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Percutaneous coronary intervention in very small vessels

Background

Although percutaneous coronary intervention (PCI) of small coronary vessels is considered technically challenging, the treatment of such vessels has become quite common in recent years.

Nowadays, PCI is estimated to account for 30–40% of all coronary interventions. However, the best treatment approach is still debatable due to a lack of evidence.^{1–7} A recently published meta-analysis has demonstrated the superiority of stents over other available options, but the data used for this analysis was somewhat obsolete.⁸

Here, we present two cases of small vessel PCI in which a new stent intended for small vessels was implanted.

CASE 1:

Case presentation

A 62-year-old, physically active male with a family history of ischaemic heart disease was admitted to hospital due to angina, which started a few months prior to his admission. An ambulatory single-photon emission computed tomography (SPECT) perfusion scan showed ischaemia of the lateral wall.

Physical examination upon admission was normal, as were his lab results.

ECG-sinus rhythm, normal axis, ischaemic cardiomyopathy right bundle branch block, insignificant q waves on I, aVL, III, aVF.

Management

Due to typical chest pain and the scan results it was decided to proceed with coronary catheterisation.

The catheterisation revealed a three-vessel coronary disease consisting of chronic total occlusions of a small diagonal branch, a non-dominant right coronary artery (RCA) vessel and a diffuse severe (>90%) stenosis of a long marginal branch with a calibre of no more than 2.5 mm, which took off from the left circumflex artery at a 90 degree angle, first facing towards the base of the heart and then down towards the apex (Figure 1). It was decided to treat the marginal branch.

From a radial approach, an XB 3.5 6F guiding catheter was used to engage the left main coronary artery, after which a pilot 50 hydrophilic wire was carefully inserted into the almost totally occluded marginal artery and advanced along the hairline projection of the remaining artery. A 1.5/15 and 2/20 balloons were used to pre-dilate the ostial to mid parts of the artery and a 2.0/22 mm Resolute Onyx™ drug-eluting

fig. 1

Case 1 pre-intervention showing almost complete occlusion of marginal 2 (arrow)

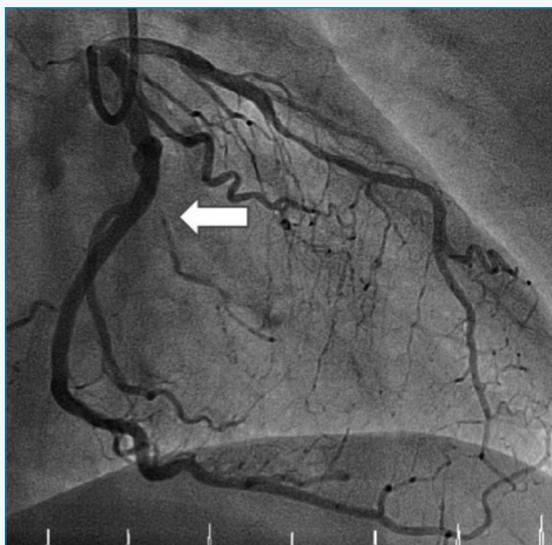


fig. 2

Case 1 post-procedure post-stenting with a 2.0 x 22 mm and 2.0 x 15 mm DES (arrows where stents were implanted)



stent (DES) was implanted from the ostial part onwards. After stent implantation it was clear that there was another distal stenosis that had to be treated and so a second shorter Resolute Onyx™ DES (2.0/15) was implanted, its proximal edge overlapping the distal one of the first stent (Figure 2).

CASE 2:

Diabetes mellitus and PCI

Diabetes mellitus (DM) is associated with a 2- to 4-fold increased risk of coronary artery disease (CAD).^{9,10} Patients with DM are prone to a more diffuse and rapidly progressive form of atherosclerosis, which affects small vessels. DM is also associated with a higher incidence of restenosis and an increased risk of major adverse cardiac events. This adverse outcome in small vessel lesions has been correlated with an increased atherosclerotic burden, negative remodelling and increased calcification.

