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Bioresorbable vascular scaffold to treat malignant in-stent restenosis in a patient with nickel allergy[☆]

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ABSTRACT

Nickel is the most frequent allergen in patients with allergic contact dermatitis and nickel allergy has been associated with recurrent in-stent restenosis. However, it is often misdiagnosed because of a low suspicion threshold. It should be discarded in patients with recurrent in-stent restenosis, especially if their medical history reveals prior contact dermatitis. It is also noteworthy and rarely specified that even newer generation stents that use novel metal alloys also contain low amounts of nickel. To avoid the implantation of new stents containing this metal, when percutaneous coronary intervention is indicated, drug eluting balloons or bioresorbable vascular scaffolds associated with small doses of steroids could provide good alternatives of treatment. To the best of our knowledge, this is the first description of this therapeutic alternative in such an exceedingly rare clinical scenario.

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A 64-year-old female underwent a percutaneous coronary intervention (PCI) with 2 cobalt-chromium (CoCr) everolimus-eluting stents (EES) at proximal-mid left anterior descending (LAD) and with one CoCr-EES at right coronary artery (RCA). Two years later, she presented an occlusive restenosis at mid RCA and at mid LAD with bad distal vessel. Circumflex artery (Cx) showed no significant lesions (Fig. 1A–C). After Heart team evaluation, a PCI with a CoCr-sirolimus-eluting stent at distal RCA and a CoCr-zotarolimus-eluting stent (ZES) at proximal-mid RCA was performed. During LAD PCI, balloon expansion through previous stents was extremely difficult (Fig. 1D), so we performed in-stent rotational atherectomy with a 1.5 mm burr. Afterwards we could expand non-compliant balloons at high pressure and implant four overlapped CoCr-ZES from mid LAD to left main with good final result (Fig. 1E). Six months later, the patient presented new severe restenosis at both vessels (Fig. 1F–G). Due to the recurrent and aggressive restenosis, metal allergy was suspected. The patient revealed previous contact dermatitis and a specific test confirmed nickel allergy. After this finding, PCI with paclitaxel eluting balloons was performed with good final result. Six months later, a single photon emission cardiac tomography showed a severe anterior ischemia. A new coronary angiography (CA) showed a critical restenosis at ostial LAD, and a severe restenosis at mid-LAD with an occluded distal vessel (Fig. 1H–I). RCA presented a moderate restenosis at mid and distal segment. The unexpected finding

was a critical ostial stenosis at Cx artery (the only vessel that had not been treated before that offered collateral circulation to RCA and LAD) (Fig. 1H). At this point, the heart team decided to perform coronary artery bypass grafting (CABG) with a left internal mammary artery (LIMA) to the Cx and with saphenous vein graft (SVG) to the posterolateral branch of the RCA. Two months later, the patient presented a non-ST elevation myocardial infarction complicated with cardiogenic shock. The echocardiogram showed inferior and anterior akinesia and lateral hypokinesia with severe ventricular dysfunction. An emergent CA showed an occlusive restenosis of ostial LAD and proximal RCA and a critical stenosis of ostial Cx (Fig. 2A). SVG was occluded, probably because of the small distal vessel of the RCA and LIMA had a diffuse stenosis (Fig. 2B) that was supposed to be produced by an inflammatory response to surgical staples. Given the clinical scenario, we decided to perform an immediate PCI. Taking into account nickel allergy, we discarded a new metallic stent and implanted a 3.5 × 15 mm bioresorbable vascular scaffold (BVS) at LM-Cx with good final result (Fig. 2C). Prednisolone 30 mg/day was prescribed after PCI and slowly reduced to a maintenance dose of 2.5 mg/12 h after discharge. The addition of small doses of steroids has been successfully used to reduce the inflammatory response after PCI in similar cases [1]. After 6 months, the patient remains asymptomatic. Angiographic follow-up showed neither restenosis nor thrombosis of the BVS and improvement of collateral circulation to RCA and LAD. Optical coherence tomography confirmed these findings and showed partial endotelization of scaffolds (Fig. 2D). Cardiac magnetic resonance also showed an improvement of left ventricle ejection fraction that was mildly reduced, with necrosis at basal segments of inferior and anterior walls.

[☆] All of the authors have read and approved the final manuscript and we do not have any conflict of interest.

