

# Evolving Techniques in the Management of Complex LM Artery Disease

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Although percutaneous coronary intervention (PCI) and coronary artery bypass grafting (CABG) have been established treatments for coronary artery disease (CAD) for about 30 and 50 years, respectively, techniques to perform these strategies continually evolve [Wijns W et al. *Eur Heart J* 2010]. In addition, complex cases, including rarely seen lesions or complex vascular anatomy, can introduce challenges to clinicians when determining how to best manage a patient requiring myocardial revascularization. Ahmed Khashaba, MD, Ain Shams University, Cairo, Egypt, discussed a case study on complex left main (LM) PCI.

This case study involved a 50-year-old man with a history of hypertension, hyperlipidemia, and smoking. The patient had established CAD and a previous drug-eluting stent of the left anterior descending (LAD) artery 2 years prior. The patient presented with accelerating angina but had a known large abdominal aortic aneurysm, for which endovascular surgery was planned in the near future. His renal function was normal. Coronary angiography was performed via the radial artery, given the large abdominal aortic aneurysm, and identified a lesion in the LAD proximal to the previously placed stents. There was also disease in the distal circumflex coronary artery (LCX).

Prof. Khashaba stated that because of the complexity of the large abdominal aneurysm, CABG was not performed; instead, a percutaneous approach for the coronary lesions was entertained. First, intravascular ultrasound interrogation of the LAD was performed, which demonstrated heavy calcification. The finding of severe calcification led to rotablation of both the LAD and the LCX. Using a “mini-crush” technique, stents were placed in the LAD and the LCX. After the intervention, the patient was discharged the same day and prescribed clopidogrel-based dual-antiplatelet therapy for 12 months. Prof. Khashaba concluded by stating that transradial PCI is feasible and safe in patients with complex lesions.

Sundeep Mishra, MD, All India Institute of Medical Sciences, New Delhi, India, described proximal dissection of the LM after deploying simultaneous kissing stents (SKS) into the LAD and LCX, using a case that he had encountered about 13 years prior. The case involved a patient aged 65 years with CAD, hypertension, congestive heart failure, dyslipidemia, gastroesophageal reflux disease, posthemorrhagic anemia, and diabetes. His ejection fraction was about 35%, and he was on oxygen therapy because of respiratory failure. Mid-LM disease with stenoses in the LAD and LCX was identified. Prof. Mishra outlined the potential interventions (CABG or PCI) for this patient. CABG was a reasonable option on the basis of the anatomy, but the multiple comorbidities, including oxygen dependence, made the risk of CABG prohibitive. As a result, multivessel PCI was determined to be the best option for the patient.

The next question was which vessel to begin with—the LM bifurcation, LAD, or LCX. Prof. Mishra and colleagues decided to start with the LAD and LCX because the LM was not tight, the patient had mid-LM disease, and the LAD and LCX were discrete. They decided to use 2 stents of nearly equal size because the LM disease appeared to be extending into the bifurcation, and the patient’s comorbidities limited the ability of the team to do a complex and prolonged intervention (as would be needed for culotte or a crush strategy). The angle was too narrow for a T stent and provisional (TAP) strategy, so given the lack of information at that time, an SKS strategy was chosen. However, during the procedure, a dissection at the proximal edge of the stents occurred in the LM.

As a result, the clinician could have converted the procedure to a crush strategy or aligned the bailout stent perfectly with the 2 distal stents to avoid a crush strategy. After attempting the latter,

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Table 1. Joint ESC-EACTS/SCAI Guidelines on Myocardial Revascularization<sup>a</sup>

Class of Recommendations	Definition	Level of Evidence A	Data derived from multiple randomized clinical trials or meta-analyses
Class I	Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective	Level of Evidence B	Data derived from a single randomized clinical trial or large nonrandomized studies
Class II	Conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of the given treatment or procedure	Level of Evidence C	Consensus of opinion of the experts and/or small studies, retrospective studies, registries
Class IIa	Weight of evidence/opinion is in favor of usefulness/efficacy		
Class IIb	Usefulness/efficacy is less well established by evidence/opinion		
Class III	Evidence or general agreement that the given treatment or procedure is not useful/effective, and in some cases may be harmful		

