ESC European Society of Cardiology

European Heart Journal - Case Reports (2022) **6**, 1–2
https://doi.org/10.1093/ehjcr/ytac230

A case report of left main perforation treated with BeGraft covered stent

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Received 25 February 2022; first decision 18 March 2022; accepted 31 May 2022; online publish-ahead-of-print 6 June 2022

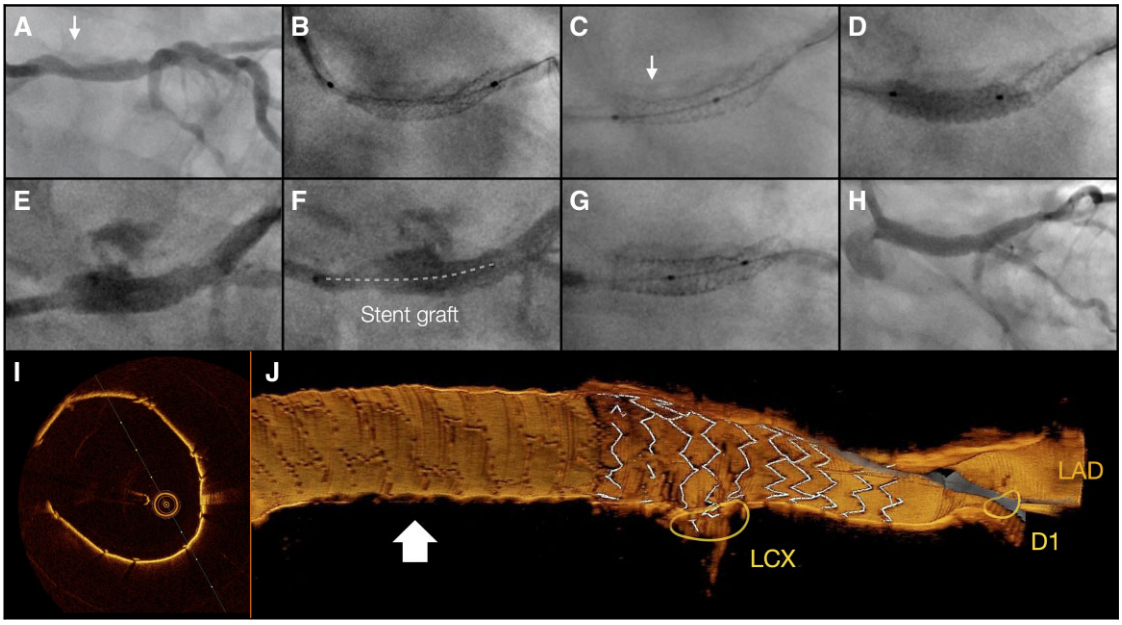

Figure 1 *Panel A*: serial mid- and distal LM stenosis (arrows); *panel B and C*: stent underexpansion after 5.0 mm balloon postdilatation (arrow); *panel D*: high-pressure postdilatation with the same 5.0 mm balloon; *panel E*: proximal LM perforation; positioning of the CS (*panel F*) which seals the perforation (*panel G and H*); *panel I*: intravascular OCT shows complete posterior shadowing inside the CS, the cobalt–chromium struts are visible; *panel J*: 3D-OCT reconstruction shows the covered stent (arrow) correctly deployed, over the first drug-eluting stent, both bifurcations with the left circumflex artery (Cx) and left anterior descending artery (LAD)—first diagonal artery (D1) remained intact; LM = left main; CS = covered stent; OCT = optical coherence tomography.

Implantation of a covered stent (CS) is the cornerstone of large vessel perforation treatment and in fact, the only rescue in left main (LM) perforation because embolization is out of the question and balloon tamponade as bridging to open surgery would lead to immediate hemodynamic collapse. We report herein such a case in a 70-year-old man who underwent 'provisional' LM percutaneous coronary intervention (PCI). Coronary artery bypass grafting (CABG) was not chosen due to the Syntax score (21 points, PCI 4.8% vs. CABG 9.6%) and because the patient preferred PCI. A single 4.0/28 mm stent was placed in a long and calcified vessel (*Figure 1*,