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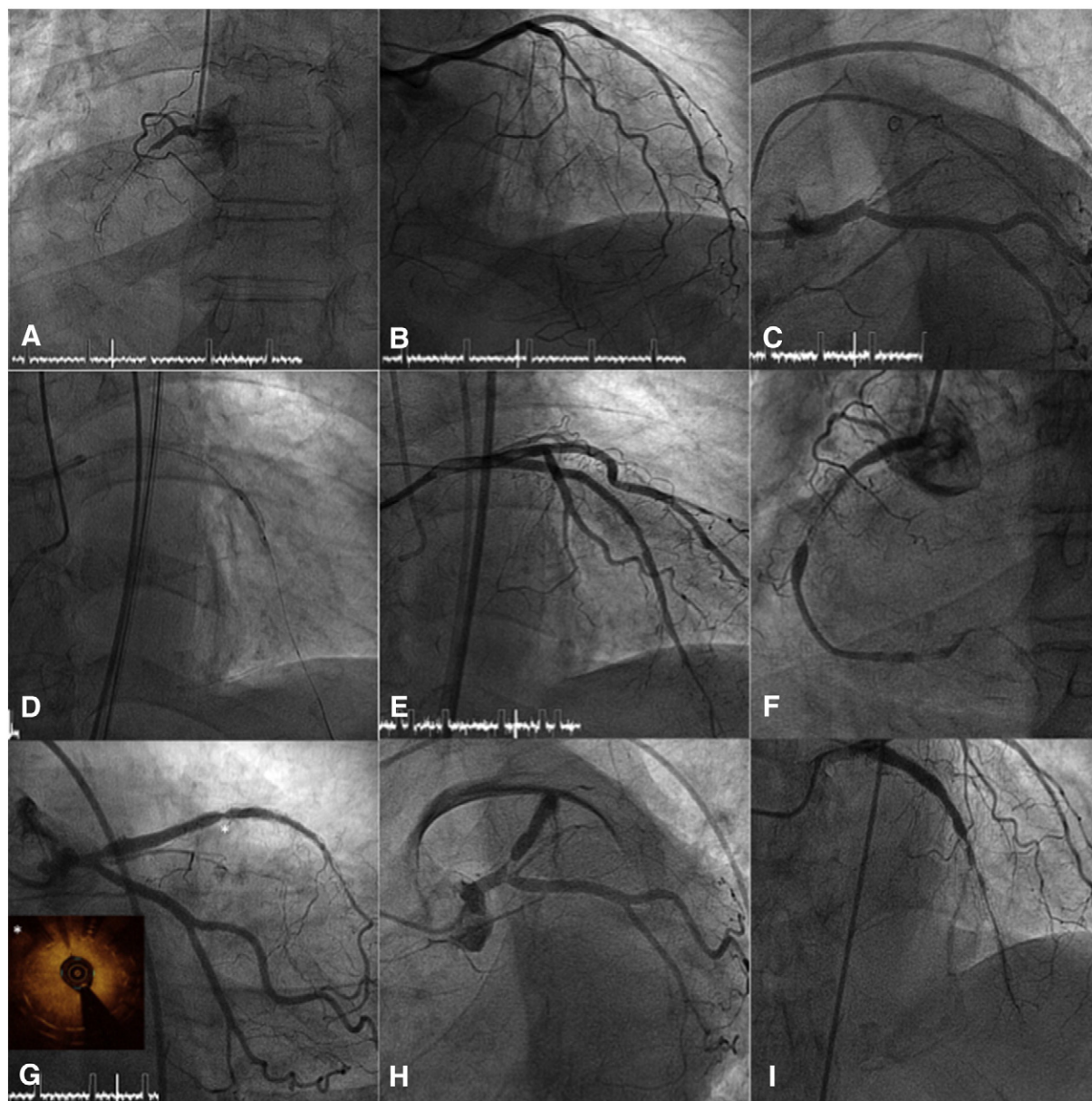


Fig. 1. A–C: Occlusive restenosis at mid right coronary (RCA) and left anterior descending (LAD). D: In-stent balloon infra-expansion. E: Final result after implantation of four overlapped CoCr-DES from mid LAD to left main. F: new severe restenosis at mid-distal RCA. G: Coronary angiography and optical coherence tomography showing new severe restenosis at mid-distal LAD. H–I: critical ostial stenosis at left anterior descending (LAD), critical ostial stenosis at Cx artery and severe restenosis at mid-LAD with an occluded distal vessel.

There are multiple possible causes for drug-eluting stents (DES) restenosis. Although mechanical and technical factors are the most common, biological factors may also contribute [2]. It has been hypothesized that contact sensitivity to the metallic components of the stent may increase the endovascular inflammatory responses leading to restenosis.

