Management of left main bifurcation and trifurcation lesions: the role of drug-eluting stents, intravascular imaging, and drug coating balloon

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Percutaneous coronary intervention (PCI) for left main (LM) coronary artery disease with bifurcation or trifurcation involvement remains one of the most challenging settings in interventional cardiology. The large myocardial territory at risk, complex vessel geometry, and prognostic importance of side branches complicate procedural decision-making.[1-3] The introduction of drug-eluting stents (DES) has reduced restenosis and repeat revascularization compared with bare-metal stents, supporting PCI as a valid alternative to coronary artery bypass grafting in selected patients, as demonstrated in the EXCEL and NOBLE trials. However, LM bifurcation and trifurcation PCI remain associated with increased risks of restenosis and stent thrombosis. Intravascular imaging with intravascular ultrasound (IVUS) and optical coherence tomography (OCT) has become essential to optimize LM PCI. IVUS-guided PCI improves vessel sizing, lesion characterization, and stent expansion, with clinical benefit demonstrated in IVUS-XPL and ULTIMATE. OCT offers superior resolution for strut apposition and edge dissections, though its penetration is limited in large LM vessels. Current guidelines advocate routine imaging guidance in LM interventions. Stenting strategies include provisional and planned two-stent approaches. The DKCRUSH V trial established the efficacy of double-kissing crush in true LM bifurcations, but simplified methods remain desirable. The single stent over bifurcation lesion or drug eluting ballon in side branch or both branches may be at least good enough as two-stent implantation. Combining DES with DCB, or DCB only strategy with IVUS or OCT guidance may enhance procedural safety and long-term efficacy in LM bifurcation and trifurcation lesions. We do not still enough data for quadrifurcation. Further randomized trials are needed to validate this approach and refine patient selection.

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LITERATURE

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