  

Left main (isolated or 1VD, ostium/shaft)	<b>IA</b>	<b>IIa B</b>
Left main (isolated or 1VD, distal bifurcation)	<b>IA</b>	<b>IIb B</b>
Left main + 2VD or 3VD, SYNTAX score ≤ 32	<b>IA</b>	<b>IIb B</b>
Left main + 2VD or 3VD, SYNTAX score ≥ 33	<b>IA</b>	<b>III B</b>

EACTS=European Association for Cardio-Thoracic Surgery; ESC=European Society of Cardiology; 1VD=1-vessel disease; SCAI=Society for Cardiac Angiography and Interventions; 3VD=3-vessel disease; 2VD=2-vessel disease.

<sup>a</sup>In the most severe patterns of coronary artery disease, coronary artery bypass grafting appears to offer a survival advantage as well as a marked reduction in the need for repeat.

the position of the stent could not be perfectly aligned, so stent deployment was suspended because of concerns about distorting the LM-LCX stent. The remaining options included using a skirt technique, in which a stent is mounted on 2 balloons and then deployed, which covered the dissection but aligned with the 2 distal stents. However, the balloons were too short, so the stent could not be aligned. Two longer balloons were then used to deploy the stent.

Prof. Mishra concluded that obvious disadvantages of a technique should not be ignored in place of a simpler strategy and that although acute complications of SKS are rare, they can happen and are frequently difficult to manage.

Ayman A. Magd, MD, Azhar University, Cairo, Egypt, discussed LM coronary artery stenting. The joint European Society Cardiology and the European Association for Cardio-Thoracic Surgery guidelines assigned a Grade IA recommendation to CABG for patients with LM disease. For isolated or single-vessel

LM disease involving the ostium or shaft of the LM, PCI has a Grade IIa (Level of Evidence B) recommendation [Wijns W et al. *Eur Heart J* 2010] (Table 1).

The simplest and easiest, yet “pesky,” type is ostial LM disease, according to Prof. Magd. He recommended viewing lesions using the left anterior oblique cranial view instead of relying on the spider view to ensure that this type of lesion is seen. In addition, it takes a fair amount of time to carefully place the stent to prevent missing the lesion. A rare type of lesion is a midshaft LM lesion, which does not occur near the bifurcation and allows easier placement of the stent.

For a complex, distal bifurcation, the T technique can be used and is beneficial for a 90° angle. An increasingly popular technique is the TAP technique because it is easier than the crush technique. The mini-crush technique can also be used for a complex, distal bifurcation. SKS can also be used, particularly when a quicker technique is desired.

Prof. Magd illustrated his experience with patients who have various types of LM disease by describing



several cases that he has managed over the past several years. In one complex case, a patient had been hospitalized for 10 days because of pulmonary edema. After the patient's discharge, Prof. Magd performed angiography and found diffuse disease in the LM and a chronic complete occlusion of the LCX with a distal LM thrombus. A major concern in this case was distal embolism. A filter may be considered; however, distal embolization can still occur with even the smallest filter that is available. The patient refused surgery. A novel technique of stent underdeployment, in which a slightly undersized stent is used to prevent balloon slippage, was undertaken. This technique was used in the patient with success, along with intervention of the right coronary artery.

In another case, a patient had previous stents in the ostial LCX now with proximal mild disease before the stent. Prof. Magd performed a 2-stent procedure using a T-stent technique, plus a long stent in the area of distal disease, which took a total of 30 minutes.

Another case involved a patient with Leriche syndrome who presented with unstable angina. The patient had a trifurcation and the procedure was initiated from the left arch. Three wires were used via the LAD, LCX, and ramus. In addition, 3 balloons were used, 2 of which were used in case of an emergency, as the patient had an old complete occlusion of the right coronary artery, and the team was concerned that the LCX was the only remaining vessel supplying the inferior wall.

Although CABG and PCI are strategies that have been in use for many years, complex cases require careful consideration by clinicians prior to performing myocardial revascularization. Complex cases may require clinicians to think beyond the current guideline recommendations, but CABG and PCI are often still beneficial for patients.

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