PCI in this subset of patients began with balloon angioplasty in the early era and was later attempted by stenting using bare metal stents. Most studies documented a clinical benefit of stenting over balloon angioplasty. However, the incidence of restenosis still remained significantly high enough to cause concern. The advent of the DES made a remarkable leap in overcoming this hurdle. Recent advances in stent technology have aimed to minimise most issues persisting

with DES implantation in small vessels; stent designs incorporating thinner struts, bio-resorbable materials and better deliverability have enabled easier access to smaller target vessels and have demonstrated reduced complication rates.^{9,10}

Case presentation

A 48-year-old man with uncontrolled DM for the past 25 years and previously treated coronary artery disease was admitted to hospital due to chest pain. His lab work was normal, including normal levels of troponin and his ECG showed sign of an old inferior myocardial infarction. On echo, there was some regional akinesis of the lateral wall that was not previously described.

Management

It was decided to proceed with catheterisation, which revealed a single vessel disease consisting of a 75–90% stenotic lesion at the proximal-mid RCA and another lesion of more than 90% at the proximal part of a small calibre right posterior descending artery (PDA). It was decided to treat both lesions. After engagement of the RCA ostium with a JR4 6F guiding catheter, successful wiring of the artery was achieved using a BMW wire. Next, the narrower stenosis at the PDA was pre-dilated using a 2/12 balloon after which a 2/12 Resolute Onyx™ DES was implanted. It was then decided to treat the RCA lesion with direct stenting. This was accomplished using a 3/15 Resolute Onyx™ DES with good angiographic results.

fig. 3

Case 2 pre-intervention showing narrowing in the right PDA (arrow)

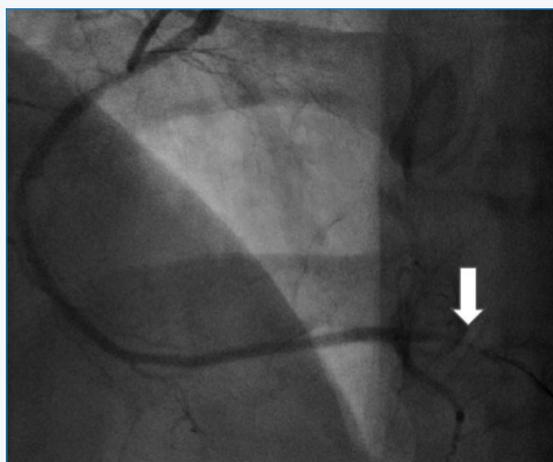
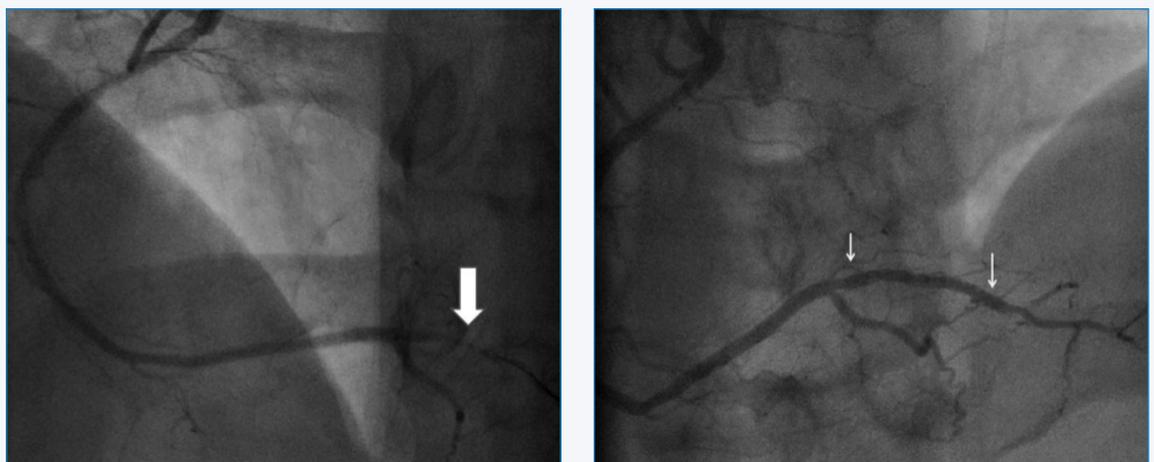


fig. 4

Case 2 post-procedure post-stenting with a 2.0 x 12 mm DES (arrows where stents were implanted)



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Take-home messages

1. Small vessel lesions can be treated.
2. The optimal method of treatment of small vessels is yet to be defined, but DES should probably be the method of choice.
3. The Resolute Onyx™ DES is safe, reliable and shows excellent manoeuvrability, which is crucial for the treatment of small vessels.

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