

Sirolimus-Eluting Balloon Treatment of Distal Internal Mammary Artery Anastomosis: Optical Coherence Tomography Findings

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Drug-eluting balloons (DEB) represent an interesting alternative to current generation drug-eluting stents (DES) in selected anatomic scenarios, such as in-stent restenosis, small-vessel disease and bifurcation lesions, where the systematic implantation of DES may result less appealing.^{1,2} In particular, lesions located at the distal anastomosis of a bypass graft (an artificially created bifurcation) constitute a unique anatomic setting, where DEB may overcome some inherent limitations of DES resulting from the implantation of a metallic platform throughout the bypass graft into and across the native distal vessel.

Herein we present, to the best of our knowledge, the first report of the treatment of a lesion located at the distal anastomosis of a left internal mammary artery (LIMA) to the left anterior descending coronary artery (LAD) with a novel sirolimus-DEB. Interestingly, optical coherence tomography (OCT) findings proved to be of major value to guide the procedure.

An 83-year-old man with previous history of hypertension, hyperlipidemia and ex-smoker was admitted with acute coronary syndrome. Coronary angiography revealed 3-vessel coronary artery disease, with a total occlusion at the mid-segment of the LAD and additional significant lesions at the obtuse marginal branch (OM) and mid-segment of the right coronary artery (RCA). After discussion in a Heart-Team meeting, a decision for a hybrid revascularization strategy was made. Off-pump coronary artery bypass grafting (CABG) was performed with a LIMA anastomosed to the distal

LAD and a saphenous vein graft from LIMA to OM. The postoperative period was uneventful. A week later, the scheduled percutaneous coronary intervention was successfully performed with a DES implanted at the mid RCA. However, during the procedure a revision of the bypass grafts revealed the presence of a significant lesion at the distal anastomosis of LIMA to LAD (Figure 1A). Due to a suspicion of pseudo-stenosis secondary to edema or spasm related to the recent surgery, it was decided to reevaluate this lesion later on. The scheduled control angiogram at 1 month revealed the persistence of the same image of a severe lesion at the distal anastomosis of the LIMA. The lesion appearance remained unaltered after repeated boluses of nitroglycerin. To gain further diagnostic insights, OCT imaging was performed. This imaging technique confirmed the presence of a critical stenosis with a severely reduced lumen (minimal lumen area 1.0 mm²) (Figure 2A). After lesion predilatation with a 2.0 mm semi-compliant balloon, a 2.5/15 mm sirolimus-DEB (MagicTouch, Concept Medical Inc, Surat, India) was used to treat the distal anastomosis (Figure 1B). A good immediate result was confirmed both by angiography (Figure 1C) and OCT (Figures 2B and 2C). The patient was discharged the day after and remains completely asymptomatic at the 9-month follow-up.

The diagnosis of lesions located in the distal LIMA anastomosis may be very challenging. When these lesions are detected in the early postoperative period technical problems should be differentiated from reversible causes, such as edema or spasm. Notably, however, the value of OCT to get further diagnostic insights on these elusive lesions has not been previously reported. Our findings underscore the usefulness of this technique to disclose the underlying substrate and to assess lesion severity before intervention and to guide and optimize the results of interventions. Lesions

Keywords

Angioplasty, Balloon, Coronary / methods; Coronary Artery Disease / diagnosis; Drug-Eluting Stents; Treatment Outcome; Sirolimus.

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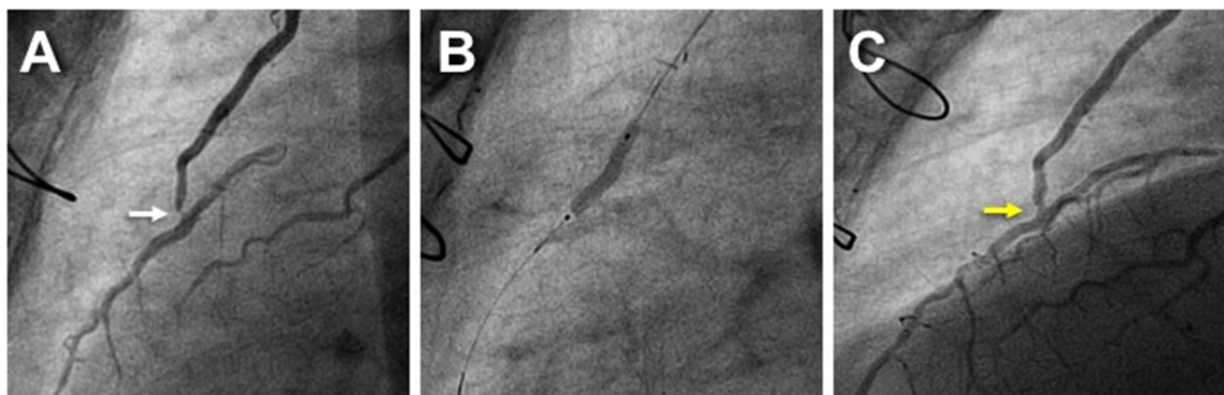


Figure 1 - A) Coronary angiogram depicting a significant stenosis at the distal anastomosis of LIMA to distal LAD (white arrow). B) sirolimus-DEB inflated at the lesion after predilatation. C) Final angiogram reveals excellent result (yellow arrow).

