Left Main Percutaneous Coronary Intervention Crossing the Threshold

Time for a Guidelines Revision!*

Jeffrey W. Moses, MD, Martin B. Leon, MD, Gregg W. Stone, MD

New York, New York

Surgery with coronary artery bypass grafting (CABG) has been the standard of care for obstructive left main coronary disease for more than 3 decades. The benefits of CABG as exemplified in the Coronary Artery Surgery Study coupled with the dismal early outcomes of percutaneously treating left main disease with balloon angioplasty created a “forbidden zone” for interventionalists (1,2).

Over the last several years, this “terra incognita” has been invaded by interventionalists on a widespread scale. A current literature search revealed more than 200 peer-reviewed citations in the past 30 months (including more than half a dozen editorials in major cardiology journals) dedicated to the subject of left main percutaneous coronary intervention (PCI). Much of these data stem from a renewed enthusiasm for left main intervention with drug-eluting stents (DES), reinforced by meta-analyses of randomized trials indicating equivalent 5- to 10-year rates of mortality and myocardial infarction in patients undergoing multivessel PCI compared with CABG (3,4). Favorable recent studies of left main DES include single-center registries (5), propensity-matched cohorts compared with CABG (6), meta-analyses of multicenter registries (7,8), and most importantly, the 705-patient left main subset analysis of the SYNTAX (Synergy Between Percutaneous Coronary Intervention with Taxus and Cardiac Surgery) randomized trial (9). The diversity and richness of these data sets are themselves a clear indication that left main PCI is now in widespread clinical practice across the globe.

In this context, LE MANS (Unprotected Left Main Stenting Versus Bypass Surgery) Registry collaborators should be congratulated. In this issue of the Journal, they report an 11-year collaborative effort that began in 1997 in a single country to evaluate the outcomes of left main PCI (10). In the course of this investigation, they also conducted a previously published modest-sized successful randomized trial comparing bare-metal stenting with CABG (11). The highly selected 252 patients in the current report represent a heterogeneous cohort, given the evolution of technique and technology during the course of the study inclusion time span. Nonetheless, certain conclusions can be drawn from their observations: 1) left main stenting in skilled hands can be performed with low morbidity and mortality with no late “catch-up”; 2) DES have improved clinical outcomes compared with bare-metal stents, principally by substantially reducing the need for repeat revascularization; 3) the rates of early, late, and very late thrombosis are low despite the limited use of dual antplatelet therapy after 2 years with both stent types; and 4) long-term survival after left main stenting is excellent in those patients with left main disease without concomitant 3-vessel disease.

The power of these observations is somewhat limited by a lack of randomization against surgery (or even a matched control group from the 1,700 CABG surgeries performed in these centers during this period), the small numbers of patients followed beyond 4 years, and the even smaller numbers treated with DES with late follow-up. Nonetheless, there is striking concordance when these findings are compared with both recent large observational registries and emerging data from the left main subset of the SYNTAX trial, in which paclitaxel-eluting stents compared with CABG in patients with left main disease and either low- or moderate-risk coronary anatomy resulted in comparable or lower rates of composite major adverse cardiovascular events.

Thus, in 2009, the weight of evidence supports the position that: 1) left main PCI with DES of the ostium or shaft can be performed with very low morbidity and mortality and with very low rates of repeat revascularization; 2) stenosis of the distal left main can be effectively treated with a single “crossover” stent in the majority of cases and has become the current preferred strategy; 3) stent thrombosis of the left main segment is infrequent; and 4) PCI with DES will result in noninferior outcomes to CABG in many patients with unprotected left main disease, although selected patients with very complex and/or triple-vessel disease still benefit from a primary surgical approach.

Numerous technical issues remain that need to be addressed in future clinical studies. Many would dispute the LE MANS group predilection for direct stenting. Many experienced left main treatment aficionados strongly favor aggressive lesion preparation and/or intravascular ultrasound guidance. The threshold for stenting both limbs of the distal left main bifurcation and the optimal bifurcation...
technique vary considerably among operators (12). And
lastly, special consideration must be given to patients in
whom long-term dual antiplatelet therapy may be problem-
atic because of compliance issues, bleeding diatheses, or
concomitant use of vitamin K antagonists.