Nickel is the most frequent allergen in patients with allergic contact dermatitis and nickel allergy has been associated with recurrent in-stent restenosis [3,4]. However, it is often misdiagnosed because of a low suspicion threshold. The stent platform for most bare-metal stents and first-generation DES is 316L stainless steel, which is steel with added nickel, chromium and molybdenum. Although newer generation DES use novel metal alloys as CoCr or platinum-chromium, also contain little amount of nickel. Thus, even with new generation DES, it should be discarded in patients with recurrent “malignant” in-stent restenosis (ISR), especially if their medical history reveals prior contact dermatitis.

When early diagnosis is made, surgical revascularization could pose the best option for these patients. In order to choose the optimal surgical

technique and material, it must be taken into account that the majority of surgical staples contain little amounts of nickel. If PCI is done, drug eluting balloons or BVS, associated with small doses of steroids to stop the malignant ISR cycle, could provide good alternatives of treatment. To the best of our knowledge, this is the first description of PCI with BVS in such an exceedingly rare clinical scenario.

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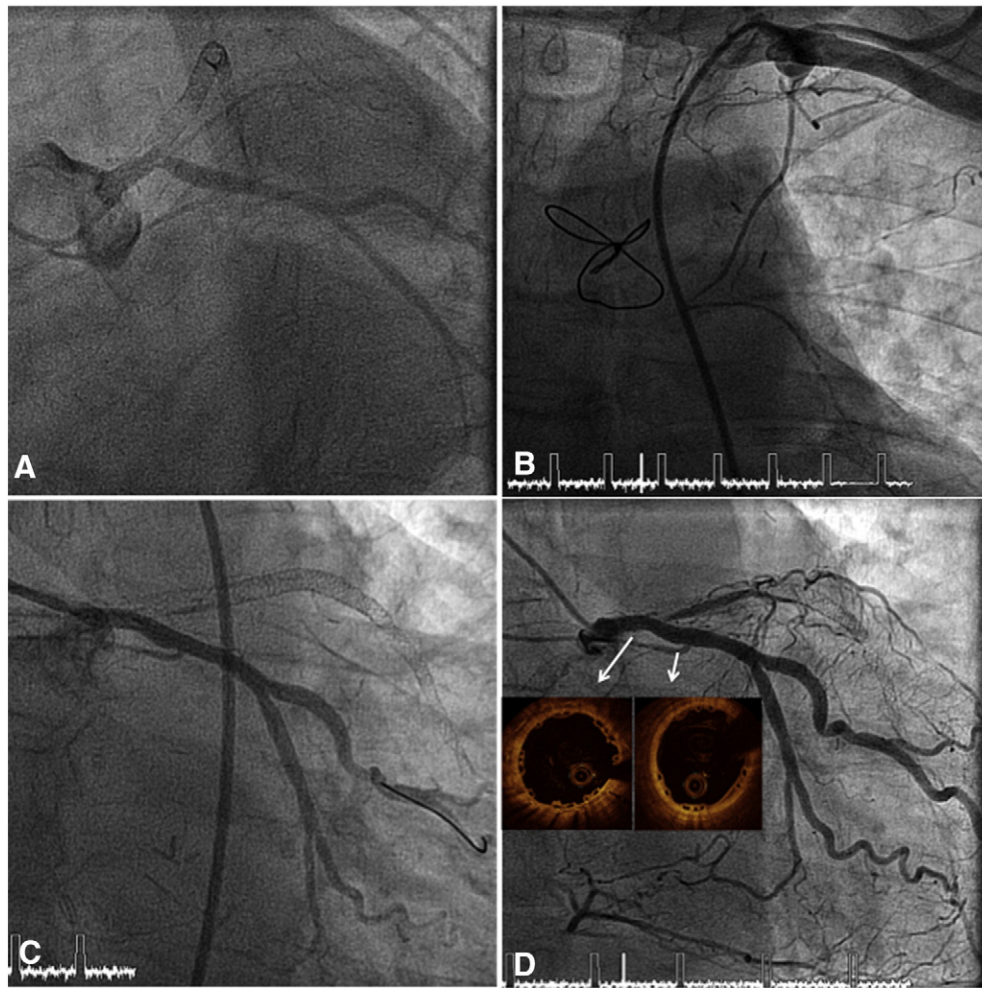


Fig. 2. A: occlusive restenosis of ostial left anterior descending (LAD) and critical stenosis of ostial circumflex (Cx). B: diffuse stenosis of left internal mammary artery. C: Implantation of a bioresorbable vascular scaffold (BVS) of 3.5×15 mm at left main-Cx with good final result after pre and postdilatation with non-compliant balloons. D: angiographic 6 months follow-up without restenosis or thrombosis of BVS and an improvement of collateral circulation to right coronary artery and LAD. Optical coherence tomography confirmed these findings and showed partial endotelization of scaffolds.