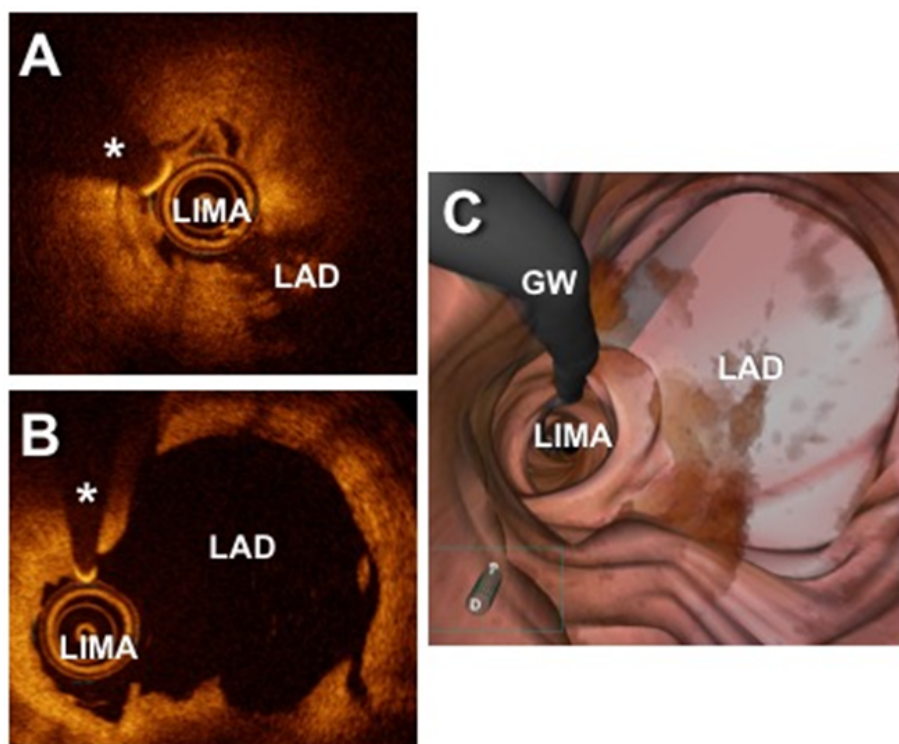


Figure 2 - A) Pre-intervention OCT at the zone of the LIMA to LAD anastomosis showing a reduced lumen area about 1.0 mm². B) OCT after predilatation and sirolimus-DEB inflation confirming good final result at the zone of anastomosis with an excellent lumen area (6.4 mm²). C) 3D reconstruction of final OCT run, showing from distal to proximal an "en face view" of the distal anastomosis of LIMA to LAD, confirming good result after Sirolimus-DEB. * denotes wire artefact. GW: guidewire.

located on LIMA distal anastomosis are frequently treated with plain balloon angioplasty, but more recently DES has been widely used. The value of DEB in this setting has not been well established.

Most of the evidence on the efficacy of DEB in both in-stent restenosis and de novo lesions has been generated with first generation paclitaxel-DEB.^{1,2} However, this technology is continuously evolving and, currently, novel

devices with limus-type drugs and more modern carrying systems, are available.³ We selected a novel sirolimus-DEB with a carrying system based on nanoparticles that enable an efficient drug transfer. Preclinical studies have shown that these nanocarriers have better bio-availability and in-tissue uptake, therefore, allowing a reduction in the drug dosage, therefore, potentially diminishing vessel toxicity.³ Preliminary experience with these novel devices appears highly promising.⁴ Our findings suggest the value of sirolimus-DEB in the treatment of de novo lesions at the distal anastomosis of LIMA bypass grafts. This therapy may represent a safe and valid alternative to current-generation DES in this setting. However, further studies with long-term clinical and angiographic follow-up are required to fully elucidate the relative value of this novel strategy in this unique anatomic scenario.

Novel sirolimus-DEB technology seems to be an alternative to current DES at curious scenarios such as distal LIMA bypass anastomosis. OCT may be helpful to assess the results after DEB treatment.

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Author contributions

Conception and design of the research: Garcia-Guimarães M. Acquisition of data: Garcia-Guimarães M. Writing of the manuscript: Garcia-Guimarães M, Alfonso F. Critical revision of the manuscript for intellectual content: Maruri-Sanchez R, Cuesta J, Rivero F, Bastante T, Alfonso F.

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Study Association

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