Based upon the mounting evidence, there can be little
dispute at this juncture that PCI can be offered as a safe
alternative to CABG for a significant number of patients
with left main disease, particularly nondiabetics without
extensive concomitant coronary artery disease. Left main
PCI no longer needs to be confined to those patients who
adamantly refuse or who are at unacceptably high risk for
CABG. As such, there is now sufficient clinical trial data to
justify a relaxation of the American College of Cardiology/
American Heart Association guidelines, such that left main
PCI is no longer a Class III indication.

From a broader perspective, left main disease should be
viewed as an extreme case of chronic coronary artery disease
with a particularly large area of myocardium at risk in which
revascularization is the preferred initial treatment strategy.
The concept of appropriately risk stratifying patients is vital
to the question of which patients with chronic coronary artery
disease benefit from revascularization in general and
by PCI in particular. Recent data from the COURAGE
(Clinical Outcomes Utilizing Revascularization and Ag-
gressive Drug Evaluation) trial, including the nuclear sub-
study and analysis of patients with silent ischemia, indicate
that in patients with an important ischemic burden, PCI is
superior in reducing ischemia and in improving outcomes
compared with medical therapy alone (13,14). This position
is also supported by the recently published JAPSP (Japanese
Stable Angina Pectoris) and BARI (Bypass Angioplasty
Revascularization Investigation) 2-dimensional randomized
control trials, indicating superiority of revascularization
versus medical therapy in patients with either documented
ischemia or a large amount of myocardium at risk (15,16).
Such observations should be placed in context with the
SYNTAX trial, in which PCI with DES was either superior
or equivalent to CABG as a revascularization strategy in
patients with isolated left main disease or accompanying
single- or double-vessel disease (9). Only in the most
complex patients with left main and associated 3-vessel
disease was CABG a superior revascularization choice.
Thus, in circumstances of significant myocardium at risk
(including the extreme case of left main disease), PCI
improves clinical outcomes and provides a preferred therapy
alternative, even in patients with so-called “stable” coronary
artery disease.

Undoubtedly, there is sufficient equipoise to justify a
definitive multicenter, prospective, randomized, controlled
trial comparing DES with CABG to more clearly identify
the optimal revascularization pathways for individual pa-
patients with unprotected left main disease. Such a trial must
have sufficient power to determine important differences in
critical clinical end points such as death, myocardial infarc-
tion, and stroke, and also must be stratified to examine
important anatomic, clinical, technique-related, and isch-
emic variables. However, the results from such a definitive
study are many years away, and in the interim, practicing
physicians must make clinical decisions on the basis of the
best available evidence. The long-term LE MANS data
adds to the growing literature indicating that in many
patients, left main stenting can be offered as a safe and
effective alternative to surgery. However, because quality
assurance indicators are often “guidelines driven,” until there
is a change in the formal guidelines to more accurately
reflect the consensus shift in physician practice, the ap-
proach to left main revascularization will remain suspended
in the past, reflecting the conundrum of infrequently revised
guidelines and appropriateness criteria based on outdated
literature (17). The rapid advancement of medical technol-
ogy combined with the telescoping and globalization of
evidence-based medicine requires that critical practice
guidelines be continuously updated to provide our patients
with the safest, most effective, and least invasive therapies in
a timely fashion.

Reprint requests and correspondence: Dr. Jeffrey W. Moses,
Columbia University Medical Center and Cardiovascular Research
Foundation, 161 Fort Washington Avenue, New York, New York
10032. E-mail: jm2456@columbia.edu.

REFERENCES

bypass surgery on survival patterns in subsets of patients with left main
coronary artery disease: report of the Collaborative Study in Coronary
coronary angioplasty: early and late results of 127 acute and elective
bypass surgery compared with percutaneous coronary interventions for
multivessel disease: a collaborative analysis of individual patient data
of percutaneous coronary intervention with stenting and coronary
artery bypass surgery for multivessel coronary artery disease: a meta-
analysis with 5-year patient-level data from the ARTS, ERAIC-II,
of drug-eluting stent implantation in unprotected left main. Circula-
systematic review and meta-analysis on 1278 patients undergoing
percutaneous drug-eluting stenting for unprotected left main coronary
after drug-eluting stent implantation in non-bifurcation lesions that
involve unprotected left main coronary artery: a multicenter registry.
intervention versus coronary-artery bypass grafting for severe coronary
results of unprotected left main coronary artery stenting: the LE
MANS (Left Main Coronary Artery Stenting) registry. J Am Coll
Cardiol 2009;54:1500–11.

Key Words: percutaneous coronary intervention • left main CAD • chronic CAD.