision of Cardiology, Seoul St. Mary’s Hospital, Catholic University of Korea, Seoul, Korea. Both authors have reported that they have no relationships relevant to the contents of this paper to disclose.
Closure or restenosis after plain old balloon angioplasty. Furthermore, DES have revolutionized the management of left main PCI, with their superiority over bare-metal stents for repeated revascularization. Several studies have compared PCI with DES versus CABG surgery for the treatment of left main CAD (7–9). These studies have typically shown similar outcomes for PCI and CABG surgery in terms of the composite endpoint of death, myocardial infarction, stroke, and repeat revascularization. Although the individual components of hard outcomes were comparable, repeat revascularization was significantly increased in PCI-treated patients. In the PRECOMBAT (Bypass Surgery Versus Angioplasty Using Sirolimus-Eluting Stent in Patients With Left Main Coronary Artery Disease) trial (7), there was no between-group difference in the composite primary endpoint of death from any cause, myocardial infarction, stroke, or ischemia-driven target vessel revascularization, even for the individual outcomes of death, myocardial infarction, and stroke. However, ischemia-driven target vessel revascularization occurred more frequently in the PCI group than in the CABG group. Likewise, in the SYNTAX trial (8), PCI was similar to CABG surgery for the composite outcome of death, myocardial infarction, stroke, or repeat revascularization. However, CABG surgery was associated with a higher rate of stroke and a lower risk for repeat revascularization. All-cause mortality represents the most unbiased outcome and may aid in the determination of the best revascularization strategy for patients with left main CAD. In both trials, the 2 groups had similar rates of death from any cause, but these trials had limited power to assess all-cause mortality.

CABG surgery remains the gold-standard treatment for unprotected left main CAD. However, the surgical risk was considered relatively higher in patients with severe left main CAD, which was a risk factor for
operative mortality among those undergoing CABG surgery (2,10). In CASS (Coronary Artery Surgery Study) (2), the greatest surgical mortality occurred among patients with severe left main CAD. In another comparison study of CABG surgery for left main and non-left main lesions, patients with high-grade left main CAD had a 3-fold increased risk for early death and a 50% higher risk for late death than those without left main CAD (10). Although the CABG findings have continuously improved, significant left main CAD may potentially increase the risk for early and late cardiovascular events following CABG. Hemodynamic instability after surgical manipulation and early graft failure might be catastrophic to patients with left main CAD because a large area of the left ventricle is affected by disturbance in the left main coronary flow. Likewise, severe left main CAD may progress to total occlusion after CABG surgery because of low and oscillating shear stress, which might make graft failure more catastrophic because of large ischemic burden. In contrast, PCI of left main CAD continues to evolve along with high rates of procedural success and favorable long-term outcomes. The risk for periprocedural death or early stent thrombosis after DES implantation remains very low (<1%) in nonbifurcation left main CAD (9). In addition, the risk for late DES failure appears to be relatively low as a consequence of the short stent length and a larger minimal stent area. A significant interaction was found between limited left main CAD (left main CAD alone or left main plus 1-vessel disease) and extensive left main CAD (left main plus 2- or 3-vessel disease) according to a pooled analysis of the PRECOMBAT and SYNTAX trials (unpublished data). The rate of all-cause mortality was lower in the PCI group than in the CABG group among patients with limited left main CAD, but the risk ratio was similar between the 2 groups with extensive left main CAD. In addition, left main bifurcation lesions requiring a complex 2-stent approach may have a high risk for DES failure, and CABG surgery might be the better treatment in this clinical setting (6). Finally, on the basis of currently available data, we propose that PCI with DES is the better treatment option for selected patients with less complex left main CAD (Figure 1). Ongoing randomized trials using newer generation DES (EXCEL [NCT01205776] and NOBLE [NCT01496651] trials) will provide more definitive answers on the relative merits of both strategies in the management of left main CAD.

In conclusion, PCI with DES is considered the preferred treatment option for patients with less complex and limited left main CAD, whereas CABG surgery is preferred for those with complex and or extensive left main CAD. The treatment that is simpler, more effective, and durable will be the final choice.

REPRINT REQUESTS AND CORRESPONDENCE: Dr. Cheol Whan Lee, Division of Cardiology, Heart Institute, Asan Medical Center, University of Ulsan, 88, Olympic-ro 43-gil, Songpa-gu, Seoul 138-736, Korea. E-mail: cheolwlee@amc.seoul.kr.

KEY WORDS bypass surgery, left main, stent

REFERENCES