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Handling Editor: Dimitrios Terentes-Printzios
Peer-reviewers: Rafail Kotronias; F Aaysha Cader
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panel A and *B*) and proximal optimization technique (POT) was performed with a non-compliant 5.0/12 mm balloon. Relevant recoil and underexpansion was observed (*Figure 1*, *panel C*). Inflation of the same balloon at maximal pressures (24–26 atm) led to LM rupture, with Ellis type III perforation [*Figure 1*, *panel E*; (see Supplementary material online, *Video 1*)]. The balloon was immediately re-inflated in the spilling area and in <1 min, a 3.5/21 mm BeGraft CS (Bentley InnoMed GmbH, Hechingen, Germany) was deployed over the same guidewire. Despite the intense situation, extra-time was devoted to exact placement of the CS to cover only the proximal and mid-segment and not reach the bifurcation. The POT was repeated with complete sealing of the perforation (*Figure 1*, *panel H*). The patient remained stable and a pericardial drainage was not necessary. Although the intervention was elective, dual antiplatelet therapy with aspirin and ticagrelor was chosen for 12 months. At 1-year follow-up, he maintained asymptomatic and event-free.

Coronary CSs carry an increased risk of stent thrombosis and restenosis, and this is of particular importance when used inside the LM. Vascular healing is hampered by the polytetrafluoroethylene membrane, which on contact with blood cells, extracellular matrix and endothelial cells triggers prothrombotic mechanisms and accelerated intimal hyperplasia, typically at the edges of the stent. The rate of major adverse events decreased with the latest generations of CSs, which are thinner and contain only one layer of metal (recent data show a target lesion revascularization rate of 5–18%, all cause death 8–20% at 1 year).[1–3] It is plausible that the larger final lumen in our LM case restored laminar flow and limited the risk of neoproliferation. Short CSs are important in bifurcations, especially in LM perforations. A careful and precise investigation of the exact location of perforation during PCI, even in presence of cardiogenic shock, is crucial in order to preserve life. Covering the distal bifurcation of the LM would mean sacrificing a crucial vessel and the operator must be prepared to fenestrate the CS to recover the side-branch or send the patient to urgent bypass surgery. Heparin reversal is not advisable in LM perforation for two reasons: perforation must be sealed quickly and the risk of intrastent thrombosis is fatal. Using intracoronary imaging at every step of the PCI could avoid such complications.

Supplementary material

Supplementary material is available at *European Heart Journal – Case Reports* online.

Slide sets: A fully edited slide set detailing this case and suitable for local presentation is available online as Supplementary data.

Consent: Informed consent for patient information and images to be published was provided by the patient.

Conflict of interest: None declared.

Funding: None declared.

Data availability

The data that support the findings of this study are available from the corresponding author, G.L., upon reasonable request.

References

1. Bartuś J, Januszek R, Hudziak D, Kołodziejczak M, Kuźma Ł, Tajstra M, Figatowski T, Pawłowski T, Gruz-Kwapisz M, Smolarek-Nicpoń M, Skoczyńska A, Tomasiewicz B, Włodarczak A, Kulczycki J, Plens K, Jaguszewski M, Dobrzycki S, Ochała A, Gąsior M, Reczuch K, Bartuś S, Wojakowski W, Wańha W. Clinical outcomes following large vessel coronary artery perforation treated with covered stent implantation: comparison between polytetrafluoroethylene- and polyurethane-covered stents (CRACK-II Registry). *J Clin Med* 2021;**10**:5441.
2. Xenogiannis I, Brilakis ES. Advances in the treatment of coronary perforations. *Catheter Cardiovasc Interv* 2019;**93**:921–922.
3. Birkemeyer R, Olivecrona GK, Hellig F, Wöhrle J, Rottbauer W, Witkowski A, Kuliczkowski W, Bernhardt P, Bettels N, Schrage B, von zur Mühlen C, Cook S, Miljak T, Eggbrecht H, Eeckhout E, Westermann D, Monsegu J, Dumonteil N. Sealing of coronary perforations with a second-generation covered stent graft—results from the PAST-PERF Registry. *Cardiovasc Revasc Med* 2021;**25**:20–26.